The 7th International Conference on Mechanics and Energy
ICME'2022, December 21-23, 2022, Hammamet, TUNISIA
Web site: http://icme.aicme.net

Certification of Paper Presentation

This is to certify that Mr./Ms **Leila BECHANE** has participated in the Seventh International Conference on Mechanics and Energy (ICME'2022) with a Poster entitled:

Optimization of Photovoltaic Conversion Yield of Cells Solar Hetero junction a-Si :H /c-Si.

Author(s): *Leila BECHANE, Wahiba SLIMANI, Hani BENGUESMIA*

President of AICME
Dr Sarhan KARRAY

ICME 2022 Chair
Pr Mohamed Salah ABID

ICME
International Conference
on Mechanic and Energy

The 7th International Conference on Mechanics and Energy

AICME Association Internationale des Chercheurs en Mécanique et Energie

December 21-23, 2022
Hammamet, TUNISIA

ICME International Conference on Mechanics and Energy 2022

ACCEPTANCE LETTER

Manuscript references: ICME2022-122

Title: Optimization of Photovoltaic Conversion Yield of Cells Solar Hetero junction a-Si :H /c-Si.

Author(s): Bechane LEILA, Slimani WAHIBA , Benguesmia HANI

Dear M Bechane LEILA

I am pleased to inform you that your paper has been accepted to be presented in the **Seventh International Conference on Mechanics and Energy "ICME'2022"** which will be held during the period of December 21-23, 2022 in Hammamet, TUNISIA.

On behalf of the Organizing Committee, I would like to thank you for your submission and I invite you to attend the conferance in order to present your paper.
So, it is worth mentioning that you should register to the conference by following the procedure outlined in our website: **icme.aicme.net** to **enable us to make your hotel reservation.**

The official participation letter will be delivered to the presenting author during the conference.

I look forward to seeing you in Hammamet, Tunisia.

With best regards,

President of AICME
Sarhan Karray

General Chair
Prof. Mohamed Salah ABID

ICME International Conference on Mechanic and Energy

AICME
Association Internationale des Chercheurs en Mécanique et Energie

International Association of Researchers
In Mechanics and Energy

The 7th International Conference on Mechanics and Energy

ICME
International Conference on Mechanics and Energy

ICME'2022 Conference Program

December 21-23, 2022, Hammamet, TUNISIA

www.icme.aicme.net

ICME' 2022 Conference Program

<table>
<tr><th>Time</th><th>Wednesday/ December 21, 2022</th><th>Thursday / December 22, 2022</th><th>Friday / December 23, 2022</th></tr>
<tr><td>08:00</td><td rowspan="5">Welcome and registration</td><td></td><td></td></tr>
<tr><td>08:30</td><td>Keynote 4 / Keynote 5 / Keynote 6</td><td>Keynote 9 / Keynote 10 / Keynote 11</td></tr>
<tr><td>10:00</td><td>Coffee break / Poster session</td><td rowspan="2">Oral session 3</td></tr>
<tr><td>10:30</td><td rowspan="3">Oral session 2</td></tr>
<tr><td>11:30</td><td>Coffee break</td></tr>
<tr><td>12:00</td><td></td><td>Closing Ceremony / Attestation Distribution</td></tr>
<tr><td>12:30</td><td>Lunch</td><td>Lunch</td><td rowspan="8"></td></tr>
<tr><td>14:00</td><td>Official Opening Ceremony</td><td rowspan="2">Keynote 7 / Keynote 8</td></tr>
<tr><td>14:30</td><td rowspan="2">Keynote 1 / Keynote 2 / Keynote 3</td></tr>
<tr><td>15:00</td><td rowspan="3">Social visit</td></tr>
<tr><td>16:00</td><td>Coffee break / Poster session</td></tr>
<tr><td>16:30</td><td>Oral session 1</td></tr>
<tr><td>19:00</td><td>Dinner</td><td>Dinner</td></tr>
</table>

WELCOME TO ICME'2022

REGISTRATION

08H00-12H00

LUNCH TIME

12H15-14H00

OFFICIAL OPENING CEREMONY

14H00-14H30

Chair: Pr. Mohamed Salah Abid & Pr. Zied Driss

(Room 1)

Keynote 1

14H30-15H00

Study of a combustion in sinusoidal chamber of combustion, based on the Finite Volume Method

Laboratory of Pure and Applied Mathematics (L.P.A.M), Department of Mathematics, University Mohamed Boudiaf. M'sila, 28000, ALGERIA

Speaker: Pr. Abdelkader Djerad **Algeria**

Keynote 2

15H00-15H30

Dynamic sealing for turbomachinery

Technical Center of Mechanical Industries (Cetim), Nantes 44000, France

Speaker: Pr. Lassad Amami **France**

Keynote 3

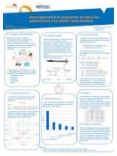
15H30-16H00

On the numerical implementation of a fully coupled model of anisotropic plasticity and continuous ductile damage for material behavior studies

Laboratory of Electro-Mechanic Systems (LASEM), National School of Engineers of Sfax (ENIS), University of Sfax (US), B.P. 1173, Road Soukra km 3.5, 3038 Sfax, TUNISIA

Speaker: Pr. Mondher WALI **Tunisia**

COFFEE BREAK & POSTER SESSION



16H00-16H30

ORAL SESSION N°1

16H30-19H00

SS _ Mechanical and physical characterization/ Computational methods in mechanics

Chair: Pr. Zied Driss & Pr. Mondher Walli
(Room 1)

1. **ICME-2022-060:** Numerical simulation of high voltage insulator using comsol multiphysics
   Oussama Ghermoul, Hani Benguesmia
2. **ICME-2022-011:** Mechanical properties of virgin and aged polycarbonate
   Sonya Redjala, Said Azem, Nourredine Ait Hocine, Anurag Dubey
3. **ICME-2022-078:** Mechanical Characterization of Natural Fiber Composite Materials
   Bendouba Mostefa, Djebli Abdelkader, Khellafi Habib, , Haddar Hasnia, Benabed Abderrahmen

4. **ICME-2022-122:** Optimization of Photovoltaic Conversion Yield of Cells Solar Hetero junction a-Si :H /c-Si.
   Leila Bechane, Wahiba Slimani, Hani Benguesmia
5. **ICME-2022-075:** Stability, phase transition and elastic properties of lithium based compounds
   B. Bennecer, N. Guechi, S. Karfaf
6. **ICME-2022-088:** Effect of uniform magnetic field on inclined Taylor-Couette flow
   BAHLOULI Abdelhak, MEZIANI Bachir and OURRAD Ouerdia
7. **ICME-2022-086:** MECHANICAL BEHAVIOUR OF E-FGM SANDWICH PLATES UNDER BUCKLING AND RESTING ON NEW ELASTIC FOUNDATION
   Ahmed Draï , Ahmed Amine Daikh, Benaoumeur Aour , Abdelhak Benaoum
8. **ICME-2022-108:** Deterministic approach to cracking in multilayer supports
   Fateh Madani, A.kirad, Y.Belkacemi
9. **ICME-2022-102:** Wavenature of the surface displacements of an elastic half-space with inertial properties
   Salah Guenfoud, Hemza Gherdaoui, Siarhei Bosakov, Abdelouahab Rezaiguia, Debra F. Laefer, Zied Driss
10. **ICME-2022-141:** Influence of Key Parameters on the type of vibration in the dominant modes of bridges
    Ouanani Mouloud, Sandjak Khaled, Khelafi Mourad Abdelouahab
11. **ICME-2022-009:** Improvement of machinability of ground Hardox 500 steel
    Kamel Bensaid, Nabil Ben Fredj
12. **ICME-2022-066:** Intensification of heat exchange by using a ferro-fluid under the effect of a magnetic field
    Laila BOUTAS, Mbarek MARZOUGUI, Jamil ZINOUBI

SS _ Fluid & structure investigations

Chair: **Pr. Sobhi Frikha & Pr. Mariem Ammar**
(Room 2)

1. **ICME-2022-067:** Study of a cavitation pocket in a turbulent flow
   Hatem KANFOUDI, Marwa El Nouri, Ridha ZGOLLI
2. **ICME-2022-120:** APPRAISAL OF SOLAR DESALINATION EFFICIENCY USING A 3D CFD VALIDATED MODEL
   Zouhayar AL ADEL, Abdallah BOUABIDI , Mouldi CHRIGUI
3. **ICME-2022-161:** A CFD modelling on Effects of Ejection Angle of a Co-flow on the Thermal Characteristics for a Combined Wall and Offset Jet Flow
   Nidhal Hnaien, Tanmoy Mondal, Meriem Ajmi
4. **ICME-2022-172:** Numerical Simulation of CaSO4 Crystallization Fouling on Heat Transfer Surfaces
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jeday
5. **ICME-2022-110:** Influence of the rotation frequency on the flapwise deformation of a flexible wind turbine blade
   Marwa Fakhfekh, Wael Ben Amira, Malek Abid, Aref Maalej
6. **ICME-2022-063:** Effects of gravity on transient evolution of gas-liquid interface in capillary tube
   Imen Bahrini, Faycel Khemili, Mustapha Najjari,Abdi Ben Nasrallah Samia, Jemni Abdelmajid
7. **ICME-2022-039:** Turbulent flow characteristics and aerodynamics forces effects of the wind acting on the tall building structure
   Lwiza Dib, Mohamed Aksouh, Amina Mataoui
8. **ICME-2022-081:** Mesoscopic numerical study of nanoscale convective heat in MOS transistor system
   Oussama Zobiri , Abdelmalek Atia
9. **ICME-2022-012:** Numerical analysis of crack nucleation in contact mechanics
   Ali Benhamena, A Baltach, F. Khelil, Mohamed Ikhlef Chaouch
10. **ICME-2022-041:** Effect of bluff-body shape on stability of Methane-Hydrogen-Air flame
    KHELLADI Fatma Zohra, ALLICHE Mounir , CHIKH Salah
11. **ICME-2022-048:** Cyclic plastic deformation response of defective SA333 C-Mn steel
    Maroua Saggar , Anouar Nasr , Chokri Bouraoui
12. **ICME-2022-087:** Experimental investigation of the physico-chemical and mechanical properties of olive pits
    Nasser Bouhemame, Abderrezak Bezazi, Hocine Khelifa, Gilberto Garcia del Pino, P.N.B. Reis, Fabrizio Scarpa

SS _ Mechanical and physical characterization / Materials and industrials technologies

Chair: Pr. Mohamed Kaffel & Pr. Sarhan Karray
(Room 3)

1. **ICME-2022-127:** Human-Robot collaboration for disassembly planning in industry 4.0 trend
   Imen Belhadj, Mahdi Aicha, Moncef Hammadi and Nizar Aifaoui
2. **ICME-2022-133:** Design and Correction of Process Nanodefects on Dynamic model of Microbeam Structures
   Hicham Bourouina , Abdelmadjid Boussendel
3. **ICME-2022-162:** Numerical analysis of formability of aluminum AA1050-H14 sheet metal using Cross-Die forming test
   Lachhel Belhassen, Mondher Wali, Fakhreddine Dammak
4. **ICME-2022-157:** Electro-intensification of mechanical dewatering during the application of electrical tomography technique
   Fatma Ouled Saad, Daoued Mihoubi, Jalila Sghaier
5. **ICME-2022-128:** Disassembly process time evaluation and its potential improvement on production lines
   Mahdi Aicha, Imen Belhadj, Moncef Hammadi, Nizar Aifaoui
6. **ICME-2022-010:** Adhesion strength and corrosion resistance of hydroxyapatite coating for biomedical implant applications Hafedh Dhiflaoui, Hayet Debbich, Ahmed Ben Cheikh Larbi
7. **ICME-2022-056:** CFD investigation on the Ranque-Hilsch vortex tube optimum design
   Ons TLILI , Hatem MHIRI, Philippe BOURNOT
8. **ICME-2022-096:** Technological Parameters Effect on Structural and Mechanical Properties of Assembled steels obtained by Manual Electric Welding Process
   Younès Benarioua
9. **ICME-2022-174:** Effects of partial discharges on epoxy resin used in the insulation of electrical machines
   E.Belhiteche, S. Rondot , P. Dony , M. Moudoud, O. Jbara
10. **ICME-2022-065:** Latent Heat Thermal Storage in Metal Foam Filled with Nano-Enhanced Phase Change Material
    Farida Iachachene; Hanane Cheradi; Zoubida Haddad
11. **ICME-2022-095:** Characterization of NiO thin films prepared by sol-gel spin coating technique: Effect of film thickness
    Djanette Meriem Blizak, Saadia Ysbaa

DINNER TIME

19H00

Chair: Pr. Mohamed Salah Abid & Abdelkader Djerad
(Room 1)

Keynote 4

08H30-09H00

The benefit of the use of composite materials in design of modern structures

Laboratoire de mécanique appliquée des nouveaux matériaux, department of mechanical engineering, Université 8 Mai 1945. Guelma, ALGERIA

Speaker: Pr. Abderrezak Bezazi **Algeria**

Keynote 5

09H00-09H30

Numerical and experimental analysis of composites reinforced by curauá and jute fibers

Department of Mechanical Engineering, State University of Amazonas, Manaus, AM, Brazil

Speaker: Pr. Gilberto García del Pino **Brazil**

Keynote 6

09H30-10H00

Techno-Economic Analysis of Solar Electricity Generation in Libya

University of Tripoli, Faculty of Engineering, Department of Mechanical and Industrial Engineering Tripoli, Libya

Speaker: Pr. Nouri Alkishriwi **Libya**

COFFEE BREAK & POSTER SESSION

10H00-10H30

ORAL SESSION N° 2

10H30-12H30

SS _ Advanced energy & Materials technologies

Chair: Pr. Mohamed Salah Abid & Pr. Zied Driss
(Room 1)

1. **ICME-2022-114:** Reduction and thermodynamic treatment of NOx emissions in a controlled ignition engine using oxygenated fuels
   Chokri Boubahri, Radhouane Meherzi, Arwa Toumi
2.
3. **ICME-2022-061:** Estimation of the surface condition of the polluted insulators using fuzzy inference system (FIS)
   Hani Benguesmia, Badis Bakri, Fareh Hamrit
4. **ICME-2022-062:** Thermophysical behavior of the sand concrete lightened by treated barley straws in an arid environment
   Belkacem Belhadj, Khadidja Kehli,Mohammed Seghir Ammari
5. **ICME-2022-129:** Prediction of the structural, magnetic and optoelectronic properties of Cd0.75Ir0.25S and Cd0.75Os0.25S: A DFT investigation
   Mokhtar Boudjelal, Mohamed Batouche, Taib seddik
6. **ICME-2022-158:** Numerical simulation of the flow around a wind turbine blade
   Wissem ZGHAL, Sarhan KARRAY
7. **ICME-2022-030:** Reliability and resistance to damage of different types of natural fibers of a unidirectional composite material
   Sidi Mohamed Amine Khiat, Ramdane Zenasni, Hadjar Bennacer, Djanet Khiat

8. **ICME-2022-051:** Influence of the Fiber Geometry on the Effective Mechanical Properties of Hybrid Epoxy Composite Materials
   Zenasni Ramdane, Amine Sidi Mohamed Khiat, Medjahed Bendida, Hamdi Mawloud
9. **ICME-2022-089:** Composite construction materials from plant resources: mechanical characterization and statistical approach
   Hocine Khelifa, Abderrezak Bezazi, Nasser Bouhemame, Haithem Boumediri, Gilberto Garcia del Pino, Paulo N.B. Reis, Fabrizio Scarpa, Zied Driss
10. **ICME-2022-069:** Physical characterization of polymers exposed to corona discharge
    El Hadi.Belhiteche, Sébastien. Rondot , Philippe. Dony , Mustapha. Moudoud, Omar. Jbara
11. **ICME-2022-097:** Stability of Anchored Retaining Walls With Pseudo-Static Method
    Benamara Fatima Zohra, Kechkar Chiraz, Nigri Ghani, Bencheikh Messaouda

SS _ Heat and mass transfer

Chair: Pr. & Pr. Ridha Boudhiaf & Pr. Mohamed Ali Jemni
(Room 2)

1. **ICME-2022-018:** Using PCA and PLS on Operating Data to Predict the Fouling Resistance in Cross-Flow Heat Exchanger
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jedaya
2. **ICME-2022-020:** Sensitivity Analysis of Artificial Neural Networks Output in Simulation of the Cross-Flow Heat Exchanger
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jedaya
3. **ICME-2022-037:** Linear and non-Linear Stability Analysis of Double-Diffusive Convection in a Shallow orizontal Rectangular Cavity Uniformly Heated and Salted From the Horizontal Sides and Filled with non-Newtonian Fluids
   Mounir Alliche, Redha Rebhi
4. **ICME-2022-055:** A Numerical Study on the Effect of Radiation on Natural Convection in a Two-Square Duct Annuli Filled with a Semi-Transparent Fluid
   Bouanani Mohammed , Benbrik Abderrahmane, Soualmi Rabiaa, Cherifi Mohammed
5. **ICME-2022-074:** Optimization of fouling resistance in cross flow heat exchanger using experimental design and response surface methodology
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jedaya
6. **ICME-2022-002:** MHD MIXTE CONVECTION OF NANOFLUID IN A CAVITY WITH A HEAT-GENERATING ELEMENT
   Adel Sahi, Messaoud Hamdi, Nesrine Abdelli, Djamel Sadaoui, Bachir Meziani, Ouerdia Ourrad
7. **ICME-2022-016:** Thermal diffusion and diffusion thermo effects on thermosolutal mixed convection using Lattice Boltzmann Method (LBM)
   Bouthayna Mhamdi, Soufiene Bettaibi, and Moez chafra
8. **ICME-2022-017:** Soret- Dufour Effect on natural Convection Past a Vertical Plate in Non-Darcy Porous Medium Saturated WithBuongiornoNanofluid thePresence of Viscous dissipation
   Aghbari Anis, Ali Agha Hamza, Sadaoui Djamel
9. **ICME-2022-019:** Heat Transfer Enhancement with Magnetic Field of Swirling Nanofluid Flow
   Brahim Mahfoud, AZZOUG Mohammed Oubelkacem
10. **ICME-2022-071:** Numerical study of a heat exchanger using a phase change material (PCM)
    Medjahed Bendida, Bucuane Enio Valter Felix, Haddam Amine
11. **ICME-2022-028:** Numerical Analysis of the Mixing of Gaseous Contaminant in a Ventilated Room
    Senouci Moussa, Ould Said Belkacem, Retiel Noureddine
12. **ICME-2022-029:** Numerical Comparison of two Ventilation Strategies in an Engine Laboratory
    Senouci Moussa, Ould Said Belkacem, Retiel Noureddine

SS _ Modeling and optimization of energy conversion systems

Chair: Pr. Hedi Kchaou & Pr. Mohamed Kaffel
(Room 3)

1. **ICME-2022-003:** THERMODYNAMIC ANALYSIS OF A PEM FUEL CELL SYSTEM
   Hamid Abdi, Omar Ketfi, Abdellah El-Bey, Abderaouf Djeghdjough, Noureddine Ait Messaoudene
2. **ICME-2022-072:** Numerical investigation of influence of partially blocked gas flow channel on mass transport and performance of solid oxide fuel cell
   Abir Yahya, Hacen Dhahri
3. **ICME-2022-112:** Modelization and Optimization of Photovoltaic modules using Design of experiments approach
   Abdallah Zegaoui, Fatma-Zohra. Kessaissia, Mustapha. Arab, Michel Aillerie.
4. **ICME-2022-035:** Comparative study of two cooling modes of a PV panel
   Sonia Ait Saada, Idir Kecili, Reki Nebbali
5. **ICME-2022-123:** Application of an Intelligent Controller in Shunt Active Power Filter
   Sayah Youcef, Hani Benguesmia, Henini Noureddine
6. **ICME-2022-148:** Prediction of flashover voltage of cap and pin insulator using adaptative neuro-fuzzy inference system (ANFIS)
   Hani Benguesmia, Badis bakri, Nassima M'ziou
7. **ICME-2022-163:** Simulation of Depollution In Electrical Networks Using MATLAB/Simulink Tools
   Hani Benguesmia , Roqiya Saada, Iman Abdelhadi
8. **ICME-2022-164:** Development and control of multi-level converters for power system applications
   Sayah Youcef, Hani Benguesmia, Henini Noureddine
9. **ICME-2022-165:** Effects of partial discharges on epoxy resin used in the insulation of electrical machines
   E.Belhiteche, S. Rondot , P. Dony , M. Moudoud, O. Jbara
10. **ICME-2022-085:** Natural convection in a rectangular cavity with an alveolus of different positions
    MEZIANI B. HAMEDI M., O. OURRAD and SADAOUI Dj.
11. **ICME-2022-052:** Performance of Salinity Gradient Solar Pond with Vertical and Inclined Walls
    Ridha Boudhiaf, Zied Driss, Mounir Baccar

LUNCH TIME

12H30-14H00

Chair: Pr. Zied Driss & Pr. Mondher Walli
(Room 1)

Keynote 7

14H00-14H30

Numerical stress analysis of biomechanical orthotropic hip prosthesis under different torsion couple of forces using the finite element methods

Mechanical Engineering Department, Laboratory of Mechanics, University of Fréres Mentouri Constantine 1, Route de Ain el bey 25000, Constantine, Algeria

Speaker: Pr. Brahim Necib **Algeria**

Keynote 8

14H30-15H00

Experimental analysis and numerical modelling of cold sheet metal stamping

Higher Institute of Technological Studies of Sfax, Tunisia

Speaker: Pr. Mounir Trabelsi / Pr. Hamdi Hentati **Tunisia**

Social visit

15H00-18H30

DINNER
19H00

Chair: Pr. Abderrezak Bezazi & Pr. Lassad Amami
(Room 1)

Keynote 9
08H30-09H00

Numerical and experimental study of the aerodynamic and thermal characteristics of a greenhouse

Laboratory of Electro-Mechanic Systems (LASEM), National School of Engineers of Sfax (ENIS), University of Sfax (US), B.P. 1173, Road Soukra km 3.5, 3038 Sfax, Tunisia

Speaker: Pr. Zied Driss **Tunisia**

Keynote 10
09H00-09H30

Modelisation and simulation of physico-thermodynamic properties: genetic algorithm and artificial neural networks methods

Département de Génie des Procédés, LSPN, Université 8 Mai 1945 de Guelma, B.P. 401, Guelma, Algeria

Speaker: Pr. Yasmina Lahiouel **Algeria**

Keynote 11
09H30-10H00

Computer Program of Structural Analysis by FEM

Laboratory of Mechanics, Engineering and Innovation (LMEI), Higher School of Technology, Department of Mechanical Engineering, University Hassan II - Casablanca, Morocco

Speaker: Pr. EL Hassan Boudaia **Morocco**

ORAL SESSION N° 3

10H00-11H30

SS _ Renewable energy

Chair: Pr. Wissem Zghal & Pr. Zied Driss
(Room 1)

1. **ICME-2022-004:** Computational Study of coupled Natural Convection and radiation in Vertical Cylindrical Annular Cavity filled with Cu-Water Nanofluid Under Magnetic Fields
   Mohamed A. MEDEBBER, BelKacem OULD SAID ; Noureddine Retiel
2. **ICME-2022-033:** Repowering of a wind farm in Sidi-Daoued -Tunisia
   Hassen Ayed Chraiga , Zakaria Twaila Zaher Khantouch , Othman jeddi
3. **ICME-2022-034:** Parametric study of a vertical air-to-ground heat exchanger
   Idir Kecili, Rezki Nebbali
4. **ICME-2022-005:** Effect of the Atmospheric Boundary Layer on a Wind Turbine
   Said Zergane, Abdelkader Djerad, Seyfeddine Guesmia
5. **ICME-2022-053:** An experimental performance of a solar air heater integrated with an internal heat storage tank made of finned phase-change material PCM
   Hussam S. Dheyab, Manar S.M. Al-Jethelah, Sirine Chtourou, Mounir Baccar
6. **ICME-2022-111:** 2-way fluid-structure interaction simulation of a wind H-Darrieus turbine with a flexible blade
   Tarek Elbeji, Wael Ben Amira, Khaled Souaissa, Moncef Ghiss , Hatem Bentaher and Nabil Ben Fredj
7. **ICME-2022-054:** Effect of water layer thickness on the performance of triangular solar still with concave absorber
   Ridha Boudhiaf , Sameh Kessentini, Elhachmi Elhassene, Zied Driss, Mohamed Salah Abid, Abderrahmane Aissa, Mohammed El Hadi Attia

8. **ICME-2022-098:** Numerical studies on the influence of Y-shaped fin arrangement on the melting performance of a vertical PCM enclosure
   Belazreg Abdeldjalil , Abderrahmane Aissa , Sahnoun Mohammed, Zied Driss, Mohamed Salah Abid
9. **ICME-2022-050:** Calcium sulfate fouling on two different heat exchanging surfaces
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jeday

SS _ Mechanical and physical systems optimization

Chair: Pr Hamdi Hentati & Pr. Jamel Mars
(Room 2)

1. **ICME-2022-043:** The influence of nitrogen and thermal annealing on the properties of titanium nitride thin films
   Selma Baali, Younes Benarioua
2. **ICME-2022-044:** Effect of Time and Temperature of Carburizing Treatment on the Structure and the Hardness of Steel 16NC6
   Selma Baali, Younes Benarioua
3. **ICME-2022-077:** Stress-frequency effect on fatigue behavior of Polyethylene
   A. Djebli, M. Bendouba, A. Baltach, A. Talha
4. **ICME-2022-180:** Strain-hardening and damage of metal matrix composites under simple shear: experimental analysis and numerical features
   M. Dammak, M. Gaspérini, P.Franciosi
5. **ICME-2022-115:** Comparative Study between Fuzzy Controller and Sliding Mode Control for Quadruple Tank System
   Akka Ali, Moussa Oussama, Bouzidi Ali, Benguesmia Hani
6. **ICME-2022-031:** Perturbation method applied to interfacial three dimensional waves in the presence of a parallel current
   Soraya Salmi, Nabil Allalou, Mohamed Debiane
7. **ICME-2022-070:** Choice of mother wavelet by the wavelet entropy
   Kenza. Zaibak, Nora. Nait Bouda and Fawzia. Mekideche- Chafa
8. **ICME-2022-045:** Experimental study and modeling of spinel biomarkers for biomedical applications as fluorescent probes
   I.Elhamdi, H. Souissi, S. Kammoun, E. Dhahri, B. F.O. Costa
9. **ICME-2022-047:** Prediction of solar irradiation using response surface methodology
   Badis Bakri,Hani Benguesmia, Zied Driss

SS _ Energy systems innovations

Chair: Pr. Mohamed Kaffel & Pr. Sarhan Karray
(Room 3)

1. **ICME-2022-038:** Linear Fresnel Concentrator Receiver: Sensitivity Analysis based on Thermal Resistance Model
   Filali Baba Yousra, AL Mers Ahmed, Abdessamad Faik
2. **ICME-2022-040:** Experimental Evaluation of the Thermal Performances of no vacuum Compound Parabolic collector Receiver
   AL Mers Ahmed , Filali Baba Yousra
3. **ICME-2022-042:** EFFETC OF PCM MASS ON THE PERFORMANCES OF LaNi5-METAL HYDRIDE PUMP
   Amel MILED, Faouzi ASKRI
4. **ICME-2022-064:** Numerical study of parameter's effect on the performance of a parabolic dish system
   Hiba Cherif, Marwa Ezzine, Jalila Sghaier, Hatem Mhiri

5. **ICME-2022-116:** Fuzzy Logic Controller Optimized by ACO for Decentralized Source Based on a SOFC
   Akka Ali, Bouzidi Ali,Moussa Oussama, Benguesmia Hani
6. **ICME-2022-121:** Fuzzy Logic Power Control of a doubly fed induction generator based on WECS
   Oussama Moussa, Lallouani Hellali , Aboubaker Essadiq Mazouz, Ali Akka
7. **ICME-2022-154:** Numerical Investigation of Solar Chimney with storage tank
   Ines Amamri , Haythem Nasraoui , Abdallah Bouabidi , Zied Driss
8. **ICME-2022-173:** Model tests on a fixed OWC wave energy converter with focus on the oscillating chamber shape effect
   Mohamed Amine Samet, Mohamed Ali Jemni, Mariem Ammar, Mohamed Salah Abid
9. **ICME-2022-168:** A study of air-swirl design features for GT air-compressor gas turbine through CFD optimization
   Mohamed Ali Jemni, Mohamed Salah Abid

COFFEE BREAK

11H30-12H00

CLOSURE CEREMONY / BEST PAPERS AWARDS / CERTIFICATES DISTRUBITION

12H00-12H30

Poster Session

(This session is taking place on **Wednesday & Thursday / December 21 & 22, 2022** with the coffee break)

1. **ICME2022-001 :**Fluid structure interaction of the turbulent flow aroundan obstacle
   Sarhan Karray, Wissem Zghal, Mohamed Salah Abid
2. **ICME2022-006 :** Tribological characterization of nano-sized silicon nitride on beta phase
   Amine Charfi, Mohamed Kharrat, Mohd Farooq Wani, Maher Dammak
3. **ICME2022-007 :** Resistance to crack propagation of a glass fibercomposite (mats) - Polyester
   Abdelkader Djerad, Lamia Benhamadouche1, Nassima Moussaoui.
4. **ICME2022-008 :** Elaboration and characterization of a composite polyester / recycled jute fabric.
   Lamia Benhamadouche, Nassima Moussaoui, Abdelkader Djerad
5. **ICME2022-014 :** Mechanical Behavior Of Unstable Embankments Reinforced With Discrete Elements (Geosynthetics)
   Messaouda Boutahir Born Bencheikh , Assia Aidoud, Salima Boukour, Fatima zohra Benamara and Lazhar Belabed
6. **ICME2022-015 :**A Design Of Experiment Study Of Plasma-Sprayed Alumina-Titania Coatings Using Taguchi's Technique
   Mokhtar DJENDEL, Rabah BOUBAAYA, Samir BENANIBA,Omar ALLAOUI,Maazouz Mourad
7. **ICME2022-021 :**The effect of adding different types of natural fibers on the mechanical properties of mortars
   Samir BENANIBA, Mokhtar DJENDEL, Rabah BOUBAAYA, Kessal Oussama, Zied Driss
8. **ICME2022-022 :** Thermal characterization of bio sourced materials reinforced with date palm fibers
   Samir BENANIBA, Rabah BOUBAAYA, Mokhtar DJENDEL, Kessal Oussama, Zied Driss
9. **ICME2022-023 :** Contribution to the study of a surface conversion treatment of a borided or cemented steel and coated with chromium films
   Rabah BOUBAAYA, Mokhtar DJENDEL,Omar ALLAOUI,Samir BENANIBA, Sami ZIEDELMEL
10. **ICME2022-024 :** Characteristics of mortars reinforced with date palm fibers
    Samir BENANIBA, Mokhtar DJENDEL, Kessal Oussama, Rabah BOUBAAYA, Zied Driss
11. **ICME2022-025 :** Effect of Aggressive Media on a Sawdust-Lightened Mortar (Physico-Mechanical Properties).
    Assia Aidoud, Messaouda Boutahir Born Bencheikh, Salima Boukour, Nacera Khaldi, Meriem Dorbani
12. **ICME2022-026 :** Cooling of an agricultural greenhouse, comparative study
    Djemoui Lalmi , Abdelouahab Benseddik, Hocine Bensaha, Abdelmadjid Adouad And Billal Arriallah
13. **ICME2022-049 :** Numerical investigation of the flow in a 2D Supersonic Ejector
    Moundir Dandani, Philippe Desevaux, Abderrahmane Ghezal, Valérie Lepiller
14. **ICME2022-058 :** Corrosion Resistance of HSLA Steel After Combined SurfaceTreatment in Simulated Seawater
    ArwaToumi , Chokri Boubahri , JalelBriki
15. **ICME2022-059 :** Modelling the full scale reverse osmosis system using new computational modelling technique
    LAIDI Maamar, HANINI Salah
16. **ICME2022-068 :** Numerical study of dust grains behavior in multi-component plasma sheath
    D. Benlemdjaldi, A. Tahraoui, and N. Fouial
17. **ICME2022-076 :** Detection of Fouling in Cross-Flow Heat Exchanger in Phosphoric Acid Concentration Plant using Artificial Neural Networks
    Rania Jradi , Christophe Marvillet b, Mohamed Razak Jeday
18. **ICME2022-083 :** Heat transfer coefficient estimation and performance evaluation of cross flow heat exchanger using normal distribution analysis
    Rania Jradi , Christophe Marvillet , Mohamed Razak Jeday
19. **ICME2022-084 :** Optimization of cutting parameters during machining of titanium alloy Ti-6Al-4V using the combination of Taguchi S/N method, GRA and genetic algorithms based on artificial neural network modeling
    Nabil Kribes, Younes Belbellaa, Lekmine Habiba, Abbed Khaoula, Mohamed Athmane Yalles, Boutabba Ismail
20. **ICME2022-092 :** Backstepping control of a doubly fed induction generator based on WECS
    Oussama Moussa, Lallouani Hellali , Aboubaker Essadiq Mazouz

21. **ICME2022-093 :** Effects of chemical treatments of Ampelodesmos mauritanicus fibres on their physico-chemical characteristics
    Abdessamed Atoui, Abderrezak Bezazi, Salah Guenfoud, Abilo Silva, Gilberto Garcia del Pino, P.N. B. Reis, Fabrizio Scarpa and Zied Driss
22. **ICME2022-094 :** Thermal Transfer on a wall corrugated
    Rabia ferhat, Ahmed.Z.Dellil, Kamel Hamidou, Khadidja Boualem
23. **ICME2022-100 :** Comparative study between electrocoagulation used separately and coupled with adsorption for dairy wastewater treatment using response surface methodology design
    Mouna Cherifi, Salah Guenfoud, Sabir Hazourli, Debra F. Laefer
24. **ICME2022-101 :** Numerical investigation on effect of fins orientation on melting performance of NEPCM in an annulus enclosure
    Abed Mourad , Abderrahmane Aissa , Sahnoun Mohammed, Zied Driss, Mohamed Salah Abid
25. **ICME2022-104 :** Development of composite materials from glass fibre waste and study of their machinability
    Habiba Lekmine, Nabil Kribes, Abderrezak Bezazi, Smail Boutabba, Younes Belbellaa
26. **ICME2022-105 :** Reinforcement Of Poor Soils By Ballast Columns
    Messaouda Boutahir Born Bencheikh, Assia Aidoud, Salima Boukour, Fatima zohra Benamara and Lazhar Belabed
27. **ICME2022-106 :** Multi-Objective Optimization in Machining of Polyamide Composite Using NSGA-II coupled with TOPSIS/AHP
    Septi Boucherit, Sabrina Haoues, Mohamed Athmane Yallese, Salim Belhadi, Mounia Kaddeche
28. **ICME2022-107 :** The Method of Characteristics and its application to the solution of hyperbolic differential equations
    A. Haddad
29. **ICME2022-109 :** Vibration study of a helicopter blade in vertical flapping using the MYKLESTAD method
    Abdelkader kirad , M.Fateh , Z.Loukmane
30. **ICME2022-117 :** Reinforcement of unstable slopes with recycled plastic pins RPP
    Fatima Zohra Benamara, Chiraz Kechkar, Ghania Nigri, Messaouda Bencheikh, Mohamed Salah Nouaouria
12. **ICME2022-118 :** Numerical simulation study of the outlet temperature in an air/buried ground heat exchanger coupled with a humidifier
    Soufounizia Boultif , Noureddine Belghar, Abdelhafid Moummi , Sadam Houcine Sellam, Foued Chabane
31. **ICME2022-119 :** Effect of surface roughness of steel on structural and mechanical properties of galvanization coatings
    Younès Benarioua
32. **ICME2022-125 :** Numerical analysis of the fluid-structure interaction in the environment of gas turbine flame tubes
    Sidali Bensedira, Ishak Ouzeri
33. **ICME2022-131 :** Elaboration and Mechanical Characterization Composite Materials Based on Particles of Fibrous Wood of Date Palm Tree.
    Tarek Djoudi, Toufik Ameur, Mabrouk Hecini.
34. **ICME2022-132 :** Fault analysis of induction motor drive fed by PMW voltage source inverter
    Lallouani Hellali , Oussama Moussa, Aboubaker Essadiq Mazouz
35. **ICME2022-134 :** Digital analytical study of the piston deformation of a 1.7 DCI turbo diesel engine consisting of different composite materials in four strokes
    Hassen MERZOUK, Samir HABIBI, Amar ABBOUB
36. **ICME2022-135 :**
    Considering photocatalytic activity of Bi-doped TiO2 thin films in degradation of rhodamine B under sunlight irradiation
    Elhachmi Guettaf Temam, Hachemi Ben Temam, Tarek Djoudi, Mostefa Mohamed Touba, Abdelkrim Merzougui
37. **ICME2022-136 :** Dynamic Balancing of a Rigid Rotor
    Abdelouahab Rezaiguia, Salah Guenfoud, Debra F. Laefer
38. **ICME2022-137 :** Effect of radiation on the performance of a simple-passe solar air heater
    Yassmin Touhami, Ridha Boudhiaf, Slah Driss, Abederrahmane Aissa, Zied Driss, Mohamed Salah Abid
39. **ICME2022-140 :** Prediction of the thermal conductivity of cellulose fiber reinforced aerogel composite using periodic conditions
    Wiem Nasri, Kyu-Yeon Lee, Hyung-Ho Park, Paulo Reis, Abderazak Bezazi, Zied Driss

40. **ICME2022-142 :** Air out-flow in the ventilation channels of a disc brake
    Mohamed Kaffel, Mounir Baccar
41. **ICME2022-146 :** Interface model effect on Banki micro hydro-turbine
    Marwa Hannachi, Ahmed Ketata, Marco Sinagra, Tullio Tucciarelli, Zied Driss
42. **ICME2022-150 :** Prediction of Solar Radiation Using Artificial Neural Network
    Badis Bakri, Hani Benguesmia, Zied Driss
43. **ICME2022-151 :** Meshing Effect for the numerical study of A Darrieus Wind Turbine
    Dorra Ghodhbani, Sihem Kahalaf, Mariem Lajnef , Mabrouk Mosbahi, Costansa Aricò , Tullio Tucciarelli Zied Drissa
44. **ICME2022-152 :** 2D approach for the Turbulence modeling choice of a zephyr vertical axis wind turbine
    Madiha Khlifi,Omar Hammami, Zied Driss, Hedi Kchaou
45. **ICME-2022-153:** Impact of the windows opening in the indoor air quality
    Sondes Ifa, Zied Driss
46. **ICME2022-155 :** Modeling of DFIG with converter control used in wind energy conversion system
    Oussama Moussa, Lallouani Hellali , Aboubaker Essadiq Mazouz
47. **ICME2022-159 :** Control of Double Stator Induction Motor by Field Oriented Control based on Interval type-2 fuzzy logic
    Lallouani Hellali, Oussama Moussa, Aboubaker Essadiq Mazouz, Saad Belhamdi
48. **ICME2022-160 :** Study for Control of Dual Star Induction machine based on Direct Torque Control
    Lallouani Hellali, Oussama Moussa, Aboubaker Essadiq Mazouz, Saad Belhamdi
49. **ICME2022-166 :** Optimization of Cutting Parameters for Removal Rate of Medium Carbon Steel C-45 in CNC Turning Machining by Using Taguchi Method
    Khaled Aljaly , Salah Iddin Ali Salem Issa, Akram Aleiah, Faouzi Masmoudi
50. **ICME2022-167 :** Numerical analysis of metal cutting operation
    Alia Khanfir
51. **ICME2022-169 :** Application of desirability function to optimizing cutting parameters when turning Ft-25 gray cast iron by GC1690 tool
    Bouchelaghem Hadjira, Yallese M. Athmane, Chihaoui Salim.
52. **ICME2022-170 :** A Comparative Study on Inhibition Corrosion of X52 and X70 steels in sodium chloride (NaCl) solution saturated with CO_2 gas
    Zidelmel Sami, Dakmoussi Maamar, Allaoui Omar
53. **ICME2022-175 :** The Effect of Porosity on elastic buckling behavior of shell structures made of Porous Functionally Graded Materials
    Jamel MARS, Hanen JRAD, Mondher WALI, Fakhreddine DAMMAK
54. **ICME2022-181 :** Characterization of the mechanical behavior of a duplex stainless steel in relation to the phenomenon of hydrogen embrittlement
    Amar Abboub , Ahmed Aboura, Hassen Merzouk
55. **ICME2022-182 :** Experimental analysis flow of a combined three bladed Darrieus and Savonius Water Rotor
    Ibrahim Mabrouki, Abdelkader djerad, Zied Driss, Mohamed Salah Abid

ICME Organizing Committee

ICME' 2022 Conference Program

<table>
<tr><th>Time</th><th>Wednesday/ December 21, 2022</th><th>Thursday / December 22, 2022</th><th>Friday / December 23, 2022</th></tr>
<tr><td>08:00</td><td rowspan="5">Welcome and registration</td><td></td><td></td></tr>
<tr><td>08:30</td><td>Keynote 4 / Keynote 5 / Keynote 6</td><td>Keynote 9 / Keynote 10 / Keynote 11</td></tr>
<tr><td>10:00</td><td>Coffee break / Poster session</td><td rowspan="2">Oral session 3</td></tr>
<tr><td>10:30</td><td rowspan="3">Oral session 2</td></tr>
<tr><td>11:30</td><td>Coffee break</td></tr>
<tr><td>12:00</td><td></td><td>Closing Ceremony / Attestation Distribution</td></tr>
<tr><td>12:30</td><td>Lunch</td><td>Lunch</td><td rowspan="8"></td></tr>
<tr><td>14:00</td><td>Official Opening Ceremony</td><td rowspan="2">Keynote 7 / Keynote 8</td></tr>
<tr><td>14:30</td><td rowspan="2">Keynote 1 / Keynote 2 / Keynote 3</td></tr>
<tr><td>15:00</td><td rowspan="3">Social visit</td></tr>
<tr><td>16:00</td><td>Coffee break / Poster session</td></tr>
<tr><td>16:30</td><td>Oral session 1</td></tr>
<tr><td>19:00</td><td>Dinner</td><td>Dinner</td></tr>
</table>

International Association of Researchers
In Mechanics and Energy

Association Internationale des Chercheurs en Mécanique et Energie

ADVANCES IN Mechanics and Energy

Proceeding of International Conference on Mechanics and Energy (ICME'2022)

LABORATOIRE DES SYSTEMES ELECTROMECANIQUES
LASEM

ICME
International Conference on Mechanics and Energy

ENIS

ICME'2022

December 21-23, 2022

Hammamet, TUNISIA

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International Conference

ICME'2022

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ADVANCES IN MECHANICS AND ENERGY

ICME'2022 is a leading International Conference in all areas of Mechanics and Energy. The subject areas include, but are not limited to the following fields:

- Mechanical characterization
- Computational methods in mechanics
- Static and dynamic behavior
- Design and Manufacturing
- Mechatronics
- Composite Materials
- Metallic corrosion
- Physical characterization
- Material Physics
- Computational Physics
- Mathematical Physics
- Nanoscience and Nanotechnology
- Materials for advanced energy
- Renewable energy
- Energy Management
- Modeling and optimization of energy conversion systems
- Advanced energy technologies
- Photovoltaic and solar energy
- Sustainable environment
- Thermal building
- Computational Fluid & Structure Dynamics
- Heat and mass transfer
- Fluid and structure interaction
- Experimental investigation techniques
- Industrial and production technology
- New product process
- Product Management
- Materials and engineering technologies
- Maintenance and reliability

Table of contents

Editorial

On behalf of all members of the Organizing and Scientific Committees of the International Conference on Mechanics and Energy (***ICME'2022***), it is an honor for us to welcome all of you in Hammamet, TUNISIA. As you will have the opportunity to see, Hammamet is a nice city in board of the Mediterranean Sea.

ICME'2022 is a leading international Conference in all areas of Mechanics and Energy. This conference has been organized by the International Association of Researchers in Mechanics and Energy, which has set up a goal since its creation to contribute to the welfare of technology exchange and to create a fruitful environment between researchers of developing countries in the mainland and a broad other scientists from the international community to create the closer contacts and sharing experience in various sectors, preparation and implementation of experiments, processing of results and numerical simulations.

The International Conference on Mechanics and Energy (***ICME'2022***) is aimed to concretize these objectives and intended to attract the interest of specialists, academicians and researchers from the international community working in areas related to mechanics, energy, physics and fluids and structure.

The conference will to bring together innovative academics and industrial experts in the fields of mechanical and energy engineering to a common forum and to cater sessions on these fields, thus enabling even greater interdisciplinary knowledge sharing.

It is devoted to all innovative aspects and experimental methods used in the fields of mechanics and energy. Its aim is to bring together leading researchers who are interested in experimental and also theoretical work in these fields to initiate more careful consideration of these issues and to meet the share cutting-edge development in these areas.

During the three days of the scientific conference, more than 162 scientific ans technical papers concerning these subjects, made for about 366 authors and 11 keynotes coming from North Africa, principally from Algeria as well as from the others continents, will present their works in parallel sessions. The conference offers an exceptional opportunity to assess the state-of-the-art of mechanical and energy engineering and its potential for future applications with different sessions covering the following topics:

- Mechanical characterization
- Computational methods in mechanics
- Static and dynamic behavior
- Design and Manufacturing
- Mechatronics
- Composite Materials
- Metallic corrosion
- Physical characterization

- Material Physics
- Computational Physics
- Mathematical Physics
- Nanoscience and Nanotechnology
- Materials for advanced energy
- Renewable energy
- Energy Management
- Modeling and optimization of energy conversion systems
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- Photovoltaic and solar energy
- Sustainable environment
- Thermal building
- Computational Fluid & Structure Dynamics
- Heat and mass transfer
- Fluid and structure interaction
- Experimental investigation techniques
- Industrial and production technology
- New product process
- Product Management
- Materials and engineering technologies
- Maintenance and reliability

Finally, we wish to express our gratitude for all your help in the results of the Conference.

A sincere thankfulness should be addressed to the Ministry of High Education and Scientific Research, the universitie of Sfax, the National School of Engineers of Sfax and all others sponsoring institutions who have actively, financially and morally contributed to the organization of the conference among academic, scientific and industrial communities. Our thanks are also due to municipality of Nabeul.

And last, but not least, the Organizing Committee of the Conference is very recognized to all of you, members of the International and Tunisian Committees, contributors, speakers, chairpersons and all of our local assistants, for giving an international prestige to the Conference, as well as for the good work accomplished.

We hope that you all find an enjoyable environment for exchange of ideas and satisfying conditions to follow all the sessions of the conference that of interest to you. As you were informed in the site web of the conference, the selected papers will be presented to publish in different international journals and Books covering the general areas of mechanics and energy engineering.

Once again, you are welcome to the conference.

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Taoufik Kammoun (Tunisia)
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Walter Bosschaerts (France)
Zied Driss (Tunisia)
Zoubir Zahzouh (Algeria)
Zoulikha CHARIFI (Algeria)
Zuzia Baptiste (France)

List of Keynotes

List of keynotes

List of Abstracts

List of Abstracts

Keynotes

Study of a combustion in sinusoidal chamber of combustion, based on the Finite Volume Method

Abdelkader Djerad [1] *, Lamia Benhamadouche [2], Ibrahim Mabrouki [3]

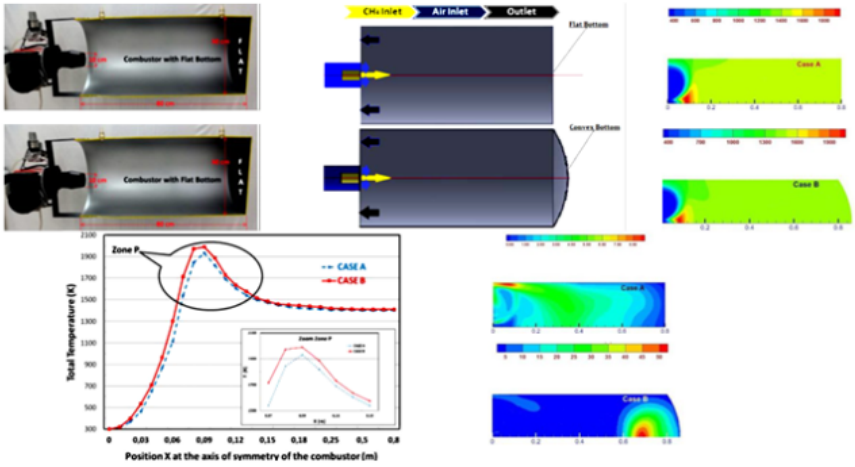
[1] *Laboratory of Pure and Applied Mathematics (L.P.A.M), Department of Mathematics, University Mohamed Boudiaf. M'sila, 28000, ALGERIA*

[2] *Departement of Mechanical engineering, University Mohamed Boudiaf. M'sila, 28000, ALGERIA*

[3] *Laboratory of Electro-Mechanic Systems (LASEM), National School of Engineers of SFAX (ENIS) University of SFAX, B.P. 1173, Road Soukra km 3.5, 3038 Sfax, TUNISIA*

Abstract: For a boiler must be competitive at the risk of making the obvious, be as inexpensive as possible while ensuring the required service. Reduce costs should be at all stages of the design of the boiler. The construction of the combustion chamber of a steel boiler remains to this day based on the practical experience of tradesmen. In order to find the best scenario that allows us to enjoy the energy of combustion and recovery and minimize risk deterioration of the devices used, a numerical study was conducted on a coaxial jet by a methane-air burner for air blown attached to the symmetrical axis of the combustion chamber of the steel boiler model CH01 of company SARL ECOCHAUDIERE answer questions put by the technical service concerns a deformation was home to bottom and the efficiency of the boiler. The numerical solution of the problem is realized with the help of Ansys commercial code (Fluent), using turbulence models k-ε standard combustion "Eddy Dissipation". We examine the effect of the change in the form of the lateral wall of the combustion chamber in a sinusoidal form at the dynamics and thermal structure of the flow and efficiency of the boiler.

Keywords: Finite Volume Method, Combustion, Simulation, Burner, sinusoidal form.



Graphical abstract

***Corresponding author:** Abdelkader Djerad
Email: abdelkader.djerad@univ-msila.dz

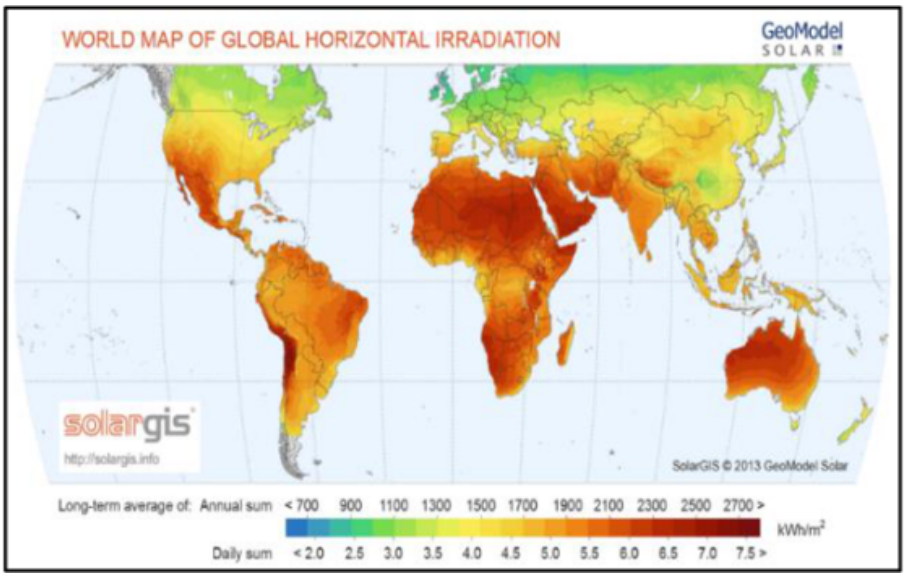
Techno-Economic Analysis of Solar Electricity Generation in Libya

Nouri Alkishriwi [1] *, Mohammed Mashena [1]

[1] *University of Tripoli, Faculty of Engineering, Department of Mechanical and Industrial Engineering Tripoli, Libya,*

Abstract: Libya is witnessing an increasing demand for energy, which depends on burning more depleted and polluting hydrocarbon fuels, while has intense solar radiation and high brightness hours, which represent an important source to fill the deficit in the energy supply in the country and reduce environmental pollution. Solar power plants are one of the most important alternatives available to provide clean energy. Where it can now be used on a large scale in the national energy system so that it is a major tributary in the energy mix of Libya. The study aims to verify the technical and economic capabilities of generating electricity using solar energy through the construction utility scale photovoltaic power plants, which are financed by investment or government funding in Libya. The data and technical information necessary to conduct the simulation were collected from the ground stations solar radiation measurements or from satellite measurements for all the geographical area of Libya. As for the economic data represented for the capital costs and operating and maintenance costs for this type of plant, different types of photovoltaic systems were selected according to the specifications and cost after conducting an extensive survey of reports issued by international institutions, especially for ground-based photovoltaic systems. A detailed technical and economic analysis of the performance of the proposed fields was carried out based on the weather conditions of the cities of Tripoli, Sabha and Kufra, using specialized software SAM issued by the American National Renewable Energy Laboratories (NREL). In this analysis, the field productivity was calculated per hour for a whole year. The maximum production of a field with a capacity of 50 MWac reached 134 GWh in the Kufra area, which is equivalent to a capacity factor of 24.1%. The payback period is 8.7 years.

Keywords: Solar Energy, Photovoltaic Cells, Electricity Generation, Technical and Economic Analysis



Graphical abstract

***Corresponding author:** Nouri Alkishriwi
Email: n.alkishriwi@uot.edu.ly

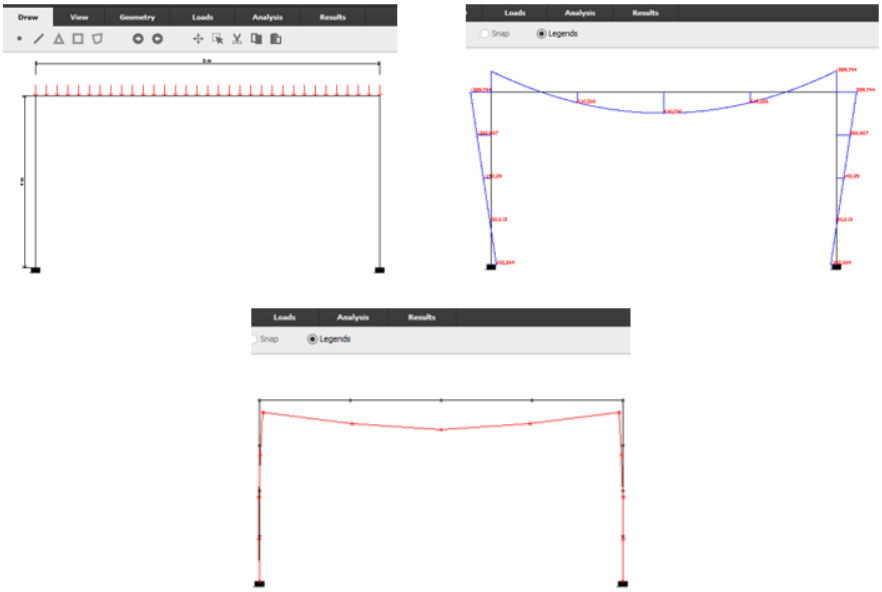
Computer Program of Structural Analysis by FEM

El Hassan Boudaia [1] *

[1] *Laboratory of Mechanics, Engineering and Innovation (LMEI), Higher School of Technology, Department of Mechanical Engineering, University Hassan II - Casablanca, Morocco*

Abstract: The importance of numerical simulation justifies a work that uses of computational possibilities to develop a software solution that implements the Finite Element Method (FEM) to solve various problems in the field of structural engineering. In this study, the focus is on one-dimensional, two-dimensional and three-dimensional finite elements, such as Euler-Bernoulli and Timoshenko beams and Kirchhoff and Reissner-Mindlin slabs. In order to demonstrate the operation of the program, all the steps from the structure modeling to the graphic display of the results are detailed.

Keywords: Finite Element Method, Beams, Slabs, Software Development, Structure modeling, Graphic display.



Graphical abstract

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Modeling and simulation of physico-thermodynamic properties: genetic algorithm and artificial neural networks methods

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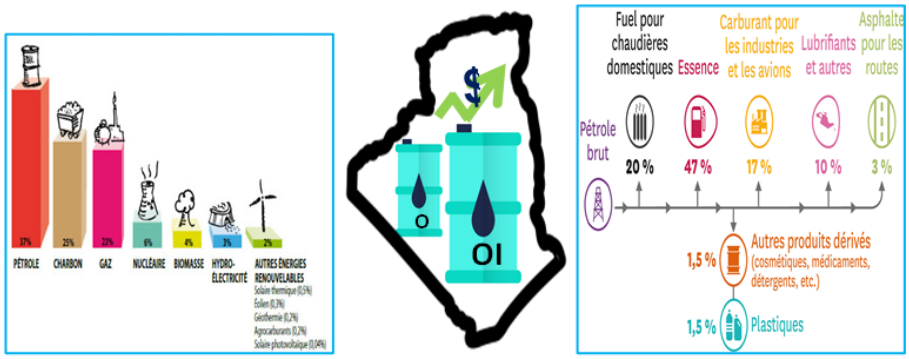
Abstract: This work aims to develop mathematical models based on the molecular structures of compounds, in order to predict some physicochemical parameters of pure hydrocarbons, through a Multi-Layer Perceptron-Artificial Neural Network (MLP-ANN) based on the concept of Quantitative Structure-Property Relationships (QSPR). The resulting models from the combination between the QSPR concept and the ANN called in this thesis; Quantitative Structure Property Relationship -Artificial Neural Network (QSPR-ANN) models. QSPR-ANN models are developed to predict physicochemical parameters of pure hydrocarbons: normal boiling point temperature (Tb), relative liquid density (d20) and the critical properties {critical temperature (Tc), critical pressure (Pc) and critical volume (Vc)}. A complete database of 223, 222 and 221 of different data points for (Tb, Tc and Vc), (d20) and (Pc) are respectively used to create QSPR-ANN model's type. 1666 molecular descriptors come from 20 different classes, are calculated using the online software E-Dragon, and then a statistical methodology of reduction based on the Multiple Linear Regression (MLR) method, is adopted, in order to reduce and select these large numbers of molecular descriptors, and retain them to an acceptable number of relevant descriptors. A percentage of the excluded primary molecular descriptors is approximately higher than 98% in the all five models developed. The BFGS (Quasi-Newton Back Propagation) algorithm is applied to train the ANN. The best QSPR-ANN models obtained, showed good precision confirmed by the high values of the regression (R) and the determination (R2) coefficients, which are respectively ranging between 0.9965-0.9999, and 0.9931-0.9999 for the three basic subsets of the database (the training set, test, and the whole dataset. The relative errors types, which are: The Standard Error of Prediction (SEP), the Mean Percentage Error (MPE) and the Mean Absolute Percentage Error (MAPE), have low values respectively ranging between 0.3255-2.4024%, 0.2613-2.2683%, and 0.2600-2.2497%. The sensitivity analysis method (weight method) is used in this work, in order to appreciate individually the contribution of the input descriptors on each QSPR-ANN model type developed. A comparison is made between the results obtained by the QSPR-ANN models type and other models of some studies published in scientific articles that have adopted the same approaches (QSPR, ANN, MLR ...).

Keywords: Genetic algorithms, Physico-chemical properties, Hydrocarbons, Modelling, QSPR-ANN, Descriptors



Graphical abstract

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The benefit of the use of composite materials in design of modern structures

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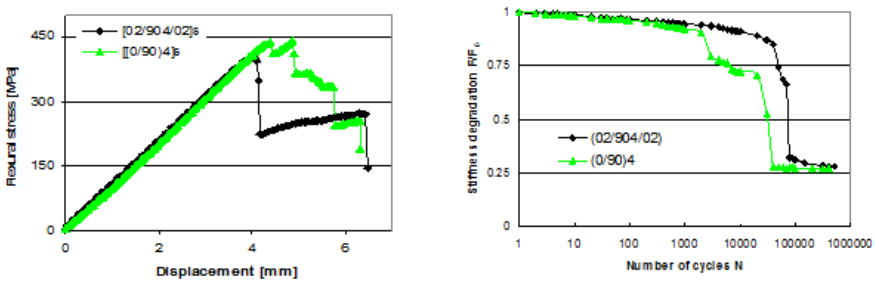
Abstract: The global composites market estimated in 2019 at 90.6 billion dollars with an average annual growth rate of 7.7% is increasing more and more because these materials have very important advantages: lightness, mechanical and chemical resistance, reduced maintenance, freedom of forms, realization of complex form and less and less expensive. They increase the life of certain equipment not only due to their mechanical properties (rigidity, resistance to fatigue), but also thanks to their chemical properties, i.e., resistance to corrosion. They also enhance safety due to their better resistance to impact and fire. They offer better thermal or sound insulation and, for some of them, good electrical insulation. The use of composites can allow, for equal performance, significant mass gains of up to 50% with a cheaper price of up to 60%. A helicopter rotor hub made of carbon/kevlar/epoxy composite has made it possible to save 20% in weight with a cost price 60% cheaper than a conventional metallic structure. The filament winding process is a technique primarily used to produce structure parts subject to high internal pressures like hollow, circular tubes or pipes, or prismatic structure such as cylinders and vessels. This process is more important compared to other processes for the implementation of composite materials in terms of quality and production speed, very profitable due to the automation of shaping which allows mass production. The products of the filament winding process, can be used for the transport or storage of hydrocarbons, natural gas or clean energy such as hydrogen.

Keywords: Benefit of composite, structures, helicopter rotor hub, pipes, tanks.



Graphical abstract.

Graphical abstract

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Numerical and experimental study of the aerodynamic and thermal characteristics of a greenhouse

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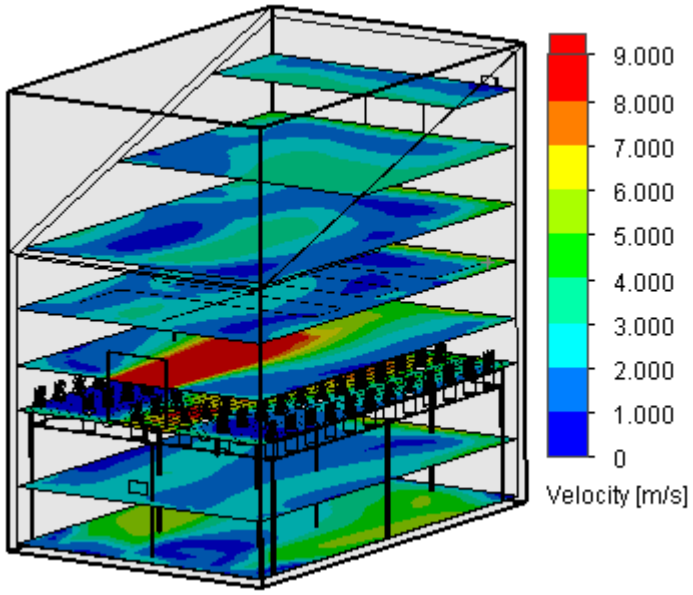
Abstract: In this paper, we have studied the aerodynamic and thermal characteristics of a greenhouse installed in the Sfax region. As a first step, we have used adequate instrumentation to measure the velocity and the temperature in different directions placed in the middle of the greenhouse. As a second step, we have developed numerical simulations to study different parameters like the solar radiation, the inlet velocity, and the event effect. Globally, it has been observed that all these parameters have a direct effect on the local result. However, solar radiation provides an increase in the temperature and it has no effect on the velocity. The inlet velocity of the air has a huge effect on the considered greenhouse. The velocity, the turbulent kinetic energy, the dissipation rate of the turbulent kinetic energy, and the turbulent viscosity have been increased due to the inlet value of the velocity. It has been observed that the event we have installed in the considered greenhouse provides supplementary ventilation to the greenhouse. The good agreements obtained by the comparison of the numerical results with the experimental data confirm the validity of the numerical method.

Keywords: Greenhouse, aerodynamic, thermal, experimental validation, modeling, CFD.



Graphical abstract

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Numerical stress analysis of biomechanical orthotropic hip prosthesis under different torsion couple of forces using the finite element methods

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Abstract: Extremely strict requirements are imposed on the materials used for the construction of human prostheses. The material of such prostheses must be biocompatible, that means they are neither toxic, nor carcinogenic to the human body and they induce no rejection or reaction. Also, they meet series of requirements at all the level of their mechanical and longevity behavior. Consequently, they should have a convenient resistance to the fatigue and the repeated shocks as well as a good resistance to the wear and to the corrosion in aggressive environment such as the human body motion. In reality, the modeling analyses are alternatives to experimental testing in vitro, often expensive and difficult to implement. This modeling is widely used to analysis orthotropic materiel in the many areas of engineering including biomechanics, aeronautical, mechanics and civil engineering. In our work, biomechanical stress analysis on a human prosthesis body is considered as an orthotropic material under different boundary conditions using the finite element models. It consists on the analyze of the mechanical behavior of a the material cupule of a total hip prosthesis reprocessed in a block of polypropylene (PP) extruded in a solid state by using the process of extrusion cranked to equal areas (ECEA), using numerical simulation based on the finite element methods. The maximum normal stresses and strain deformations are determinate along the distance of the x-axis of the cupule for different extruded speed, based on Ansys program. The results of the mechanical behavior in vitro of the cupule of a total prosthesis of hip (TPH) have been found and presented graphically. The extruded polypropylene in the State of the process of extrusion cranked to equal areas has an elasto-viscoplastic behavior and their parameters are known and experimentally obtained by mechanical tests of characterization. The obtained results show that the use of the extruded PP give a better distribution of the stress-strain at the level of the cupule compared to those given by a virgin PP which can be explained by the fact of the increase in the ductility of the material after the extrusion.

Keywords: Hip prosthesis, polypropylene cupule, torsion couple of forces, bent extrusion, stress, strain, finite element models

Graphical abstract

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Dynamic sealing for turbomachinery

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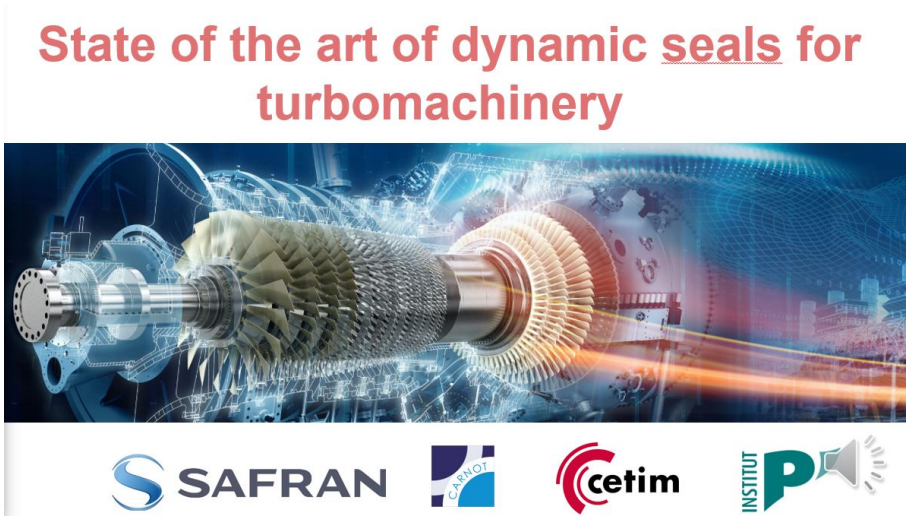
Abstract: The economic context of the industrial sector today leads to strong requirements for competitive differentiation which necessitate constantly evolving systems, products and components to offer more performance, robustness and lower operating costs. Seals are essential for the proper operation of turbomachinery. The level of tightness guaranteed also makes it possible to optimize its performance. The continuous search for improvement of propulsion systems in terms of performance in fuel consumption, pollution, thrust, mass and compactness leads to sustained research activities for seals improvements. In this context, a state of the art of dynamic sealing technologies for aeronautical, aerospace and terrestrial turbomachines has been achieved. An overview of the different dynamic sealing technologies including the operating principle, the characteristics, advantages and disadvantages of each system was also carried out. Subsequently, a census of the results of different experimental as well as numerical tests for the different technologies was developed in order to supply a tool to estimate the leakage rate of each of the studied technologies. Finally, a comparison of leakage rates as a function of the pressures applied to the various dynamic sealing systems was carried out for the different technologies identified.

Keywords: Dynamic sealing, turbomachinery, technologies, leak rate, comparison.



Graphical abstract

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On the numerical implementation of a fully coupled model of anisotropic plasticity and continuous ductile damage for material behavior studies

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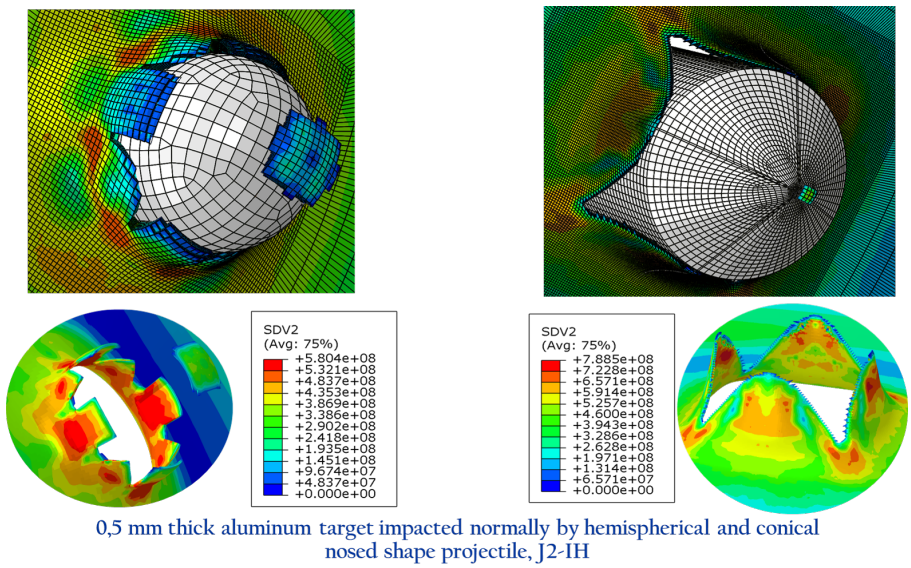
Abstract: This research deals with the implementation of an anisotropic plasticity constitutive equations exhibiting nonlinear isotropic/kinematic hardening and coupled continuum ductile damage models. The developed model is implemented into a user defined material subroutines (UMAT) and (VUMAT) to study materials behavior for different and complex applications (i.e. Metal forming process, Low velocity impact, FGM material, …). The proficiency of the finite element model to predict the material deformation process is inquired by comparing numerical and experimental results.

Keywords: Metal forming process, FGM, Low velocity impact, Anisotropic plasticity, Ductile damage, Material behavior



0,5 mm thick aluminum target impacted normally by hemispherical and conical nosed shape projectile, J2-IH

Graphical abstract

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Experimental analysis and numerical modelling of cold sheet metal stamping

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Abstract: The sheet forming process is one of the most used in manufacturing processes. Modified Erichsen tests are convenient tests in which it gives the formability of sheet material properties. The accuracy of any numerical model is frequently reliant on the truthfulness of material behavior and damage modeling. In this work, experimental characterization tests like tensile and Erichsen ones are elaborated. Plastic deformation until ductile rupture characterizes the metallic structural components. For that, it is important to develop an efficient numerical model to predict the mechanical behavior of sheet metal in stamping operation. In fact, finite element simulation of ductile damage evolution in metallic solids is presented in this paper. After proving the accuracy of this model, some stamping simulation are made and analyzed.

Keywords: Sheet metal forming, ductile damage, FEM

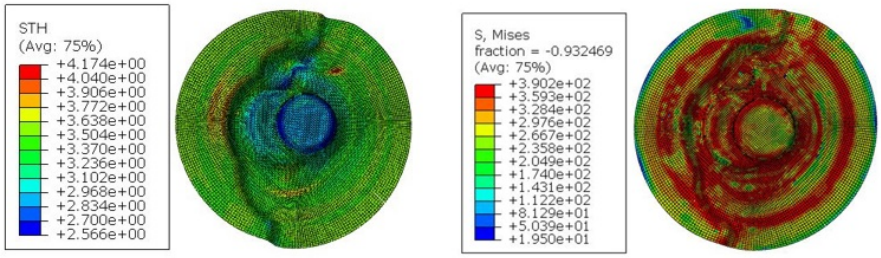

Fig. Numerical results of stamping operation

Graphical abstract

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Numerical and experimental analysis of composites reinforced by curauá and jute fibers

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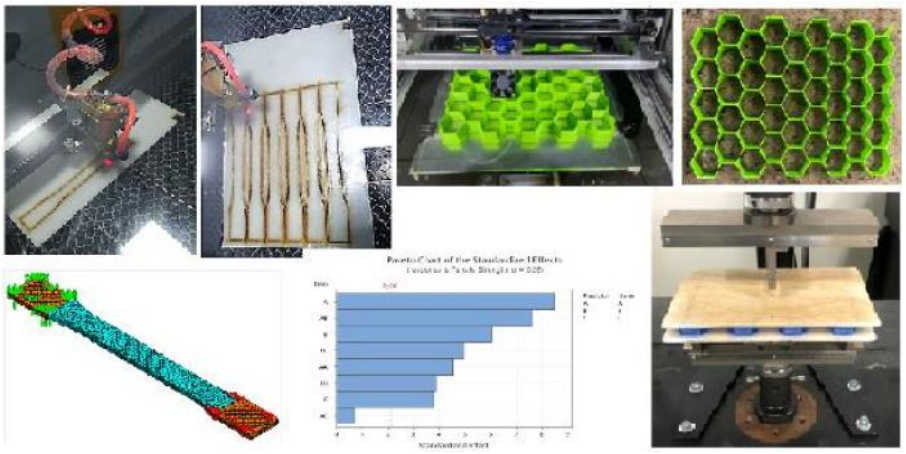
Abstract: Recently, there has been a rapid growth in research and innovation in the natural fiber composite area. Interest is warranted due to the advantages of these materials compared to synthetic fiber composites, including low environmental impact, renewable resources, low cost which attract wide range of applications. The use of lignocellulosic fibers for reinforcing polymers represents an alternative in the replacement of synthetic fibers in composites. Curauá is a legitimately Brazilian plant, easy to grow and process, which produces fibers with excellent mechanical performance. In this work a computational and experimental analysis is carried out with the objective of comparing curauá fibers and jute ones used in epoxy resin matrix composites for use in industry using the Finite Element Method (FEM), tensile tests and three-point bending tests in sandwich composites, with honeycomb made with 3D printer. As a result of the work, a higher strength was obtained in the composites made with curauá fiber than in the one made with jute fibers, both in the results obtained by the FEM and in the experimental tensile tests. In both types of analysis, an increase in the tensile strength of the compound was observed with the increase in the amount of the fibers for both types of composites. The results obtained show a good agreement between the FEM and the experimental tests. Furthermore, the results of the present study were compared with the who's obtained previously mentioned in the open literature

Keywords: biocomposites, curauá fiber, epoxy resin, jute fibers, FEM



Graphical abstract

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Abstracts

Mechanics

Composite materials

Resistance to crack propagation of a glass fiber composite (mats) - Polyester

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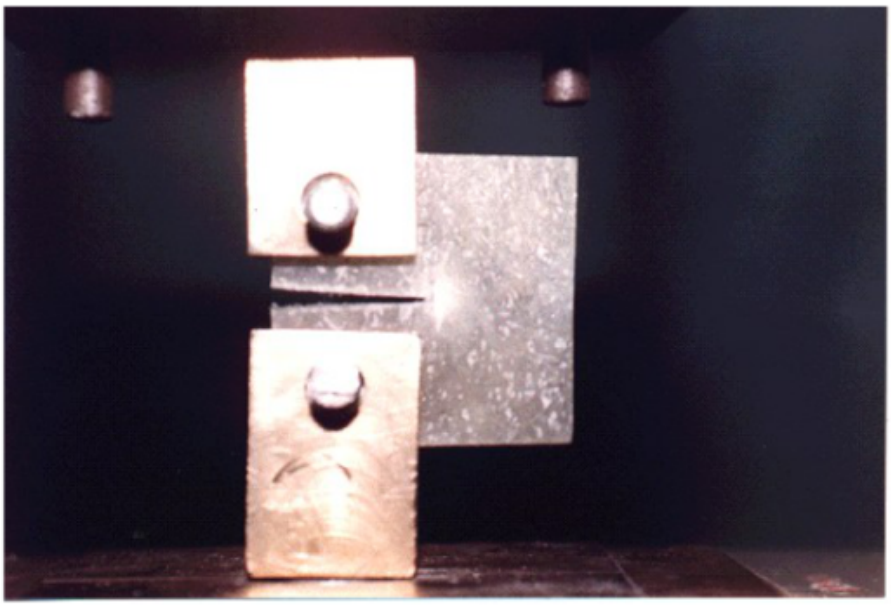
Abstract: This work is devoted to the study of the resistance to crack propagation of a fiber composite material "Glass - Polyester". The reinforcement is in the form of mats. The material is produced in the non-metallic materials laboratory (OM P). The fracture parameters are determined from tensile tests on CT specimens (Compact Tension). The analysis of the fracture energies is made under the assumption of a non-elastic non-linear behavior. The resistance curves (R) are determined according to different methods which are based on measurements of compliances and areas under the load-displacement curves.

Keywords: Reinforced plastics, Composite, Rupture, Mechanical behavior, Toughness, J integral, R curves



Graphical abstract

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Elaboration and characterization of a composite polyester / recycled jute fabric.

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Abstract: This work aims to help reduce environmental impacts through the preparation of composites with recyclable materials for use in different applications. To this end, composites have been developed based on jute recovered from packaging bags and polyester. Jute-Polyester bio composites have been developed with different jute architectures (Satin, Serge 2x2, Taffetas). Tensile tests were carried out on these composites to determine the effect of the reinforcing weaving structure. These composites represent a very promising material in terms of mechanical strength and effective costs, as well as an ecological alternative to some conventional materials used in furniture and building construction. ou rigidité comparée aux deux autres types de tissage.

Keywords: composite, jute, recycling, fabric, polyester, fracture.

Graphical abstract

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Reliability and resistance to damage of different types of natural fibers of a unidirectional composite material

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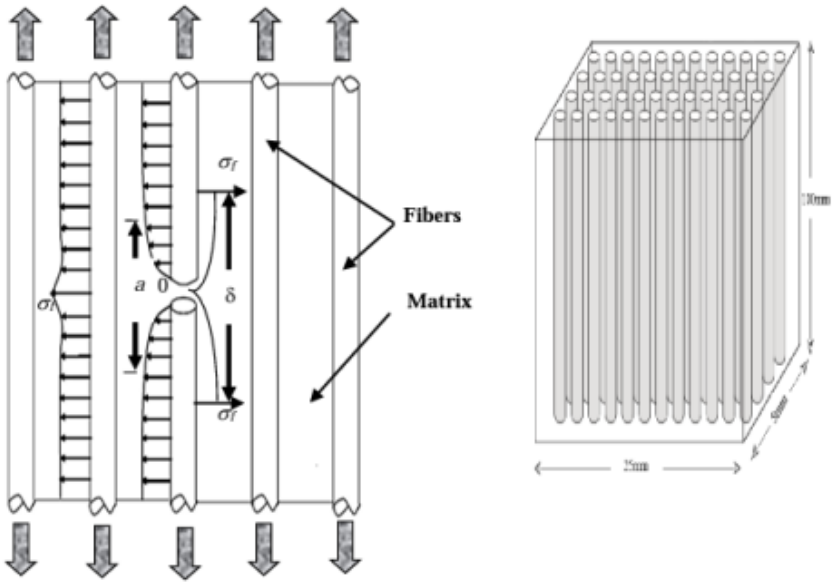
Abstract: This work is in line with the various studies carried out to date on the damage of natural fiber composite materials in order to predict the strength and durability of a unidirectional composite by comparing three cases of natural fibers, the Linen, the Jute and the Ramie in an epoxy matrix using micromechanical techniques. The mathematical developments used are presented in a Fortran program to justify the form of stress distribution and these longitudinal displacements around the broken fiber and the nearest adjacent fibers, The interface and adhesion conditions are into account by this model in order to quantify the rate of transfer of shear stresses through the matrix between two neighboring fibers intact and broken.

Keywords: Unidirectional composite, Stress concentrations, Natural fiber, Polymers



Graphical abstract

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Influence of the Fiber Geometry on the Effective Mechanical Properties of Hybrid Epoxy Composite Materials

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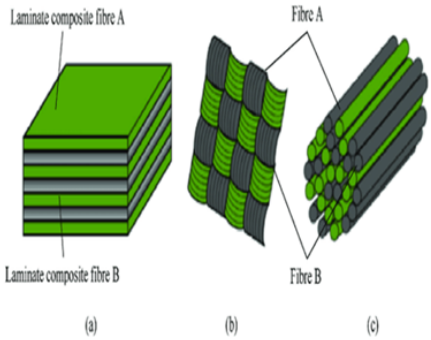
Abstract: A computational study of the effect of microstructure of hybrid carbon/glass fiber composite is presented. The effective mechanical properties were determinates through the finite element Abaqus package and EasyPBC codes using periodical boundaries respectively. Two different fiber geometries were considered (square and circular) associated with two RVEs square and hexagonal respectively. Four different arrangements of fibers are used. E glass fiber and TM300 carbon fiber for both square and hexagonal unit cell were used. For all patterns. For all considered cases, the fiber volume fraction was about of 62%.

Keywords: Hexagonal RVE, square RVE, hybrid, circular fiber, square fiber, epoxy matrix, Abaqus, EasyPBC



Graphical abstract

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Composite construction materials from plant resources: mechanical characterization and statistical approach

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Abstract: For ecological reasons, the recovery of agricultural waste has become a global necessity. These enormous residues, biodegradable, can be used with different percentages as a reinforcing element in cementitious matrices in building materials. This study deals with the influence of the length and percentage of date palm trunk fibers (DPTF) incorporated into bio-mortars. In order to improve the fiber/matrix cohesion energy, the extracted DPTFs underwent alkaline treatments, by varying the percentage of sodium hydroxide and the immersion time before being used in the preparation of bio-mortar. Compression tests were carried out to evaluation the mechanical properties, namely the ultimate stresses, Young's modulus and displacements. To do this, a design of experiment was carried out using the response surface methodology (RSM) in order to minimize the number of tests. The results obtained shows that the incorporation of DPTFs in the mortar can improve the mechanical behavior of the bio-mortar by 46.6% and 36.3% in the compressive strength and Young's modulus, respectively.

Keywords: bio-mortar; date palm trunk fiber (DPTF); compression tests; alkali treatment; response surface methodology

Graphical abstract

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Effects of chemical treatments of Ampelodesmos mauritanicus fibres on their physico-chemical characteristics

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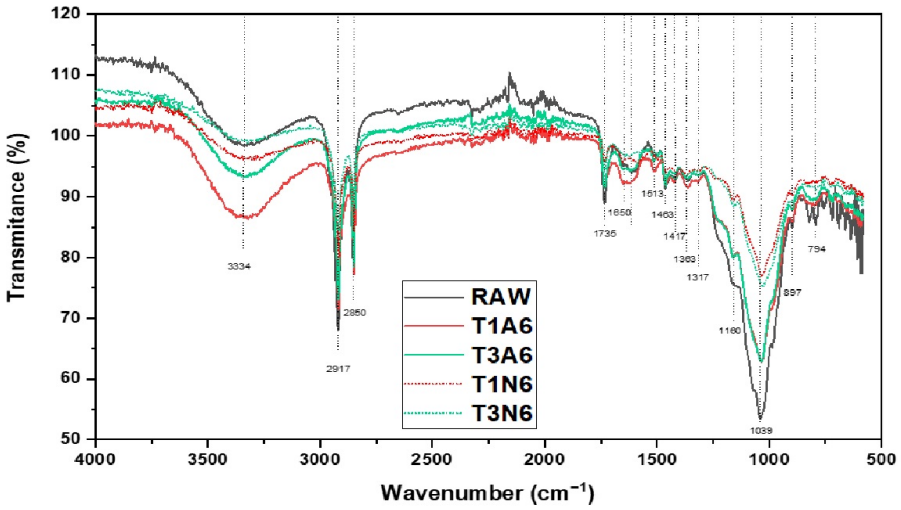
Abstract: The fibres extracted from vegetable plants are hydrophilic and rich in cellulose and can be considered as an excellent alternative to synthetic fibres, in particular glass fibres, and to be used as reinforcement in hydrophobic polymers they must generally be chemically treated with alkaline solutions to improve their fibre/matrix bond. However, alkaline solutions are dangerous chemicals that are harmful to the environment, especially if used in high concentrations, so it is best to avoid them as much as possible. This investigation concerns the chemical treatment of the leaves of Ampelodesmos mauritanicus which is a wild plant, widely available on the Algerian territory and the Mediterranean basin, with a citric acid solution which is eco-friendly as a substitute for sodium hydroxide which is an alkaline. To do this, two concentrations of the solutions were used for a treatment of 6 hours each. Treated and untreated natural fibres were characterized by Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA).

Keywords: Ampelodesmos mauritanicus, eco-friendly treatment, natural fibres.



Graphical abstract

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Development of composite materials from glass fibre waste and study of their machinability

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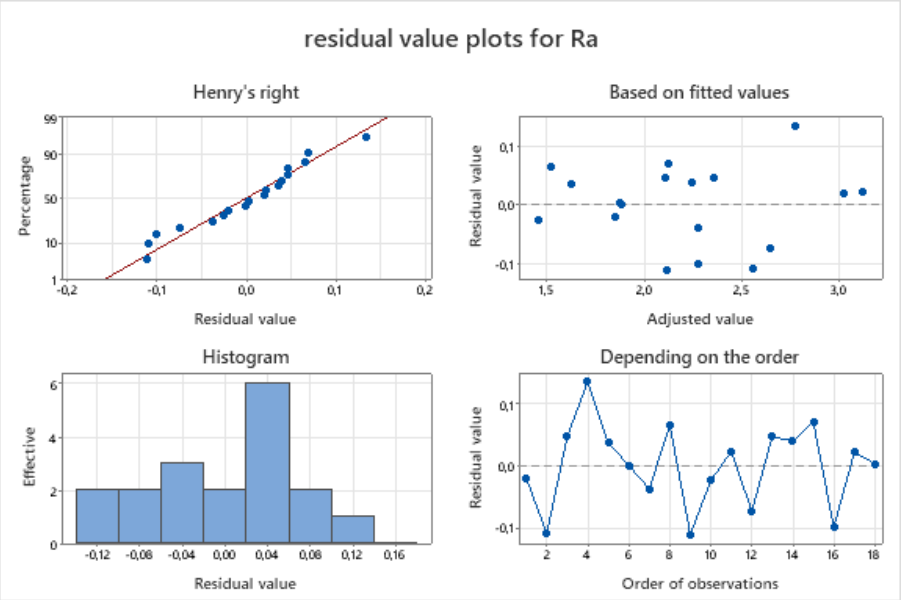
Abstract: The use of glass fibre reinforced polymer composites has spread in many fields due to its low-cost price, light weight, good mechanical properties, corrosion resistance, etc. These industries using synthetic fibres, especially glass fibres non-biodegradable, produce enormous waste every year, hence the need to recover them as reinforcement for certain non-structural applications. In this context, this research work focuses on the development of cylindrical composites made up of different percentages of waste glass fibres and a polyester resin. The study of the machinability of the elaborated composites is carried out in turning. Five parameters considered to be the most important during machining in turning influencing roughness, cutting forces have been taken into account. Three levels were adopted for the cutting speed, the feed rate, the depth of cut and the percentage of fibres in composite (wt.%), while the tool nose radius only two levels were taken into account. A design of experiments was established using Minitab V.20 software in order to minimize the number of experiments. The states of the machined surfaces were measured using a Mitutoyo Surftest-210 and the cutting forces by a Kistler platform. The degree of influence of each cutting parameter has been identified and mathematical models have been established for the roughness as well as for the material removal rate.

Keywords: Composite, machining, cutting parameters, roughness, material removal rate.



Graphical abstract

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Numerical analytical study of artificial teeth consisting of Composite materials

Hassen Merzouk [1] *, Samir Habibi [1], Amar Abboub [1]

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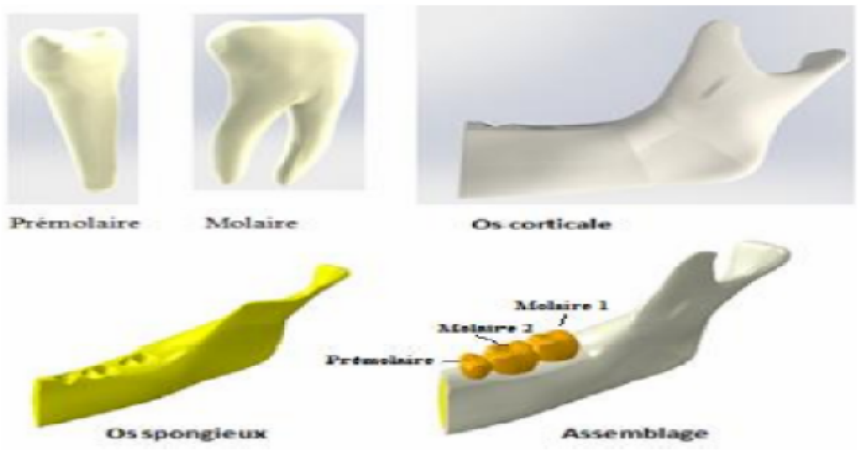
Abstract: This study compares the biomechanical behavior of the mandibular os in natural teeth versus implant-supported dental prostheses. The study is based on the analysis and monitoring of the durability of biomechanical constraints that occur in the mandibular os (cortical and spongy os) and artificial elements (stents, implants, and couronnes) as a result of various mastication efforts. The 3D models studied were assigned to three spatial orientations (kurono-apicale, distale-mediale, and vestibulaire-linguale).

Keywords: Biomechanique, Orthopédie, Dental Implants, Finite Elements,Composite materials



Graphical abstract

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Prediction of the thermal conductivity of cellulose fiber reinforced aerogel composite using periodic conditions

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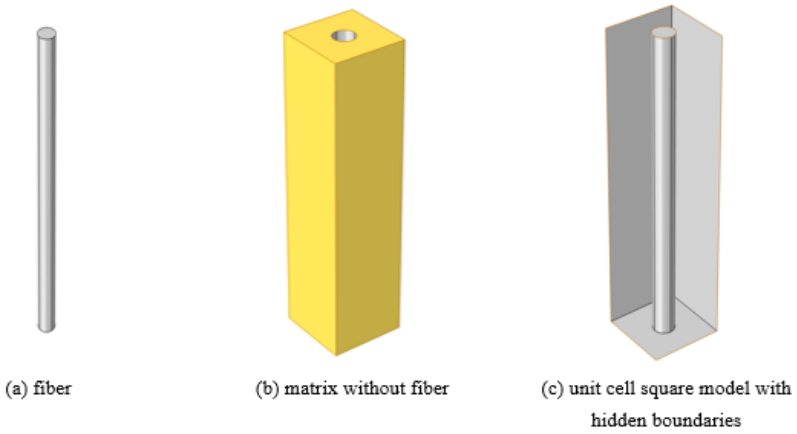
Abstract: In order to use materials sustainably, the construction industry innovates frequently. Utilizing affordable, environmentally friendly materials and technology that reduce a construction's impact on the usage of non-renewable resources and energy consumption is necessary. An environmentally acceptable thermal insulating material made from recycled paper fibers is cellulose fiber insulation. It has little embodied energy and good thermal characteristics. The cellulose fiber is embedded in the aerogel matrix. In this paper, thermal simulation of micro-scale yarn is performed using the commercial code COMSOL Multiphysics.

Keywords: Micro-scale yarn, thermal conductivity, cellulose fiber reinforced aerogel composite, periodic conditions.



Graphical abstract

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Work hardening and damage of composites with a metal matrix in simple shear: Experimental analysis and modeling

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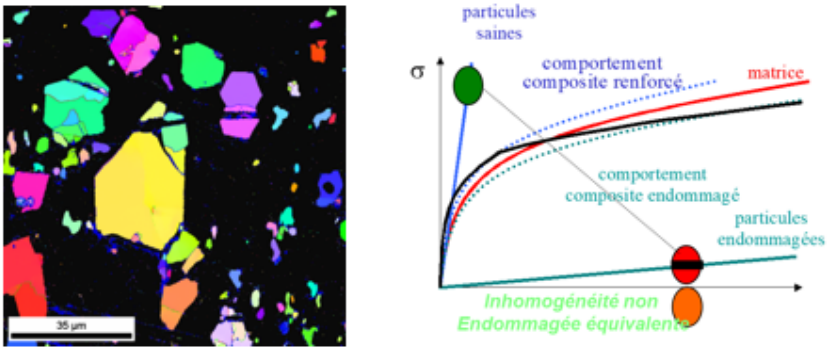
Abstract: The present study aims to analyze the plasticity and damage mechanisms of a new family of Fe-TiB2 steel matrix composites, in order to understand the microstructure/mechanical properties links and apply a behavior model taking into account different parameters of the microstructure, of interest for shaping. The study focuses on grades of composites with fixed particle content and differing in the grain size of the matrix, developed by ArcelorMittal. This work combined experimental measurements of different kinds and digital tools: The experimental characterization of the initial microstructures and textures by SEM/EBSD made it possible to qualitatively and quantitatively analyze the different morphological parameters of the reinforcements and the matrix. The effect of the grain size of the matrix and the reinforcements on the strain hardening of these composites was studied by simple monotonic shear tests. The analysis of microstructural evolution with shear deformation identified particle breakage as the predominant damage mode of Fe-TiB2 composites. The damage depends on the grain size of the matrix and the particle size. A model of damage to heterogeneous materials made it possible to estimate the breaking stresses of the particles on the basis of the available experimental results.

Keywords: composite à matrice métallique, cisaillement simple, écrouissage, endommagement



Graphical abstract

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Computational methods in mechanics

Numerical analysis of crack nucleation in contact mechanics

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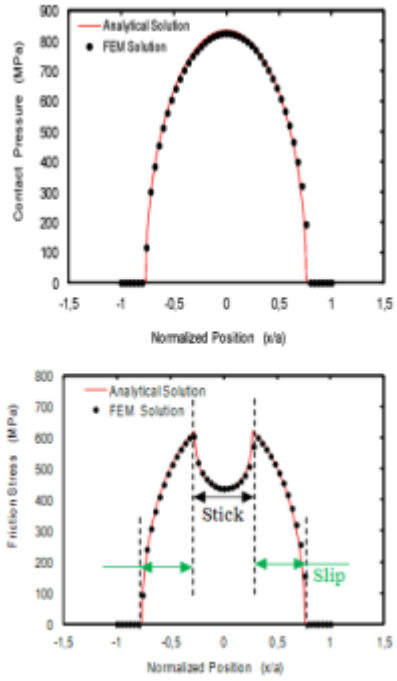
Abstract: The goal of this work is to analysis of contact pressure and shear stress on contact zone under fretting loading. The non-linear finite element method based on the computation of normal and shear stresses was used to analysis the fracture behavior of flat. The effect of shear force on the distribution of normal and shear stresses was highlighted. A multiaxial fatigue criterion is used to determine the crack initiation location in contact zone. The critical position (crack initiation) in contact line is based on the computation of maximum value that the hydrostatic and deviatoric stresses. The size of stick and slip zones is related at the magnitude of contact pressure and shear force. A good correlation was found between the FEM simulations and the analytical results.

Keywords: Fretting; Friction; Contact mechanics; Stick; Slip; Stick-slip; Finite element analysis; Crack nucleation



Graphical abstract

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MESOSCOPIC NUMERICAL STUDY OF NANOSCALE CONVECTIVE HEAT IN MOS TRANSISTOR SYSTEM

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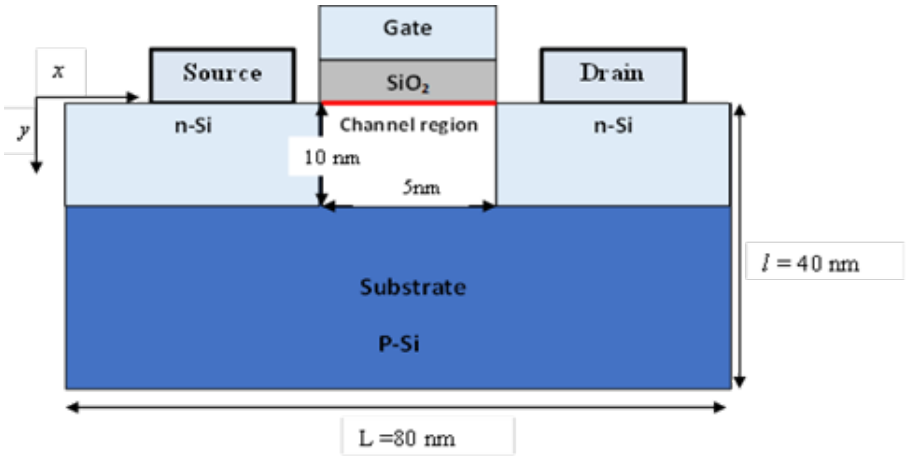
Abstract: Electronics technology has clearly developed in the past few years, reaching a nanoscale size. Among these devices is a metal oxide semiconductor field-effect transistor (MOSFET) device, which is current used in all electronic circuits, but with the reduction in its size, the heat generated affects the efficiency of the device. This paper analysis of convective heat with effective thermal conductivity (ETC) and secularity parameter(p) in a nanoscale MOSFET device at Knudsen number (Kn =20) using a mesoscopic method. At p = 0.8, the maximal temperature at the interface SiO2-Si reaches 313.84 K for coefficient convective (h)= 107 W/m2.K and 312.8K for h= 1010 W/m2.K at time scale t =30 ps . At p = 0.6 and 30 ps, the temperature at the interface estimates 315.21 K for h= 1010 W/m2.K . The results indicated that there was a positive relation between the increasing of convective coefficient and the reducing temperature in the drain-source.

Keywords: MOSFET; Effective thermal conductivity; Convective heat; Nanoscale size; Knudsen number; Mesoscopic method



Graphical abstract

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MECHANICAL BEHAVIOUR OF E-FGM SANDWICH PLATES UNDER BUCKLING AND RESTING ON NEW ELASTIC FOUNDATION

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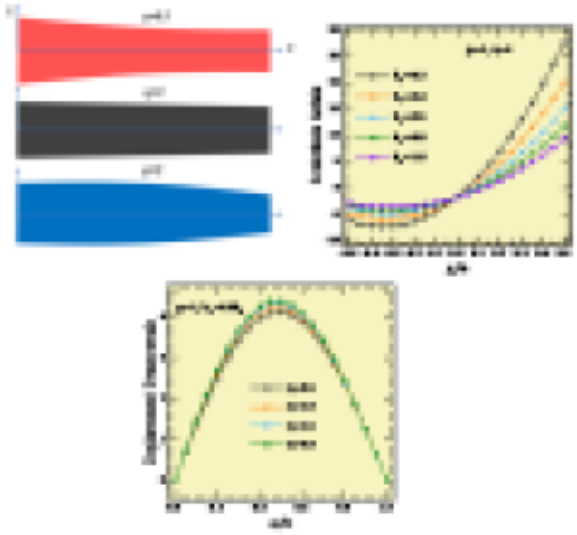
Abstract: Mechanical buckling of functionally graded sandwich plates is analysed in this research. New FGM sandwich structure is presented. Material properties of FGM layers are assumed to vary continuously through-the-thickness according to an exponential function in terms of the volume fractions of the constituents (E-FGM). Equilibrium and stability equations of E-FGM sandwich plate with simply supported boundary conditions are derived using the higher-order shear deformation plate theory. The influence of the plate aspect ratio, the relative thickness, the gradient index and the sandwich scheme on the critical buckling load of FGM sandwich plates are investigated.

Keywords: Mechanical Buckling, E-FGM Sandwich Plate, Higher-order Shear Deformation Theory, Simply Supported Boundary Conditions.



Graphical abstract

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The Method of Characteristics and its application to the solution of hyperbolic differential equations

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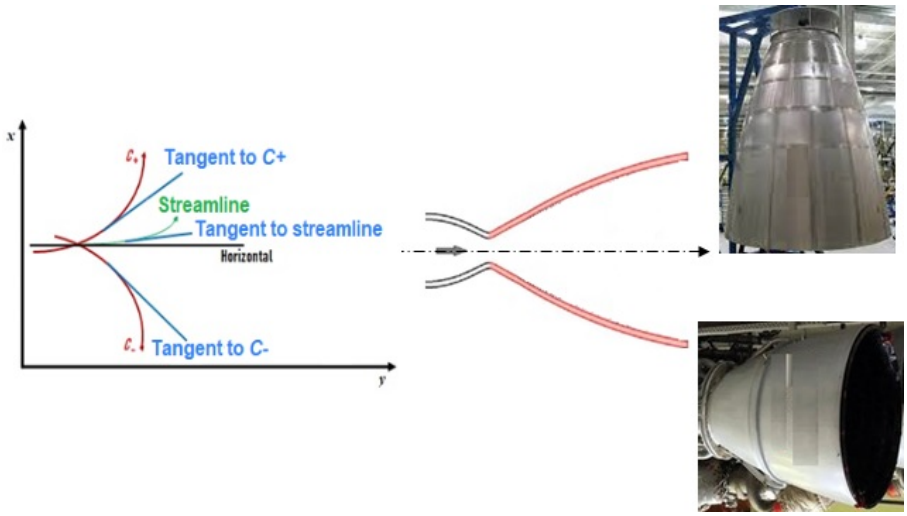
Abstract: The method of characteristics is a technique commonly applied in the development of propulsion nozzle profiles. It allows the reduction of the system of partial differential equations that represents the expansion within the divergent section of the nozzle into a system of total differential equations that would be solved along the characteristics represented, in the case of supersonic flows, by the Mach lines. The present investigation applies this method in order to solve the equations representing a two-dimensional, inviscid and irrotational flow that takes place within the supersonic divergent of a de-Laval nozzle. The transformation allows the replacement of the partial differential equations describing such flow into two ordinary equations commonly called the characteristic equation and the compatibility equation. These relationships are then transformed into finite difference equations that lead to the application of an appropriate predictor-corrector procedure in order to achieve the appropriate solution. The application to a case study represented by an axisymmetric propulsion nozzle is presented.

Keywords: supersonic flow, method of characteristics, design, profile, propulsion nozzle.



Graphical abstract

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Deterministic approach to cracking in multilayer supports

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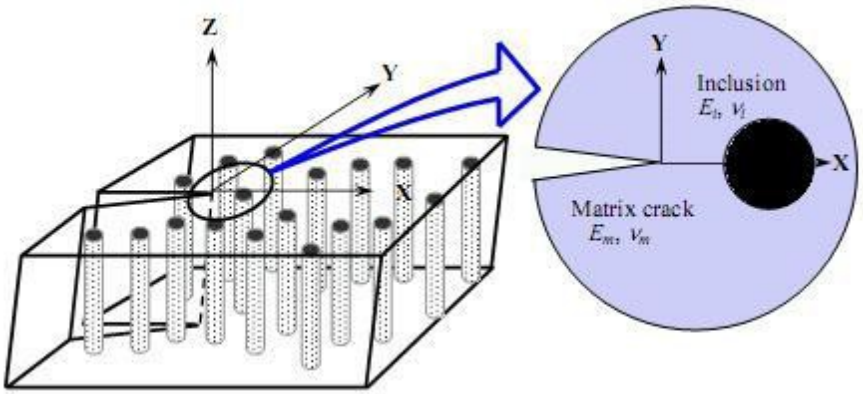
Abstract: This work focuses on the study of the interaction between cracks and inclusions. The displacement discontinuity method was chosen to perform the numerical simulation. The aspect of the critical potential of the position of the crack with respect to the inclusion is highlighted by working on the mechanical properties of the inclusions and of the matrix. The stress intensity factor is the parameter used in this case.

Keywords: Displacement discontinuity, stress intensity factor, inclusion, displacement discontinuity method, interaction.



Graphical abstract

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Vibration study of a helicopter blade in vertical flapping using the MYKLESTAD method

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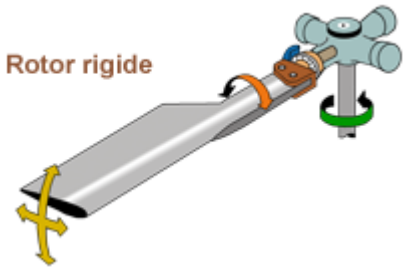
Abstract: The dynamic loads transmitted by the helicopter's rotor to the fuselage, through the vibrations they generate, degrade component life and passenger comfort. The work presented consists in developing a numerical calculation program making it possible to determine the natural flapping frequencies of a recessed helicopter blade and to find the cases of resonance which signifies the equality between this frequency and the multiple of the rotation speed and trying to avoid resonance by the variation of the parameters of action representing by the rigidity the distribution of the masses and the speed of rotation. The method used is MYKLESTAD. The blade is modeled using a series of point masses mn interconnected by flexible zones without mass. To validate the precision of this method, the results are compared with the analytical method. Keywords: vibration, resonance, natural frequency, rigidity, deformed..

Keywords: vibration, resonance, natural frequency, rigidity, deformed.



Graphical abstract

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A study of air-swirl design features for GT air-compressor gas turbine through CFD optimization

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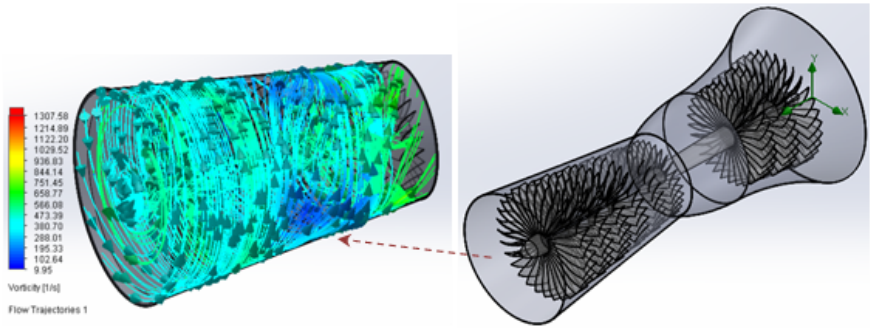
Abstract: Gas turbines serve an integral purpose in stationary power generation and continue to be a pivotal element for the foreseeable future for multiple factors. To date, numerous attempts have been made to enhance the efficiency of gas turbines because of operating costs and greenhouse gas environmental emissions. Optimizing the performance of a gas turbine engine can be described by minimizing fuel consumption while maintaining rated thrust, maximizing thrust for the same fuel consumption, and minimizing turbine blade temperature and acoustic emissions. This paper investigates the optimizing of these turbines operation by improving the intake and compression conditions through the air compressor using numerical process. Methods for determining steady-state and transient air compressor performance are discussed in detail, including the prediction of thermodynamic and aerodynamic air properties

Keywords: Air compressor, Gas turbine, design enhancement, CFD, Swirl



Graphical abstract

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The Effect of Porosity on elastic buckling behavior of shell structures made of Porous Functionally Graded Materials

Jamel Mars [1] *, Hanen Jrad [1], Mondher Wali [1], Fakhreddine Dammak [1]

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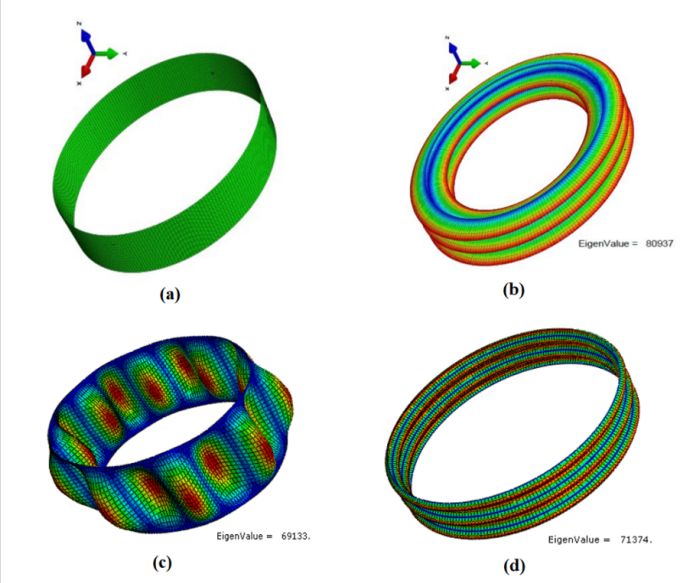
Abstract: This research deals with the stability analysis of cylindrical shell made of porous functionally graded (FG) material. The material properties of porous shell are assumed to be functionally graded as a function of the thickness and porosity parameters. Porous cylindrical shells are subjected to lateral pressure, axial compression, and hydrostatic pressure loads. A user-defined subroutine (UMAT) is developed and implemented in Abaqus/Standard to study the buckling behavior of FG shells. The effects of porosity distribution of the shell on the critical buckling loads of porous cylindrical shell are studied.

Keywords: Buckling behavior, FGM, porosity effect, FSDT



Initial meshing configuration of the FGM cylindrical shell (a), Mode shapes at the critical load h = 0.01, L = 2 (b) perfect FGM, n = 1, R/h = 500; (c) even FGM, n = 1, R/h = 200, α = 0.1, (d) even FGM, n = 1, R/h = 500, α = 0.1.

Graphical abstract

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Design and Manufacturing

Improvement of machinability of ground Hardox 500 steel

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Abstract: The work presented in this paper aims to improve the machinability of ground surfaces of Hardox 500 steel using a Sol Gel (SG) grinding wheel, with a depth of cut equal to 10 ?m, a wheel speed equal to 22 m / s, a working speed equal to 9 m/min and with two lubrication modes (dry, soluble oil). The results show that employment of soluble oil lubrication offers better machinability and low roughness compared to the dry condition.

Keywords: Grinding, Hardox 500, forces, roughness

Machine	Tecnoscuola SRT600
Grinding wheel	Sol-Gel (2SG 46 H V S)
Material	Hardox 500
Vs [m/s]	22
Vw [m/min]	9
ap [µm]	10
Lubrication type	▪ Dry ▪ Soluble oil ▪ Cryogenic

Graphical abstract

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Cyclic plastic deformation response of defective SA333 C-Mn steel

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[2] *LGM, IPEIM, university of Monastir, Monastir, Tunisia*
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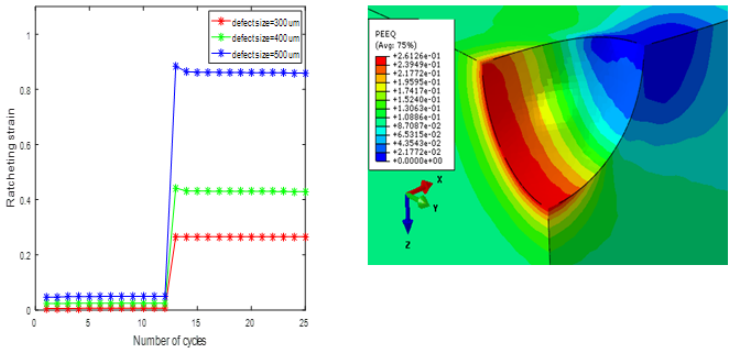
Abstract: To determine the nature of damage acting on a defective material, it is indispensable to know the detailed cyclic plastic deformation response in the bottom of the notch. In this attempt, the cyclic plastic deformation response has been studied on a defective material. The effect of overload is tested at three different load ratios, three different overload ratios and three different defect sizes. Chaboche model is used for characterizing SA333 Gr 6 C-Mn steel material behavior. Defect-tip cyclic stress/strain hysteresis loops and ratcheting strain accumulation are simulated with/without overload. Additionally, the effect of overload ratio, load ratio and defect size on the stress loading direction and the ratcheting strain evolution developed in the bottom of the defect, are discussed. It is seen that the ratcheting strain accumulation in the cyclic plastic zone in the bottom of the defect is sensitive to the load ratio and the defect size under overload.

Keywords: Defects, ratcheting strain, Overload, Fatigue, Damage, cyclic plastic deformation



Graphical abstract

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Optimization of cutting parameters during machining of titanium alloy Ti-6Al-4V using the combination of Taguchi S/N method, GRA and genetic algorithms based on artificial neural network modeling

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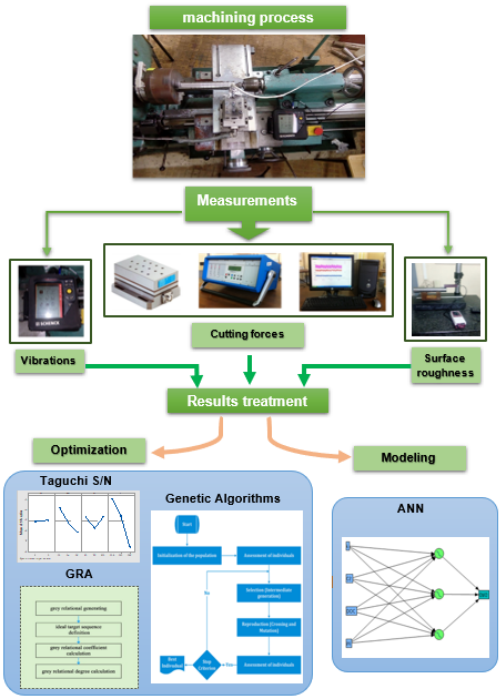
[2] *Laboratory of mechanics and structures (LMS), mechanical engineering department, University 8 May 19, Algeria*

Abstract: the work of this paper is based on the optimization of cutting parameters such as cutting speed, depth of cut and feed rate during finish turning of Ti6Al4V titanium alloy with the aim of minimizing surface roughness (Ra), cutting forces (Fz) and vibration (Vt) using a combination of different methods and techniques such as signal-to-noise Taguchi, gray relational analysis and genetic algorithms based on mathematical models obtained by artificial neuron networks.

Keywords: Ti-6Al-4V, turning, optimization, ANN.



Graphical abstract

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Multi-Objective Optimization in Machining of Polyamide Composite Using NSGA-II coupled with TOPSIS/AHP

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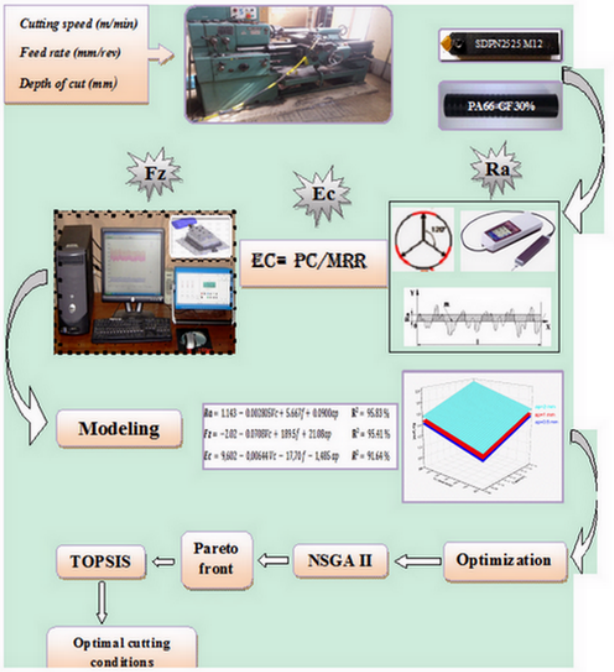
Abstract: Polymer-based fiber reinforced composites are becoming more popular in the mechanical industry because of their low cost, durability, and superior mechanical qualities. Using the response surface methodology (RSM), a modeling investigation of performance parameters such as surface roughness (Ra), tangential cutting force (Fz), and specific cutting energy (Ec) was carried out in this work. The dry machining procedures were carried out on glass fiber reinforced polyamide composite (PA66-GF30%) workpieces designed by Taguchi L9. A two-step methodology was designed for the multi-objective optimization of machining parameters. The non-dominated genetic sorting algorithm (NSGA-II) is used in the first stage to identify the non-dominant Pareto front solutions. The second stage integrates an MCDM approach (TOPSIS) with the Analytic Hierarchy Process (AHP) to select the optimal solution among the provided solutions (NSGA-II).

Keywords: PA66-GF30%, AHP, MARCOS, NSGA-II, TOPSIS.



Graphical abstract

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Human-Robot collaboration for disassembly planning in industry 4.0 trend

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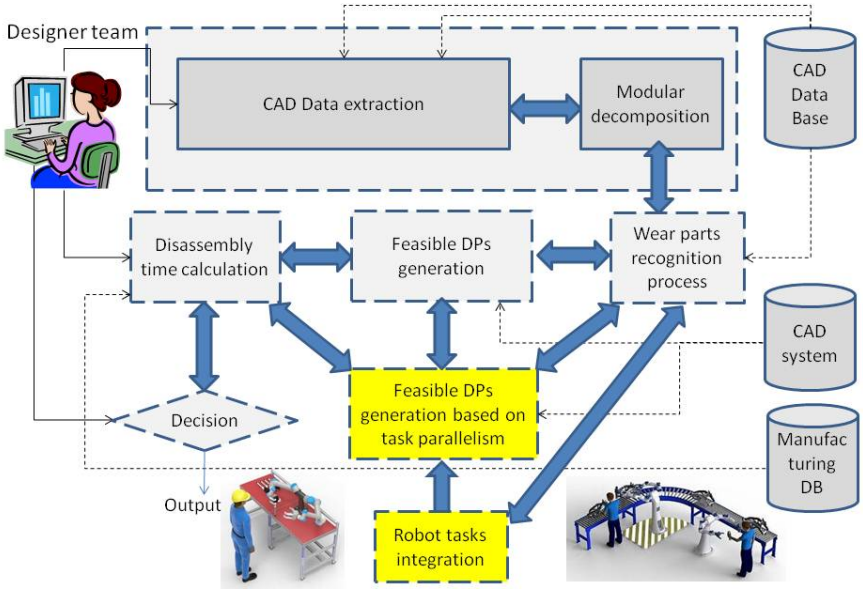
Abstract: Industry 4.0 (I4.0) leads to the numerical age. The whole object is digital: environments, manufacturing systems, machineries, workers, robots and products. All those should be interconnected within a digital setting. Assembly and Disassembly actions by human and robot can growth the efficiency and reduce the product cost. Until now, research works on Assembly and Disassembly Plans (AP/DP) has not integrated the I4.0 objectives in order to guarantee concurrency and persistence of industries. In this paper a new method for DP generation with Human and Robot Collaboration (HRC) is developed. The proposed method produces optimal DP plans with human and robots tasks allocation. To show the added value of the proposed method, an industrial example, selected from the literature, is treated.

Keywords: Robot, HRC, Disassembly plan, Optimization, Tasks allocation



Graphical abstract

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Design and Correction of Process Nanodefects on Dynamic model of Microbeam Structures

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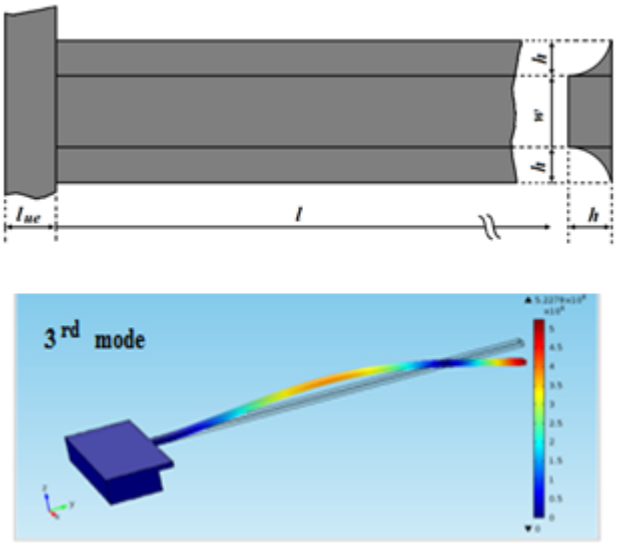
Abstract: The functional microstructures used in microsystems technology such as microbeam structures has more attractive due to the large integration for sensing and actuation in microengineering applications. Given the simplicity in functionalization, the open range and the elevated sensitivity in detection, this type of structures is very attractive for the realization of both chemical and biological microdevices. This study models and analyzes the influence of the technological process defects on the dynamic vibration of thin structure for microengineering applications. The standard beam model is analyzed using dynamic vibration theory and investigated using Finite element method to determine the validity of the microstructure model. A semi-analytical approach is proposed for the extraction of mechanical proprieties of microbeam structure. The derived model is than tested on measurements of thin Aluminum microbeam structure with micrometrics dimensions size. Numerical results indicate that the applied correction for manufacturing process defects is very significant for the microbeam where the corrected value of mechanical is very close to the experimental results. In addition, The Young's modulus of microbeam film extracted from the measured frequencies is a priori precise if we takes in consideration the numerical corrections suggested in the improved microbeam model

Keywords: Integrated Resonator, Mechanical Parameters, FEM Correction, Manufacturing Process, Microstructure Vibration



Graphical abstract

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Numerical analysis of formability of aluminum AA1050-H14 sheet metal using Cross-Die forming test

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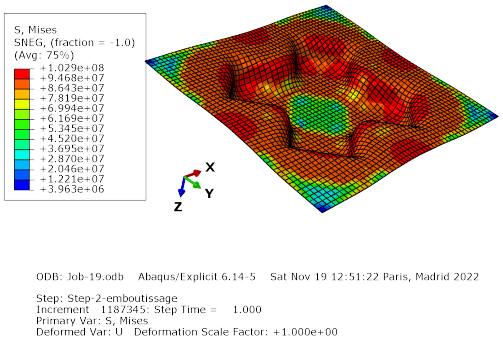
Abstract: Cross-die forming tests is widely used in the automotive and aircraft industry to evaluate the formability of sheet metals. It involves complex loading paths. In this regard, a numerical analysis is carried out to study the forming of aluminum AA1050-H14 sheet metal through this kind of testing method. An elasto-plastic constitutive model with J2 yield criterion and mixed non-linear isotropic/kinematic hardening has been implemented in ABAQUS/Explicit software in order to better understand the deformation mechanics during this forming process. The frictional conditions were considered by Coulomb friction model. Stress and strain distributions in the workpiece is studied to indicate locations which are prone to fracture. Evolution of major strain with minor strain, load-displacement and thickness distribution are predicted accurately by the simulation. Tearing locations that present the higher values of equivalent plastic strain and can lead to fracture have been well identified. Numerical findings are in a good correlation with different studies from literature.

Keywords: Numerical analysis, formability, cross-die test, aluminum sheet metal, thinning, stress, strain



Graphical abstract

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Mechanical characterization

Tribological characterization of nano-sized silicon nitride on beta phase

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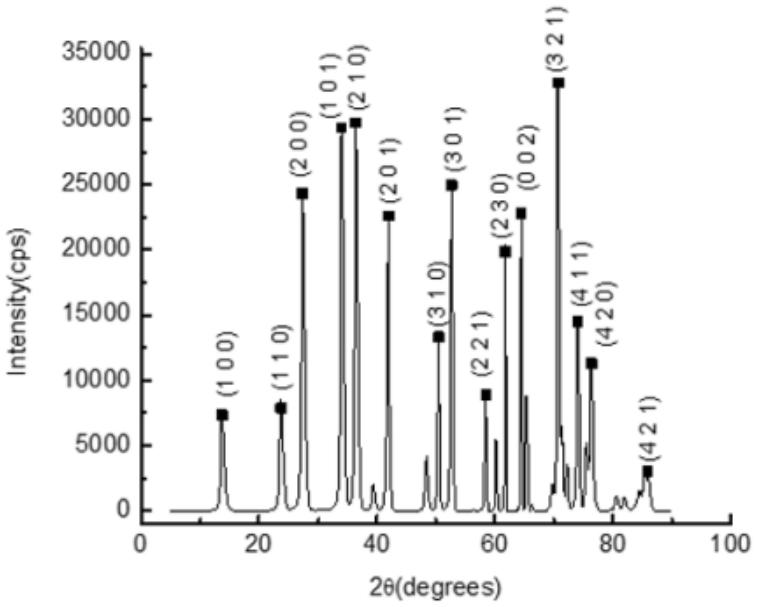
Abstract: Tribological tests on nano-sized silicon nitride in beta phase (?-Si3N4) were studied. Sliding tests were performed using reciprocating ball-on-flat tribometer against silicon carbide (SiC) ball under various normal loads under dry condition. Samples were prepared by spark plasma sintering method. Surfaces analyses was done by scanning electron microscopy. The results show that friction coefficient increases from 0.15 to 0.36 when the normal load goes from 11N to 57N. Specific wear rate decreases with the increase of normal load to reach 0.15 10-3 mm3/Nm.

Keywords: Nano-sized beta phase silicon nitride; friction; wear; normal load



Graphical abstract

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Mechanical properties of virgin and aged polycarbonate

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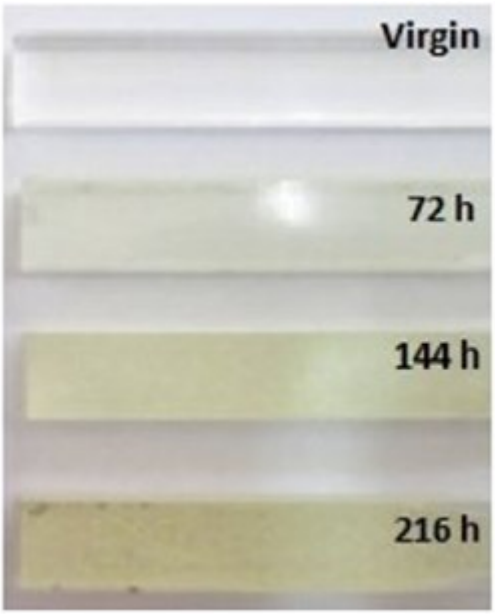
Abstract: The aim of this work is to study the effect of the exposure of a polycarbonate (PC) to the simultaneous effects of heat and ultraviolet radiation. PC is an amorphous polymer widespread in commerce. Among its many interesting properties, we can mention, among others, transparency, impact resistance and low density, this is why it is used like a material of greenhouses, windows of headlights, body parts, anti-shock windows, anti-vandal panes. However, long exposure to the heat and radiation makes it fragile and translucent. In this study, we subjected the PC to the simultaneous action of ultraviolet (UV) of a wavelength of 253 nm combined at a temperature of 80 ° C for 72, 144 and 216 hours. Changes in mechanical properties were revealed by compression and tensile tests.

Keywords: Polycarbonate, Thermal aging, irradiation, HV microhardness, tensile tests, Compression tests.



Graphical abstract

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Contribution to the study of a surface conversion treatment of a borided or cemented steel and coated with chromium films

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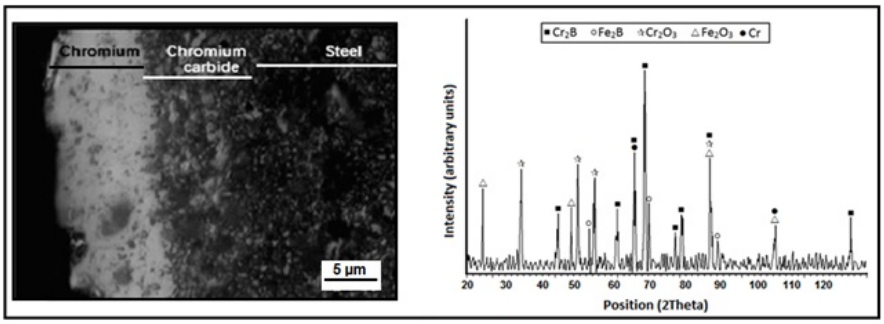
Abstract: Coatings based on chromium borides and chromium carbides are commonly employed in applications requiring mechanical performance, such as high hardness and low friction coefficient, as well as corrosion resistance. In this work, we made layers of chromium borides and chromium carbides on the surface of low carbon steel through some specific treatments. For chromium borides, the boriding treatment in a solid medium at 900 °C for 4 hours followed by chromium electroplating on the steel surface and finally the application of annealing treatment at temperatures at 950 °C for 1 and 2 hours. For chromium carbides, the cementation in a solid medium followed by electroplating of chromium on the surface and finally the application of annealing treatment at temperatures between 500 and 1100 °C for 1 hour. The obtained results show that, in the first case, boron diffusion and chromium deposition lead to chromium borides on the treated surface. Similarly, for the second case, the cemented layer and the chromium deposited on the surface combine to form chromium carbides on the treated surface after annealing. The characteristics of the chromium borides and chromium carbides obtained are very similar to those of chromium borides and chromium carbides obtained by other processes.

Keywords: Chromium, deposition, steel, layer, diffusion, cementation, boriding, annealing.



Graphical abstract

Graphical abstract

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Effect of Aggressive Media on a Sawdust-Lightened Mortar (Physico-Mechanical Properties).

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Abstract: The significant increase in the amounts of waste has become a threat to the stability of human life, leading to damage to the environment and the ocean. Therefore, people have had to develop quick and effective solutions to reduce these quantities and why not eliminate them, hence the role of exploiting them in the field of construction. The objective is to study the influence of three aggressive media (sea water, sodium sulphate and sulfuric acid), on some physico-mechanical characteristics of a mortar lightened with sawdust in substitution of a sand of dune (0%, 10%, 20% and 30%) compared to medium tap water. Absorption by total immersion has decreased at 10% substitution and the favorable effect of sawdust is noted for the porosity accessible to water and the wet and dry density, very acceptable mechanical resistance at 30% substitution for sea water and sodium sulphate with a very remarkable degradation with sulfuric acid.

Keywords: Environment, waste, sawdust, aggressive media, lightweight mortar, durability, physical characteristics, resistance.

Graphical abstract

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The influence of nitrogen and thermal annealing on the properties of titanium nitride thin films

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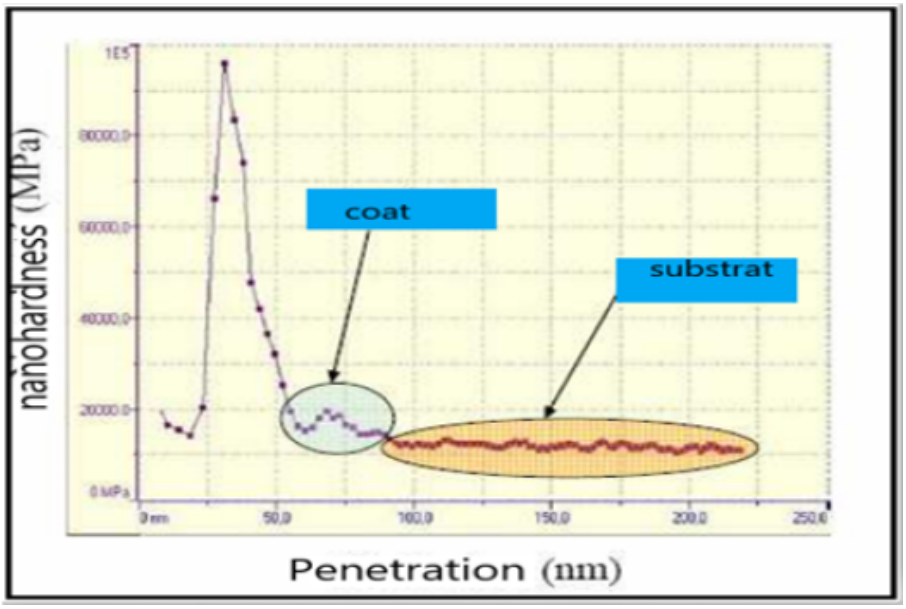
Abstract: The elaboration of materials in the form of thin films is of major interest in a wide variety of fields of application. The coating of solid materials with a film protects or prevents their degradation, whether of chemical origin (corrosion, etc. . . .) or physical (wear, etc. . . .) for example, of applications in aeronautics, biomaterials and cutting tools. The aim of this work is to study the influence of nitrogen and thermal annealing on the properties of titanium nitride thin films, The obtained samples are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), atomic force microscopy (AFM), X-ray micro analysis and nano-indentation techniques.

Keywords: Titanium nitride; thin film; hardness; coating; diffusion.



Graphical abstract

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Effect of Time and Temperature of Carburizing Treatment on the Structure and the Hardness of Steel 16NC6

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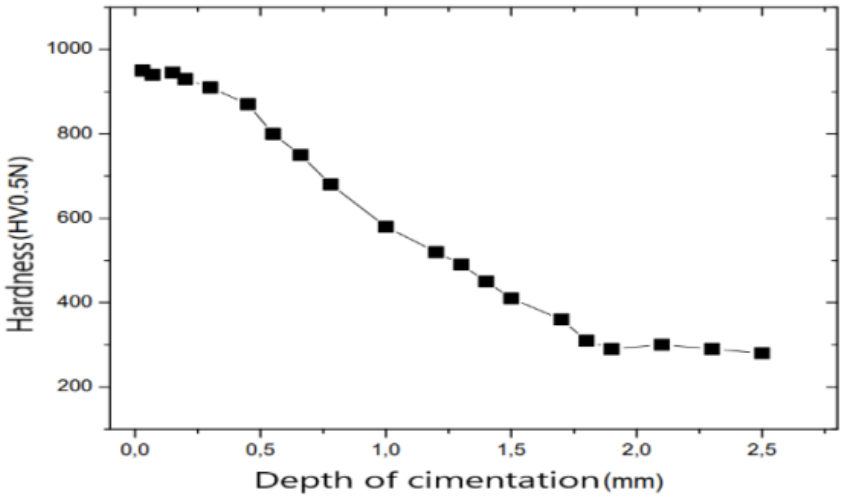
Abstract: Carburization is one of the oldest heat treatments used for surface hardening. This process was developed for further improvement of the mechanical properties of the work piece in particular the cutting tools, The purpose of this technique is to increase the hardness and wear resistance of the surface by enriching the case with higher rate of carbon with subsequent quench hardening; the core of the object, which has not been impregnated with carbon, remains very ductile. The duration and temperature of carburizing surface hardening treatment can be chosen in agreement with the thermal treatment for obtaining optimal bulk hardness in the precipitation hardening steel. Characterization point of view structural and mechanical of the samples using X-ray diffraction, optical microscopy and micro indentation testing was then introduced in this work. It was found that the incorporation of carbon resulted in a hardened additional compound consisting of a combination of martensite and expanded austenite.

Keywords: Steel; Cementation; Carbon; Carburizing.



Graphical abstract

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Stress-frequency effect on fatigue behavior of Polyethylene

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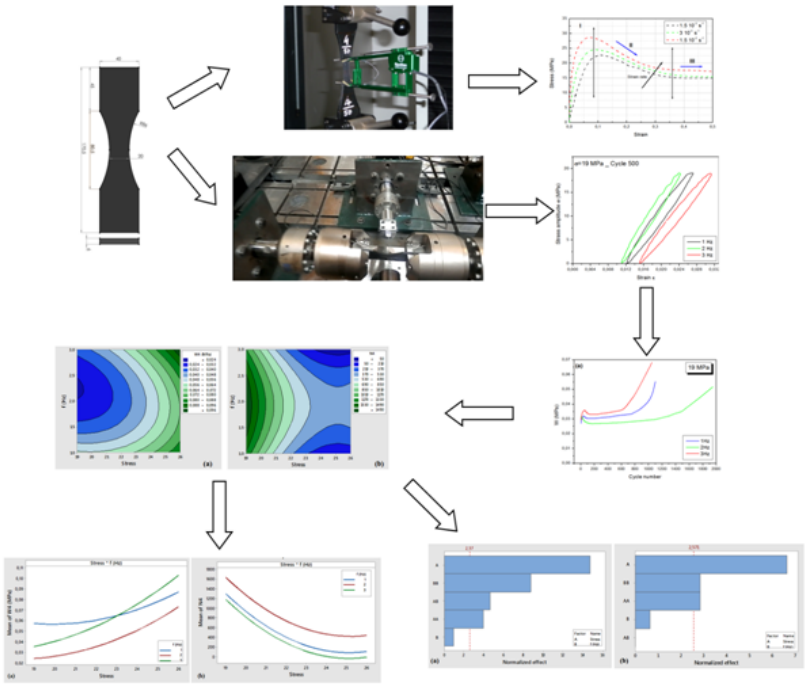
Abstract: The objective of this work is to study the effect of cyclic frequency and applied stress on the fatigue behavior of grade 100 high-density polyethylene (HDPE 100) by performing load-controlled fatigue tests. The cyclic load-unload curves were used in the calculation of the dissipated energy for each cycle. Dissipated energy was correlated with frequency and applied stress to analyze their effects on on the fatigue damage of HD-PE. The results revealed a dual frequency effect. Positive effect was observed for the studied material when increasing frequency from 1 to 2 Hz. Conversely, the effect of frequency becomes negative on the lifetime of the material when increased from 2 to 3 Hz. A complete factorial design experiment was used to study of the effects that frequency and stress can have on HDPE material fatigue response. In addition, response surface design was used to model energy lost and associated cycle number. The obtained results made it possible to identify factor settings that optimize the fatigue responses.

Keywords: Fatigue and failure, damage mechanism, mechanical test, dissipated energy, loading frequency



Graphical abstract

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Mechanical Characterization of Natural Fiber Composite Materials

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Abstract: It is important to take stock of the different categories of materials from renewable and biodegradable resources. Some industrial sectors, such as packaging and transport, are interested in the use of cellulosic fibers which lead to good performance products with good formability. In this work, we selected three types of natural fibers (Alfa fibers, palm leaf fibers, washingtonia leaf fibers). To study the effect of the external environment (aggressive environment) on these natural fibers, we chose to put them in HCl and sea water for a period of 1 to 7 days, we took a sample from each period with which we had prepared test specimens to study their mechanical behavior.

Keywords: Fibers, Natural fibers, Effect of the external environment.

Graphical abstract

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Reinforcement Of Poor Soils By Ballast Columns

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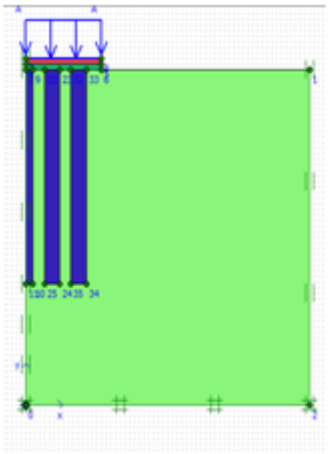
Abstract: Ballasted columns are an interesting technique for improving compressible soils in place. Their major advantages are to reduce compaction, increase the bearing capacity of soils, accelerate consolidation and eliminate the risks of liquefaction during earthquakes.. Thanks to these advantages, reinforcement processes are considerably developed in the field of geotechnical construction and this on an international scale. Numerical modelling is a necessary and effective alternative for approaching the real behaviour of soils reinforced by ballasted columns. the present work aims to change several parameters which are :(the number of columns, the rise of the water table, the friction angle …….) . A parametric study was carried out in order to determine the influence of certain parameters on the results settlement and see their influences on the mechanical behaviour of the soil through the Plaxis 2D calculation code. This study found that the right choice was based on the number of columns which is three, the rise of the groundwater do not have a big influence on the results.

Keywords: Ballasted, Column, Displacement, Forced, Finite element, Granular, Improvement, Inclusion, Soil.



Graphical abstract

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Optimization of Photovoltaic Conversion Yield of Cells Solar Hetero junction a-Si :H /c-Si.

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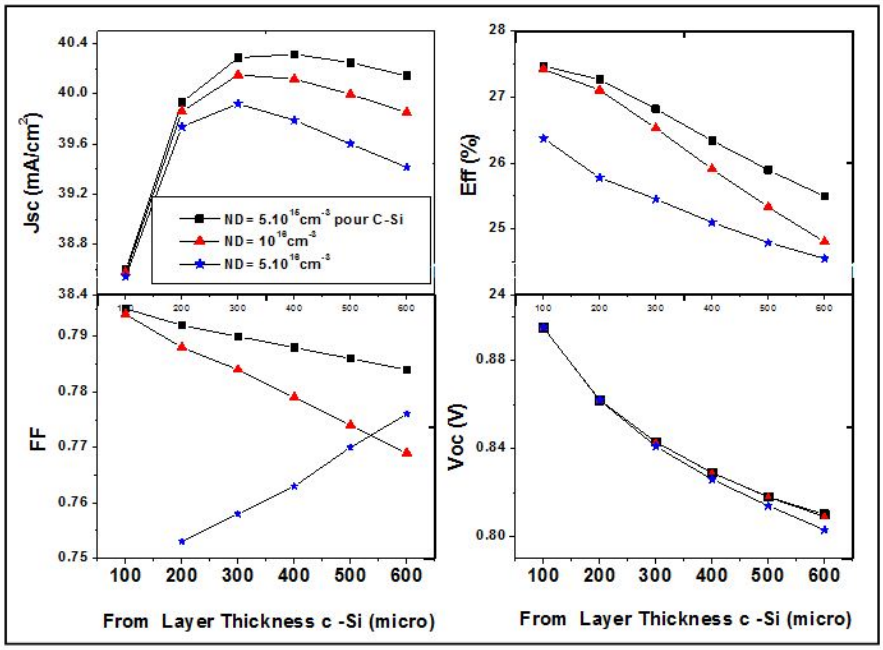
[2] *University of Mohamed El Bachir Ibrahimi, Bordj Bou Arréridj 34000, Algeria*
[3] *Electrical Engineering Laboratory (LGE), University of M'sila, M'sila, Algeria*

Abstract: A hetero junction solar cell of the HIT type based on silicon, crystalline silicon and amorphous silicon (a-Si:H(p)/c-si(i)/a-Si:H(n)) was simulated, using the one-dimensional computer code AMPS-1D (One Dimensional Analysis of Microelectronic and Photonic Structures). On the one hand, our objective is to determine the effect of the thickness of the active layer (c-Si), as well as the variation of the concentration of the donors (Nd) of this layer on the performances of the cell: the short-circuit current (JSC), the open-circuit voltage (VOC), the form factor (FF) and the efficiency (Eff), and on the other hand, to find all the structural parameters characterizing each constituent layer of the cell. The results obtained from the optimization are shown in the following figure. We have found that the best thickness for the active layer that gives good performances of the studied solar cell, lies between 100 and 300 micro. Besides, the best value of Nd that provides better output parameters in the range of 5.1015 – 1016cm-3. In our optimization which has been done depending of temperature and wavelength, we have gotten those values of Voc= 0.795 V, Jsc= 38.599 mA/cm2 and FF= 0.800 corresponding to an efficiency of Eff=27.472%.

Keywords: AMPS-1D, solar cells, C-Si solar cells, HIT, Active layer, Efficiency.



Graphical abstract

Graphical abstract

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Elaboration and Mechanical Characterization of New Composite Materials Based on Particles of Fibrous Wood of Date Palm Tree.

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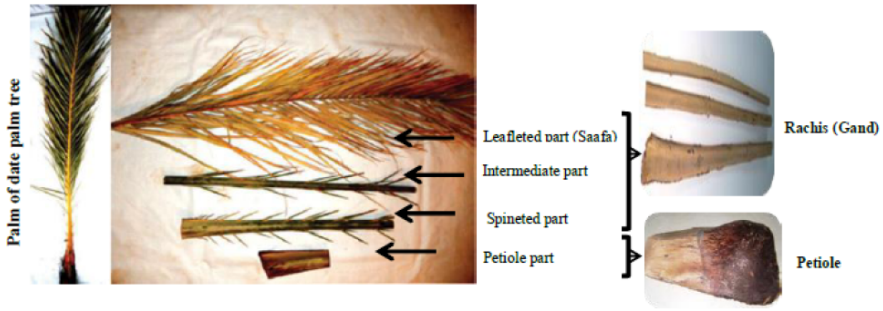
Abstract: The aim of this study was the development and mechanical characterization of new composite materials based on fibrous wood particles from date palm tree waste with a natural matrix based on lignin. The fibrous wood particles were prepared from the wood waste of the petioles from the date palm tree. The results obtained by the compression tests have proven the anisotropy of the material and the effect of the particle size distribution on these mechanical properties. But in general, these characteristics were quite acceptable in comparison with other materials such as cork and wood.

Keywords: Fibrous wood , date palm tree, petiole , particle composite, mechanical characterization



Graphical abstract

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Control of Double Stator Induction Motor by Field Oriented Control based on Interval type-2 fuzzy logic

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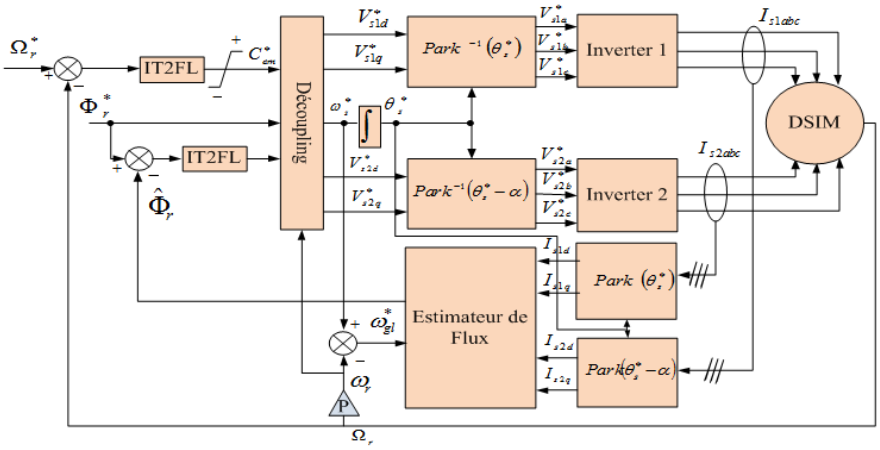
[2] *Department of Automatics and Electromechanical, Faculty of Science and Technology,Ghardaia,Algeria*
[3] *Department of Electrical Engineering L2GEGI Laboratory, Faculty of applied science, University of Tiaret, Algeria*

Abstract: In recent years a number of studies have been carried out in relation to improvements in control methodologies for Double stator induction motors. This paper is to present an interval type-2 fuzzy logic of double stator induction motor where flux and torque decoupling strategy is decoupled in terms of magnetizing current instead of stator current to alleviate the effects of core loss. The performances of proposed interval type-2 fuzzy-logic-based controller have been verified by computer simulation. The simulation study for high-performance control of DSIM drive shows the superiority of the proposed interval type-2 fuzzy logic controller over the conventional PI controller.

Keywords: Double stator induction motor; Inverter; field oriented control; Interval type-2 fuzzy logic.



Graphical abstract

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Study for Control of Dual Star Induction machine based on Direct Torque Control

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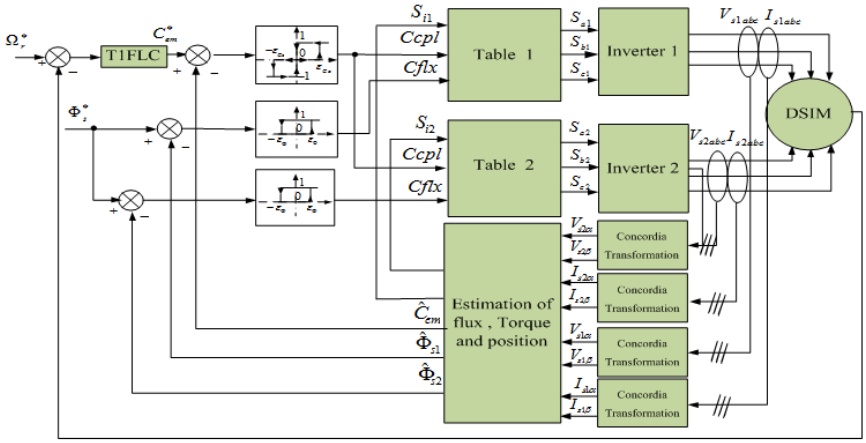
[3] *Department of Electrical Engineering L2GEGI Laboratory, Faculty of applied science, University of Tiaret, Algeria*

Abstract: In this paper describe the direct torque control of dual star induction machine using fuzzy logic. The direct torque control technique has become one of the excellent performance control strategies for AC machine to provide a very rapid torque and flux control. Thus, this method is inherently a motion sensorless control technique. Simulation results show that the proposed controller (T1FLC) has superior performance response robustness tests.

Keywords: Dual Star Induction Machine; Direct Torque Control; Proportional and Integral; Fuzzy Logic Controller.



Graphical abstract

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Numerical analysis of metal cutting operation

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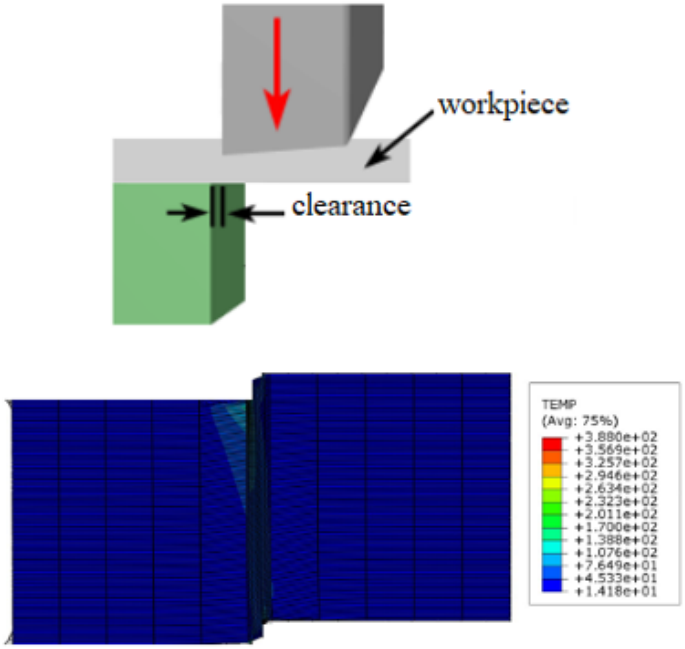
Abstract: Metal cutting is essential operation that heads many metal forming processes. In order to optimize cutting results, the Finite Element method is an efficient tool to predict the mechanical behavior and damage parameters. The main goal of this work is to characterize experimentally bar and sheet metals in order to model a cutting operation. We prove that in the case of sheet metal, we can consider Ludwik with ductile damage. These models predict correctly the cutting operation. However, for the bulk workpiece, we prove that the Johnson Cook models give a good prediction of cutting test. The temperature field is considered in these models. It should be taken into account in experimental tests used to characterize the material behavior and failure.

Keywords: MEF, cutting operation, sheet metal , bulk metal



Graphical abstract

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Characterization of the mecahnical behavior of a duplex stainless steel in relation to the phenomenon of hydrogen embrittlement.

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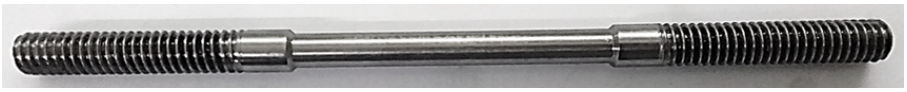
Abstract: this work presents a chacarcerization study of mechanical behavior of duplex in relation of the phenomenon of hydrogen embrittlement (H.E). The experimental work consists in using heat treatments, which have been carried out on standard test specimens electolytically pre-leaoded in medium of sulfuric acid aqueaous H2SO4 at 0.1N with the different loading times in hours form 2h00 to 16h00 with step up of 2h00. The results given in the form of experimental curves to be noted after a mechanical fracture test by the instrumented tensile machine to refetence : Frank karl GMBH, consists in breaking these pre-loaded specimens at ambiant temperature a displacement speed of (£'=6.10-3.S-1). In particular to characterize mechanical performance of this material, ductility and the plasticity in relation to the mechanism of hydrogen embrittlement (H.E).

Keywords: stainless steel, mechanical properties, heat treatments, hydrogen, hydrogen embrittlement.



Graphical abstract

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Mechatronics

Comparative Study between Fuzzy Controller and Sliding Mode Control for Quadruple Tank System

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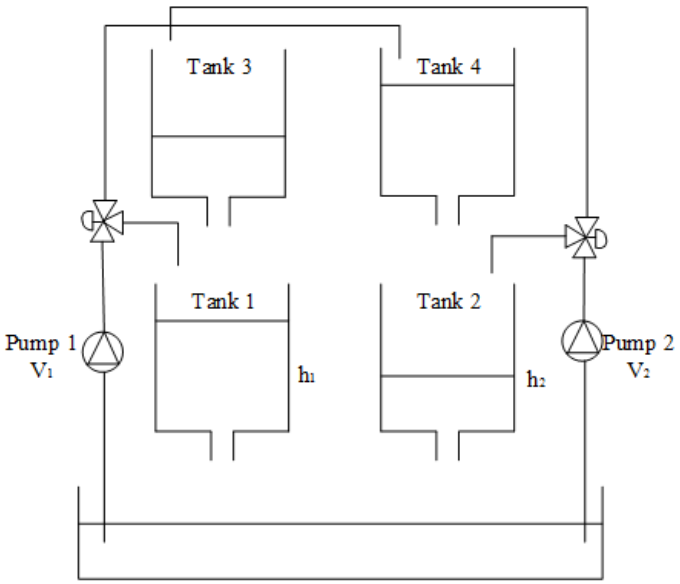
Abstract: The quadruple tank process has been widely used in control literature to illustrate many concepts in multivariable control. In this context, this paper deals with the intelligent control of a quadruple tank process. The objective of the current study is to design and to compare between fuzzy controller and sliding mode control for a multivariable four-tank process. Simulation results confirm the effectiveness of the proposed control strategies and highlight the superiority of the sliding mode control in both minimum phase and non-minimum phase operating conditions.

Keywords: Fuzzy controller, Sliding mode control, Quadruple Tank System, Non-minimum phase system.



Graphical abstract

Graphical abstract

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Metallic corrosion

A Comparative Study on Inhibition Corrosion of X52 and X70 steels in sodium chloride (NaCl) solution saturated with CO2 gas

Zidelmel Sami [1] *, Dakmoussi Maamar [2], Omar Allaoui [2], Rabah Boubaaya [3], Mokhtar Djendel [3]

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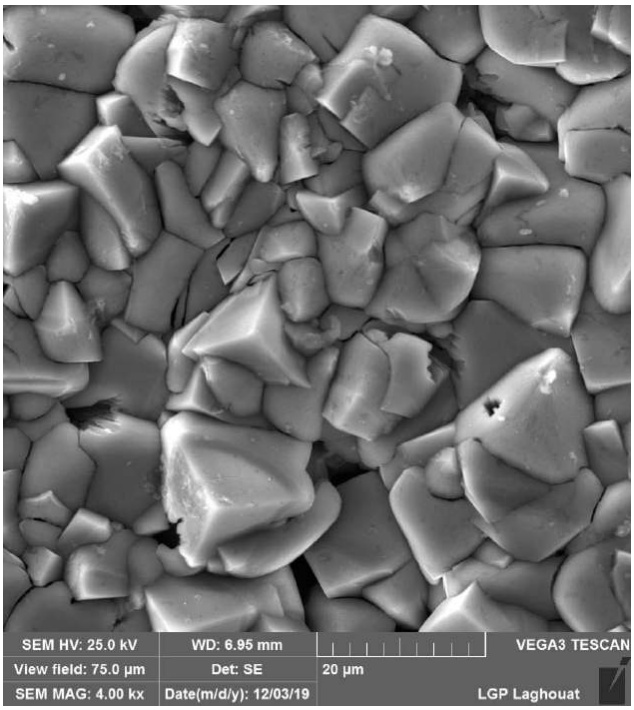
Abstract: This work investigates the influence of concentration 10, 20, and 30 ppm of organic inhibitor, based on trimethyl benzene, on the corrosion resistance of X52 and X70 steels in a NaCl solution saturated with CO2, in the absence / presence of inhibitor by Potentiodynamic polarization and weight loss methods. It has been found that the X52 corrodes, in NaCl solutions, faster than the X70 steel under the same conditions. Increasing the concentrations of inhibitor from 10 to 30 ppm showed a significant reduction in corrosion parameters for both steels. The inhibition efficiencies of X70 and X52 reached 96% and 97.7%, respectively, for 30 ppm of inhibitor concentration. Compared to X70, the results indicated that the inhibition efficiency of X52 steel exhibited higher inhibition efficiency due to the difference between their microstructures.

Keywords: API steels, Corrosion resistance, inhibition.



Graphical abstract

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Static and dynamic behavior

Stability of Anchored Retaining Walls With Pseudo-Static Method

Fatima Zohra Benamara [1] *, Chiraz Kechkar [1], Ghania Nigri [1], Messaouda bencheikh [1]

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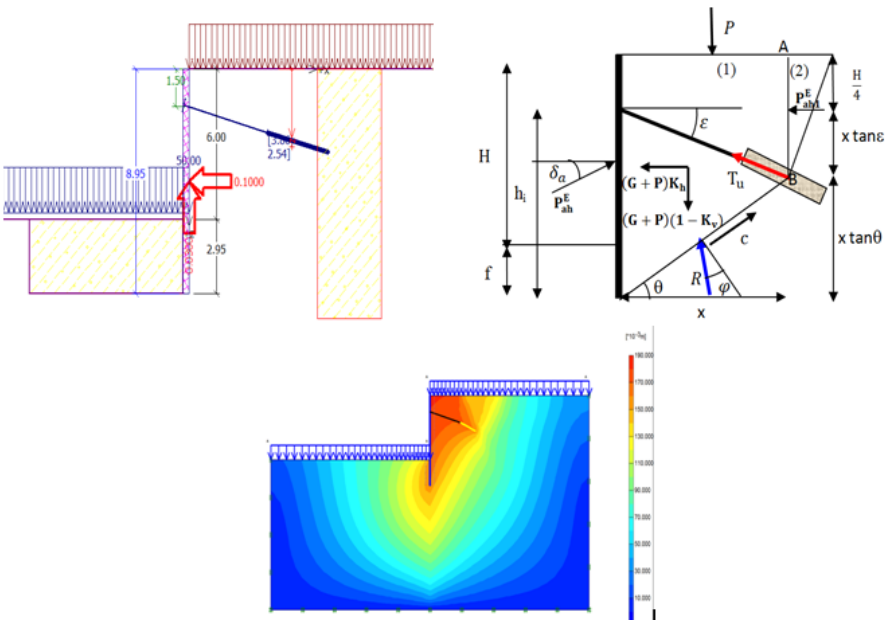
Abstract: The dynamic response of the retaining walls is quite complex compared with the static response of these structures. The aim of this paper is to design and study the stability of anchored retaining wall loaded with different seismic actions to obtain minimal anchor lengths. Mononobe-Okabe approach is used to evaluate the dynamic earth pressures developed behind the anchored wall. In this approach. The methods used to estimate dynamic earth pressure on retaining anchored walls can be estimated analytically and numerically. In this study we have design an anchored retaining wall, by applying the pseudo static method of Mononobe okabe for different horizontal seismic coefficients. The Kranz failure model was used to evaluate the stability of the structure. The software Geo5 and Plaxis 2D were used to evaluate the safety factors. An interpretation of the calculation' results permitted us to explain the effect of seismic intensities in the design of the anchored retaining wall.

Keywords: Anchored retaining walls, safety factor, pseudo static, dynamic earth pressure, Plaxis2D, Geo5.



Graphical abstract

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Wave nature of the surface displacements of an elastic half-space with inertial properties

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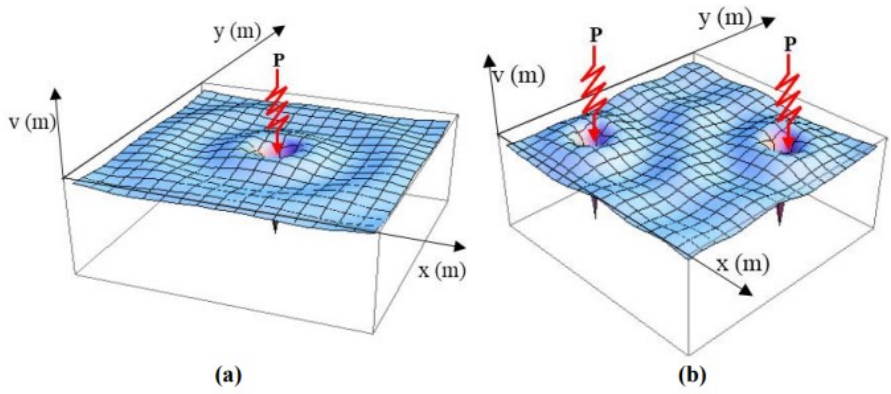
Abstract: This work undertakes the study of Green's function defining the vertical displacements of the surface of an elastic half-space with inertial properties caused by a dynamic external load. The study employs results from a previously published, semi-analytical evaluation of the integrals of the Lamb [1]. These are integrated over the loaded element surface to generate an expression that represents the Green's function allowing the determination of the vertical displacements of the surface of an elastic half-space with inertial properties due to any dynamic external load. This semi-analytical study is associated with major mathematical difficulties that required the use of several mathematical techniques with the help of the formal calculation software "Mathematica" and also the use of a powerful calculation station to arrive at the final formulas.

Keywords: Displacements' wave nature; Lamb's model; Green Function; Half-space surface; Dynamic load; Contact problems



Graphical abstract

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Dynamic Balancing of a Rigid Rotor

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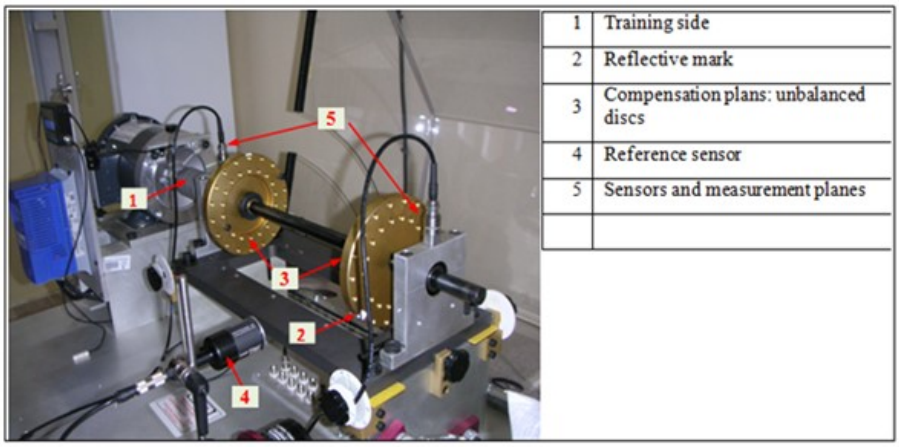
Abstract: One of the major problems of rotating machinery is bending vibrations due to synchronous rotating forces, in which the amplitudes increase with the square of the rotational speed. These vibrations are transmitted directly to the bearings. Despite the very precise machining and assembly techniques, the residual unbalance still remains. The unique solution to solve this problem is balancing, an action which consists in minimizing the unbalance of the rotor in such a way that the free centrifugal forces around the axis of rotation imposed by construction and their vibrations do not exceed the allowed tolerances. This work consists to carry out a dynamic balancing operation of a rigid rotor of a machine fault simulator using the Schenck Smart Balancer analyser, based on the influence coefficient method.

Keywords: Dynamic balancing, Rigid rotor, Influence coefficient method



1	Training side
2	Reflective mark
3	Compensation plans: unbalanced discs
4	Reference sensor
5	Sensors and measurement planes

Graphical abstract

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Influence of Key Parameters on the type of vibration in the dominant modes of bridges

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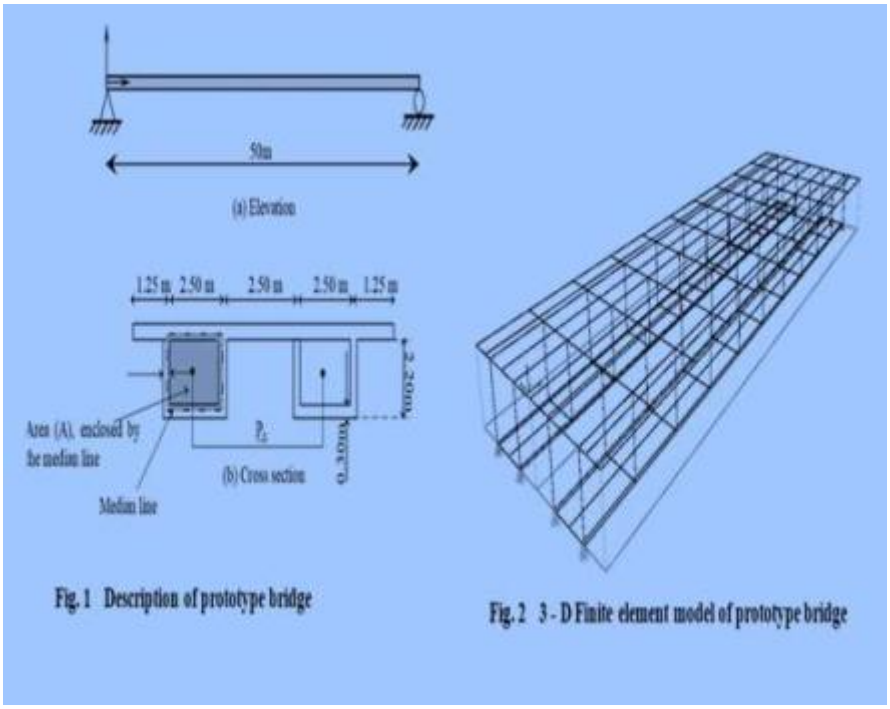
Abstract: Human sensation is affected by the type of vibration in the dominant modes of bridges. In particular, the pedestrian tend to reply more negatively to torsional modes of vibration than to flexural modes. This paper examines the main results of investigation on the influence of some key parameters affecting the changes in dominant modes vibration. The study is carried out on a prototype model of a twin box girder bridge in prestressed concrete. A finite element model is used to illustrate the analyses. Useful conclusions are also formulated on the basis of the results obtained from the free vibration analysis of the studied bridge configurations

Keywords: dominant modes, torsional modes science, flexural modes, twin box girder bridge, finite element model



Graphical abstract

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Energy

Advanced energy technologies

Reduction and thermodynamic treatment of NOx emissions in a controlled ignition engine using oxygenated fuels

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Abstract: The aim of this research is to study the effect of various mixtures of an alternative fuel environment (ethanol, isooctane) respectful of a common ignition gasoline engine. The tests were carried out on an engine test bench in accordance with DIN 70020.The results obtained with gasoline gives very interesting ecological results. On the other hand, the performance of the engine has been slightly reduced compared to those obtained with pure fuel. We noted a variation in engine performance for the blends E10 (10% ethanol + 100% pure essence) and I10 (10% isooctane + 100% pure gasoline) which its tune reduction of NOx emissions by 7.5% for E10 and 5% for I10 cooperatively with pure petrol. However, the use of mixtures E10 and I10 did not increase the specific consumption of oxidant. Thus, the increase in the octane number has led to an increase in NOx emissions. It is expected to use fuels of octane number 96 which corresponds to I40 (40% isooctane + 100% petrol) if we even have an ammunition of 8% of the engine torque, of 5% of the puissance and an increase in the specific consumption of the engine. Fuels with an octane rating greater than 96 should not be used to reduce harmful emissions. We also noted that the mixture (20% isooctane + 80% ethanol) cocides with a significant increase in NOx emissions, a significant increase in specific consumption and a drop in performance (engine torque and power).

Keywords: Mots clés:Moteur à essence à allumage commandé,mélange,carburant,performances,émissions.

Graphical abstract

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Numerical simulation study of the outlet temperature in an air/buried ground heat exchanger coupled with a humidifier

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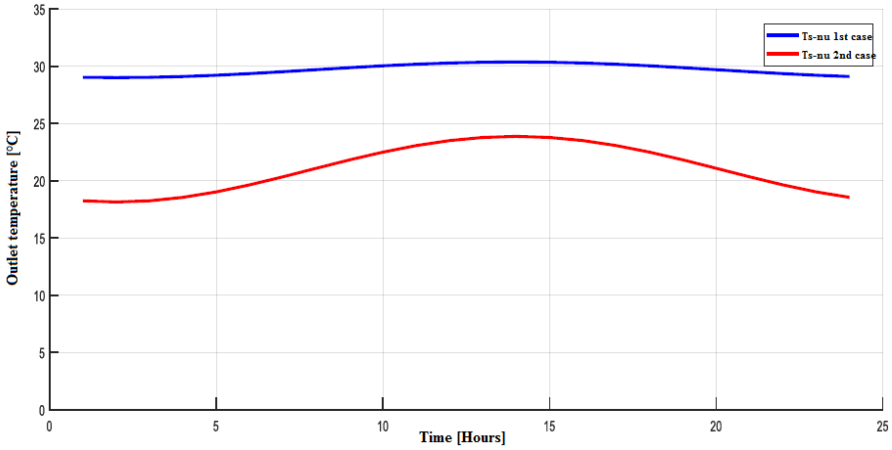
Abstract: The development of air conditioning linked in particular to the improvement of living conditions leads to an increase in energy consumption with all its harmful effects on the environment. It is therefore urgent to find viable alternatives to traditional air conditioning. The hybrid cooling concept consisting of an underground air-to-ground exchanger coupled with a humidifier is a reliable and proven alternative that contributes to the preservation of the environment. It is based on the phenomenon of geothermal energy and the effect of evaporating water for the cooling of hot air. In this paper, a numerical simulation study was carried out to predict the air outlet temperature in an air/buried ground heat exchanger coupled with a humidifier for a typical summer day, on the 15th of July in the Biskra region. The computer tool Matlab 9.2 was used during the numerical simulation study, and two layout configurations were considered. where m=0.05 kg/s is the mass air flow, L=55 m is the air/soil exchange length, and z = 03 meters is the burial depth.

Keywords: Air/ground exchanger, Humidifier, Cooling, air, Simulation, Arid and semi-arid.



Graphical abstract

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Numerical simulation of the flow around a wind turbine blade

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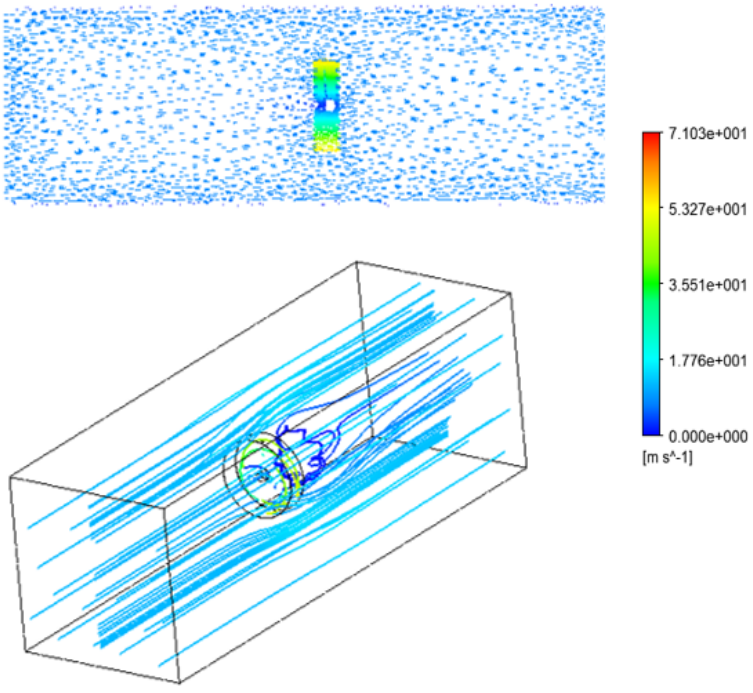
Abstract: Wind energy is one of the main alternatives for the production of electricity in urban areas today. Optimizing the performance of wind turbines is therefore the major concern of researchers and manufacturers. The main objective of this study is to approve the energy characteristics of a new configuration of the blades of a horizontal axis wind turbine. In this work, we present a numerical study of the three-dimensional turbulent incompressible airflow around the rotor of a horizontal axis wind turbine. This rotor is designed with a new blade configuration. The numerical approach used for the study and analysis of the aerodynamic behavior of the rotor is based on the resolution of the averaged Navier-Stokes equations (RANS) applied to the 3D geometry. The calculation is performed using an ANSYS FLUENT 16.2 commercial numerical code. A comparative study of different values of the specific velocity ? was carried out based on the identification of the distribution of pressure and kinetic energy and the representation of the velocity field.

Keywords: Horizontal axis wind turbine, RANS, Ansys Fluent, specific velocity.



Graphical abstract

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Energy management

Impact of the windows opening in the indoor air quality

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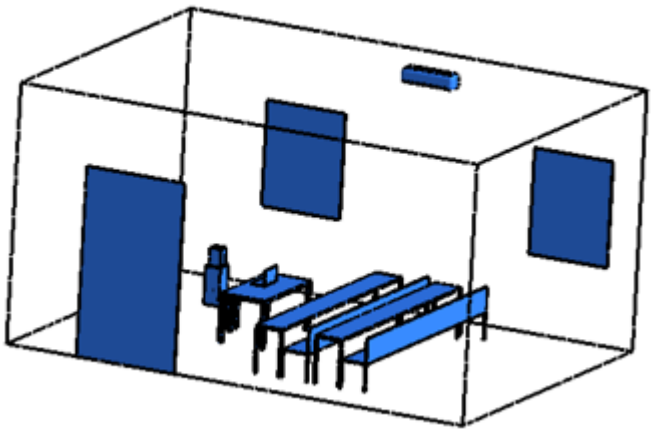
Abstract: The main goal of research was the characterization of the indoor air quality for the occupied building. This study examines the interaction between the opening of the room windows and the indoor air property testing the thermal sensation for a person sitting front a computer. The CFD tool was used to test four situations: two windows are closed, only one window is opened, only one window is closed and the two windows are opened. The numerical results given by ANSYS Fluent prove that the indoor temperature, the indoor velocity and the PMV index were affected significantly by the different situation.

Keywords: Room windows, Manikin, indoor air flow, Temperature, PMV, Thermal comfort



Graphical abstract

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Modeling and optimization of energy conversion systems

Thermodynamic analysis of a Pem fuel cell system

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[2] *Laboratory of Studies and Research in Industrial Technology, LERTI, University of Saad Dahleb Blida 1, ALGERIA*
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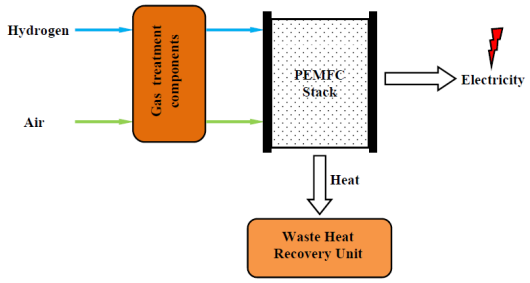
Abstract: In this work, a thermodynamic model of proton exchange membrane fuel cell (PEMFC) system containing the main auxiliary components was adopted. The system consists of a PEMFC stack, heat exchanger, water tank, water pump and inlet gas treatment components (humidifier and compressor). An optimization algorithm is introduced to identify the parameters of the electrochemical model of the fuel cell. After validation of the mathematical model, an evaluation of the electrical performances of the PEMFC stack and the overall system performance has been carried out. Through the obtained results we have noticed that the energy consumed by the different auxiliaries of the system constitutes a significant part of the final power produced by this latter. Moreover, the PEMFC system is very cost-effective in terms of power output and energy efficiency.

Keywords: PEMFC, PSOC algorithm, system efficiency.



Graphical abstract

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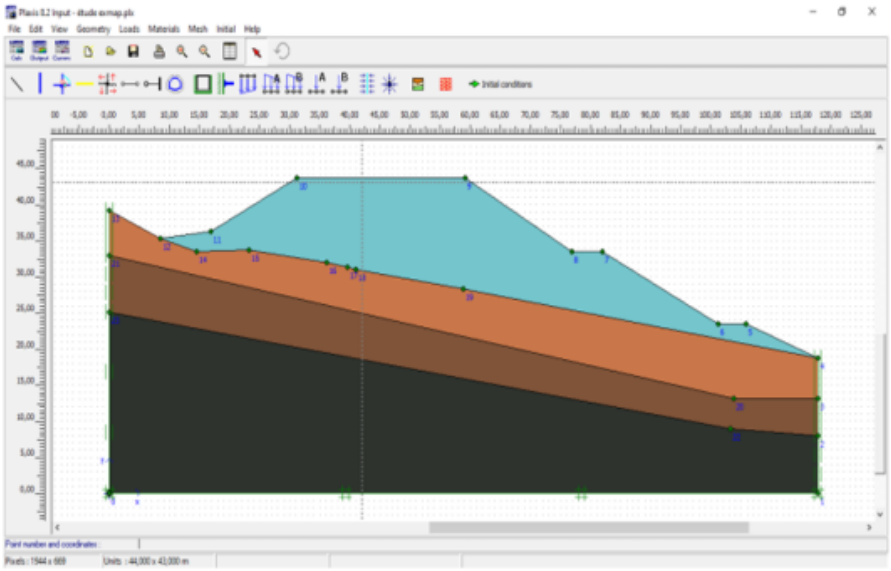
Mechanical Behavior Of Unstable Embankments Reinforced With Discrete Elements (Geosynthetics)

Messaouda Boutahir born bencheikh [1] *, Assia Aidoud [1], Salima Boukour [1], Fatima Zohra Benamara [1], Lazhar Belabed [1]

[1] *Faculty of science and technology, Department of civil Engineering and Hydraulics University 8 May 1945 , Laboratory of Civil Engineering and Hydraulic (LGCH), Guelma, Algeria*

Abstract: The use of geosynthetic (Geogrids) has experienced considerable growth in recent years throughout the world in view of the results obtained, particularly in terms of soil reinforcement. This material within everyone's reach in terms of cost, easy to use and has been one of the most spectacular innovations in the field of geosynthetic. With the different geosynthetic products innovative solutions can be offered to many situations. This work constitutes a contribution to the understanding and analysis of the reinforcement of unstable embankments and is interested in the numerical simulation of an embankment on compressible soils reinforced by geogrid layers using a two-dimensional computer code named PLAXIS 2D , aim at the effect of the spacing "e" between geogrids on the safety factor, which increases with the decrease of the latter.

Keywords: Embankment stability, Geogrids, Landslide, , Plaxis 2D, Reinforced soil.



Graphical abstract

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Prediction of solar irradiation using response surface methodology

Badis Bakri [1] *, Hani Benguesmia [2], Zied Driss [3]

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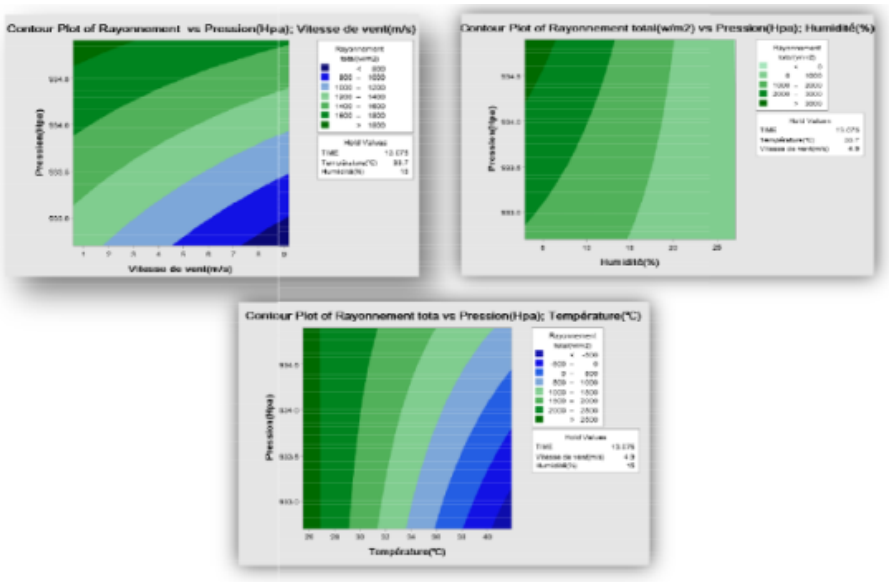
[2] *Electrical Engineering Laboratory (LGE), University of M'sila, M'sila, Algeria*
[3] *Laboratory of Electro-Mechanic Systems (LASEM), National School of Engineers of Sfax (ENIS), University of Sfax (US), B.P. 1173, Road Soukra km 3.5, 3038 Sfax, TUNISIA*

Abstract: Energy production represents a significant challenge in the years ahead. Indeed, the energy needs of industrialised companies continue to grow. As well, the countries developing countries will require more and more energy to complete their mission development. The danger, excess use of natural resources is decreasing reserves of this type of energy in a way that is dangerous for future generations.. Today, energy security is the triggering factor for a developing country. Thus, for ensuring energy security renewable energy such as PV plant could be the best alternative. The objective of this work is to develop a prediction model from real meteorological data which is using response surface methodology in the M'sila region. The results obtained made it possible to opt for this technique for its advantages adapted to the problem posed.

Keywords: Solar irradiation; Renewable energies; prediction.



Graphical abstract

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CFD investigation on the Ranque-Hilsch vortex tube optimum design

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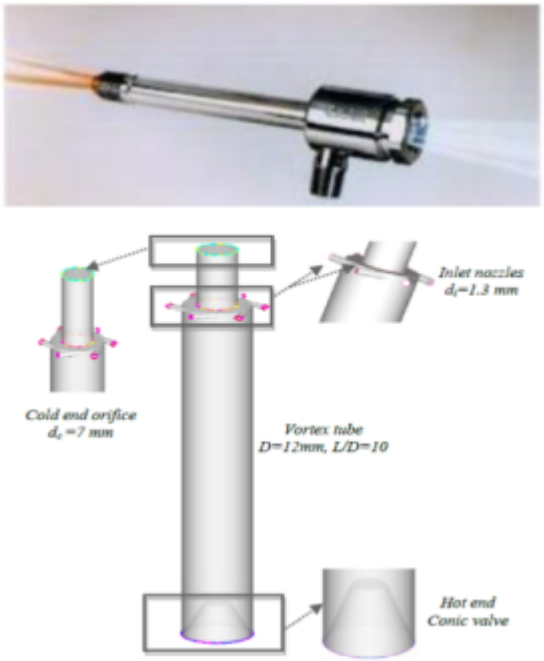
[2] *ENIM, Unit of Thermics and Thermodynamics of the Industrial Processes, Monastir, Tunisia*
[3] *UNIMECA, Marseille, France*

Abstract: This paper reports a three-dimensional numerical simulation of a Ranque-Hilsch vortex tube using the CFD FLUENT code in order to study the geometrical parameters effects on the flow pattern and to find the optimal geometrical configuration that optimizes both the energy separation mechanism and consequently ensures the highest thermal performance of the device. The work presented here shows that CFD analysis based on the RANS approach for solving the equations governing turbulent and three-dimensional flow allows to correctly predict the temperature separation mechanism and to evaluate its thermal efficiency since the results obtained are in perfect adequacy with the reference experimental data. The parametric study carried out also made it possible to determine the optimal geometrical configuration of the vortex tube length, the cold end orifice and the inlet gas nozzles, and therefore to optimize the energy separation process and consequently improves the thermal efficiency of the device

Keywords: CFD, RHVT, Energy Separation, Thermal performance



Graphical abstract

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Numerical investigation of influence of partially blocked gas flow channel on mass transport and performance of solid oxide fuel cell

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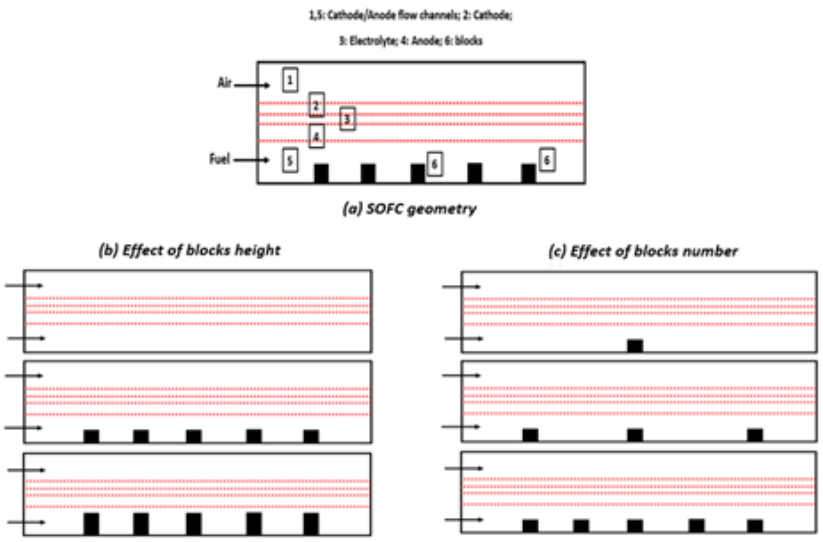
Abstract: geometry of flow channel in solid oxide fuel cell has an importance on reactants distributions and thus haw a significant influence on the cell performance. Therefore, a two-dimensional numerical model based on the Lattice Boltzmann method is developed to evaluate the planar SOFC performance with channel partially blocked. The results of developed model are validated using the available experimental data from the literature. The effect of the blocks height, number of blocks, are studied. Utilization of blocks on anode channel increases the gas flow velocity and hence improves the mass transport from the channel to the anode/electrolyte interface. It is recorded that, performance of the partially blocked anode channel is better compared to the straight channel design. The results show that SOFC performance enhances with increasing block number and blocks height, 90% blockage of the anode-side flow channels with five blocks ameliorates the power density by 14.4%.

Keywords: Solid oxide fuel cell, performance improvement, blocked flow channel, number of blocks, blocks height, mass transport.



Graphical abstract

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Modelization and Optimization of Photovoltaic modules using Design of experiments approach

Abdallah Zegaoui [1] *, Fatma Zohra Kessassia [2], Mustapha Arab [2], Michel Aillerie [3]

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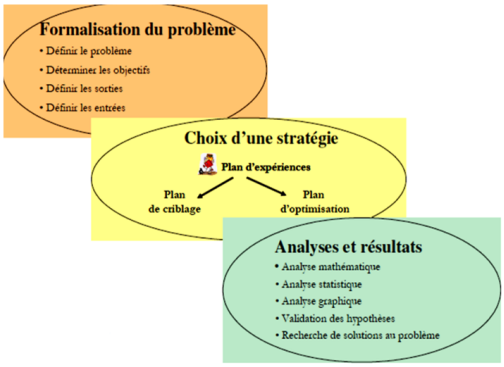
[2] *Laboratory UHBC University of Chlef, Algeria*
[3] *Laboratory LMOPS, Université de Lorraine, France*

Abstract: In the current paper, modelling and optimization of the electrical response of a multi-crystalline photovoltaic (PV) module using design of experiments (DoE) approach is performed based on a set of experimental trials. The main purpose of this contribution is to evaluate the PV module maximum power response according to variations of both variable's: solar irradiation and PV cell surface temperature tested indoor conditions. The DoE approach allows estimating both main and combined effects of the two independents considered variables. DoE uses multiple linear regression to establish the relationship between the independent input variables and output response variable, which allows determining the most significant factor and so for the combined effect of several factors. The DoE model can be used for predicting the response variable at different operating condition in a considered domain study limited by the factorial design. However, DoE approach uses ANOVA tool for statistical and graphical analysing of the accuracy of the predictive model and then the significance of coefficients. Therefore, an ANOVA table summarizes the results, detect the factor influences on the considered response variations and leads to determine the best predictive model then reproduce perfectly the most possible the experimental data.

Keywords: Design of experiments; predictive model; PV Modeling, statistical analysis; graphical analysis, ANOVA



Graphical abstract

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Application of an Intelligent Controller in Shunt Active Power Filter

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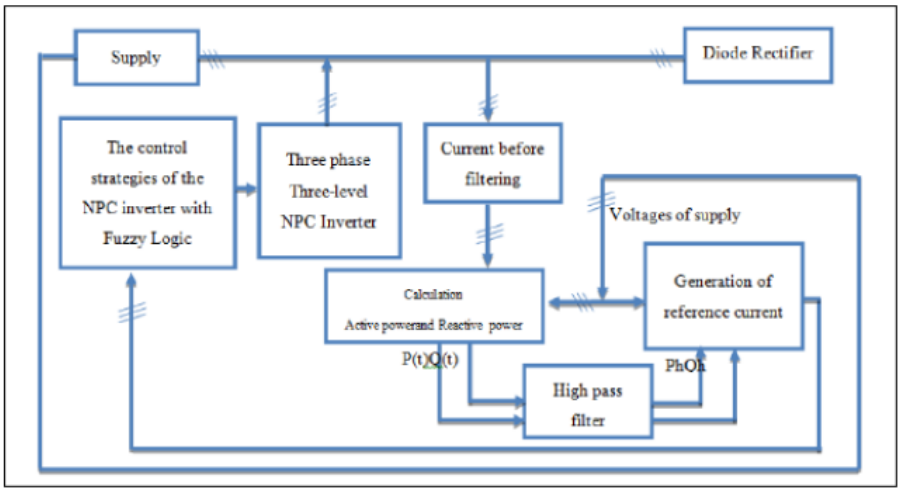
[2] *Electrotechnical and Automatic Research Laboratory, University of Dr. Yahia Fares, Médéa, Algeria*

Abstract: This paper presents application of artificial intelligent controller for shunt active power filter to improve power quality in the distribution systems. The objective is to improve performance compared to conventional pollution control systems for low voltage electrical installations. Based on the use of artificial intelligence techniques, our harmonic compensation approach is done in three steps. The first two steps respectively identify the voltage components and harmonic currents using an artificial intelligence technique. The third stage injects the harmonic currents into the electrical network through a control module. The proposed structure automatically adapts to variations in network load and therefore to fluctuations in the harmonic content of disturbances. The simulation study has been performed on MATLAB simulink.

Keywords: Three-level (NPC), Shunt active power filter (SPAF), harmonic distortion (THD).



Graphical abstract

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Prediction of ?ashover voltage of cap and pin insulator using adaptative neuro-fuzzy inference system (ANFIS)

Hani Benguesmia [1] *, Badis Bakri [2], Nassima M'ziou [3]

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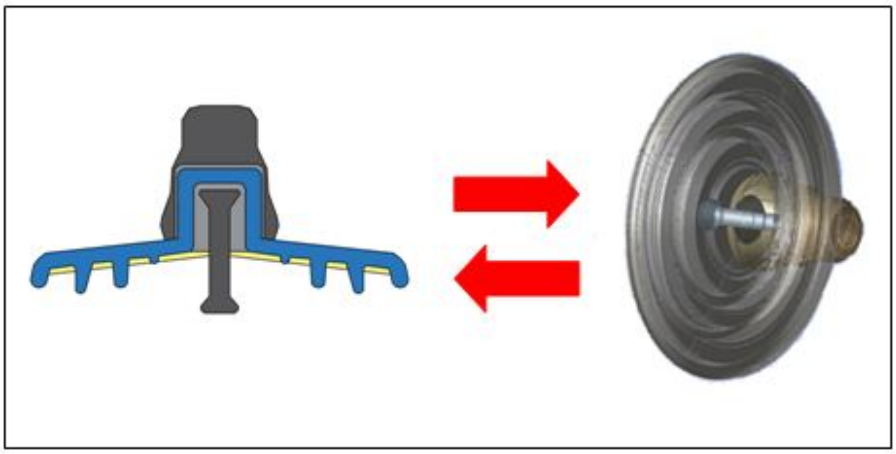
[2] *Department of mechanical engineering, University of M'sila, Faculty of Technology, M'sila, Algeria*
[3] *Department of Electrical Engineering, Faculty of engineer Sciences, University of Boumerdes, Boumerdes, Algeria*

Abstract: As transmission line voltages increase, the importance of insulator pollution research increases significantly. To determine the flashover behavior of contaminated high-voltage insulators and to determine the physical mechanism behind the phenomenon, the researchers were led to develop a model. This paper describes the application of an adaptive neuro-fuzzy inference system (ANFIS) to estimate the breakdown voltage of contaminated insulators. The results obtained are promising and ensure that the ANFIS technique can estimate the critical breakdown voltage of newly designed insulators with different operating conditions and represents an indispensable model for field simulations of different parameters of contaminated insulators.

Keywords: high voltage, insulators, fuzzy logic, polluted level, conductivity.



Graphical abstract

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2D approach for the Turbulence modeling choice of a zephyr vertical axis wind turbine

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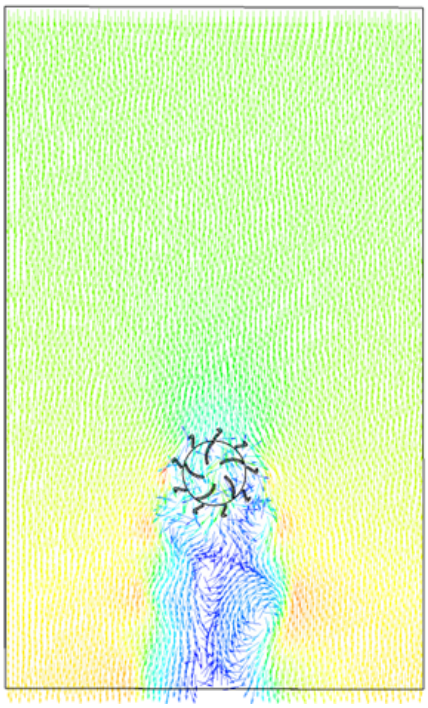
Abstract: Renewable energies are energies from natural sources that renew themselves at a rate greater than their consumption. Wind energy has been used for millennia, land and sea technologies have evolved in the last few years to maximize the electricity produced, with taller turbines and larger diameter rotors. This work was developed in our Laboratory of Electro-Mechanical Systems (LASEM) to investigate the aerodynamic performance of the zephyr vertical axis turbine (VAWT). In particular, 2D approach has been developed to choose the best turbulence for the aerodynamic structure of the wind turbine. For this, we have compared six types of turbulence models which are the SST k-?, the standard k-?, the BSL k-?, the RNG k-?, the standard k-?, and the realizable k-?. Our numerical results have been compared with experimental results found in the literature and confirm that the SST k-? turbulence model is more appropriate to investigate numerically the zephyr vertical axis turbine. The good agreement confirms the numerical method considered.

Keywords: VAWT, Zephyr, aerodynamic, Turbulence model, experimental validation.



Graphical abstract

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Simulation of Depollution In Electrical Networks Using MATLAB/Simulink Tools

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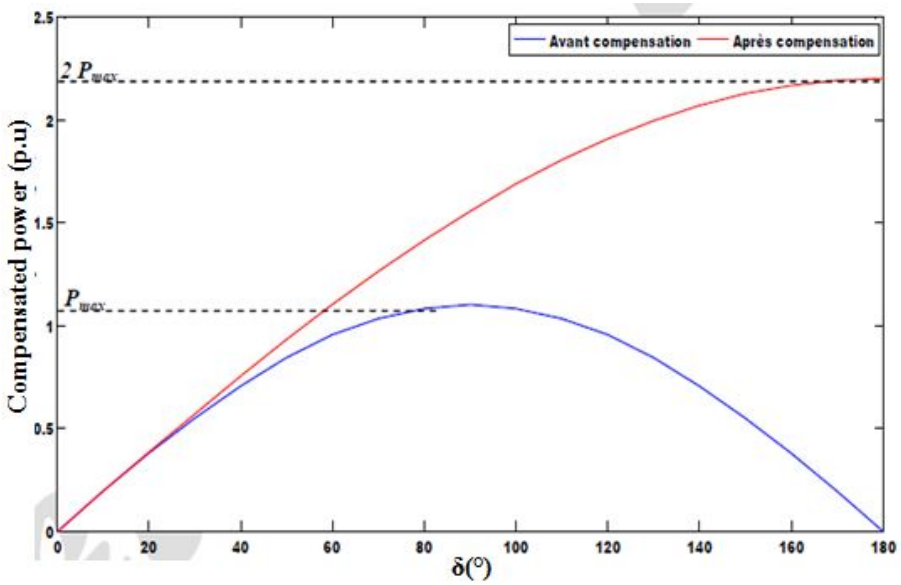
Abstract: Today, power quality has become the most important issue in the electricity sector. Electric current in commercial and electrical installations is unquestionably degrading. However, these disturbances are generally caused by the connection to the network of non-linear loads which cause distortion of currents and voltage. In this work we present in an introductory part on the quality of energy as well as the origins of the harmonics. Next, we present the classic and modern solutions for deppolution the electrical networks. The objective of our work has devoted to the programming and discussion of the results obtained by the classical method.

Keywords: non linear charge, pollution, THD, harmonics, compensation.



Graphical abstract

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Development and control of multi-level converters for power system applications

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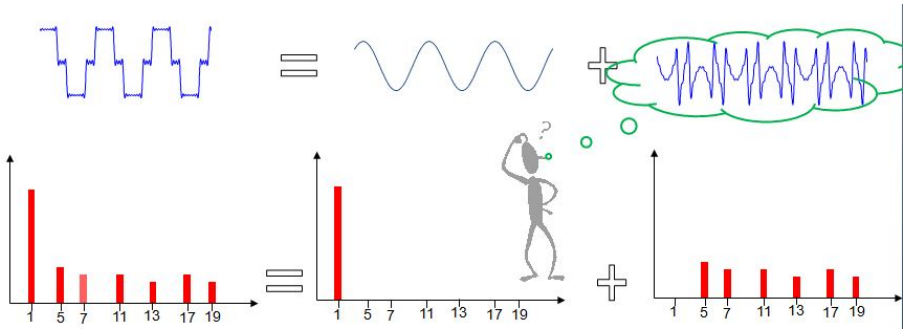
Abstract: This paper addresses the problem of power quality, and the degradation of the current waveform in the distribution network which results directly from the proliferation of the nonlinear loads. We propose to use a three-level neutral point clamped (NPC) inverter topology for the implementation of the shunt active filter (SAPF). The aim of the SAPF is to inject harmonic currents in phase opposition at the connection point. The identification of harmonics is based on the pq method. A neuro-fuzzy controller based on ANFIS (adaptive neuro fuzzy inference system) is designed for the SAPF. The simulation study is carried out using MATLAB/Simulink and the results show a significant improvement in the quality of energy and a reduction in total harmonic distortion (THD) in accordance with IEC standard.

Keywords: Three-level (NPC), Shunt active power filter (SPAF), harmonic distortion (THD).



Graphical abstract

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Effects of partial discharges on epoxy resin used in the insulation of electrical machines

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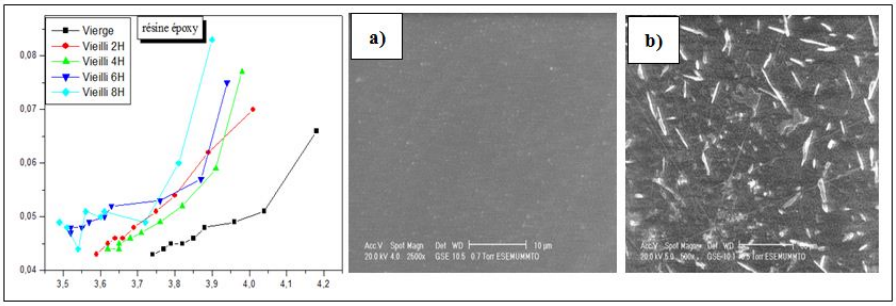
Abstract: In electrical machines, particularly those used in the medium and high voltage range, partial discharges between turns and between turns and ground constitute a significant cause of the aging of insulators. In this work, we present the results of an experimental study on the effects of partial discharges on the electrical and dielectric properties of insulating varnishes of electrical machines. The evolution of the intrinsic dielectric properties of these materials such as the relative permittivity, the resistivity and the dissipation factor are measured by the technique of dielectric spectrometry in a frequency range (1kHz – 10 kHz). The results of these measurements are discussed according to the duration of application of the electrical stress. The relative permittivity, the electrical resistivity and the dielectric loss factor depend on the frequency and the duration of the application of the electric field. The state of degradation of the insulator is evaluated by observations with a scanning electron microscope (SEM) and by analyzes by Fourier transform infrared spectrometry (FTIR). The micrographs showed that above a certain voltage value significant erosion occurs on the surface of the dielectric subjected to electric discharges. The discharge currents depend on the duration of application and the applied voltage level.

Keywords: FTIR analyses, partial discharges, surface degradation, SEM micrographs, epoxy resin.



Graphical abstract

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Photovoltaic and solar energy

Comparative study of two cooling modes of a PV panel

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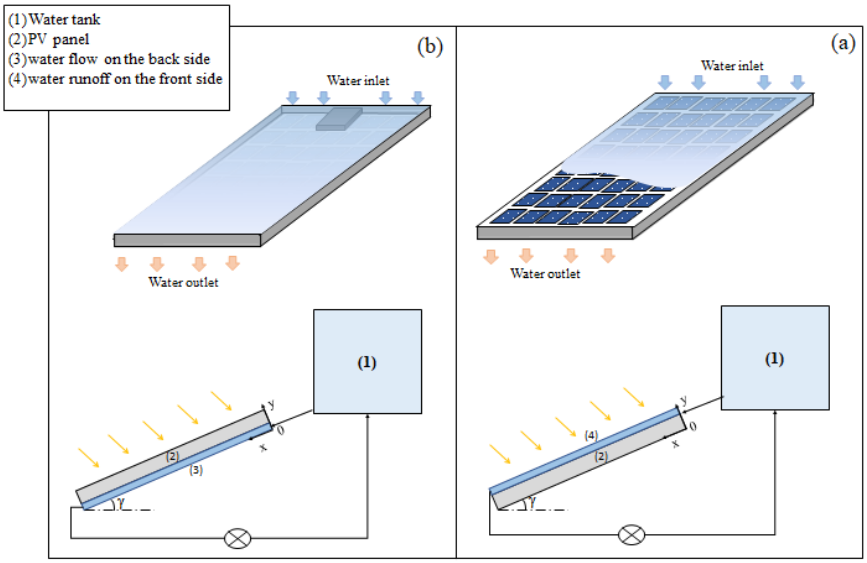
Abstract: In this work, the aim is to optimize the efficiency of a PV panel by adopting a closed-loop water cooling technique between the PV panel and a 50L storage tank. For this purpose, two cases were considered, a cooling by water runoff on the front side of the PV panel, and a cooling of the back side with a water flow through a cavity, the results of simulations showed that both techniques allow to reduce the temperature of the PV panel. In fact, it can be seen that at 12h, 15h and 17h, the cooling from the rear side brings the PV panel to temperatures of 35.41°C, 34.86°C and 32.37°C, corresponding to efficiencies of 14.32%, 14.35% and 14.49%, while its cooling by water runoff balances its temperatures at about two degrees higher: 37.30°C, 38.34°C and 36.89°C corresponding to efficiencies of 14.12%, 14.16% and 14.23%. It appears that cooling from the back of the PV panel provides better cooling than its flow on the front because of the thermal resistance induced by the glass layer that separates the water film from the silicon.

Keywords: PV panels, water cooling, efficiency, CFD.



Graphical abstract

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Renewable energy

Computational Study of coupled Natural Convection and radiation in Vertical Cylindrical Annular Cavity filled with Cu-Water Nanofluid Under Magnetic Fields

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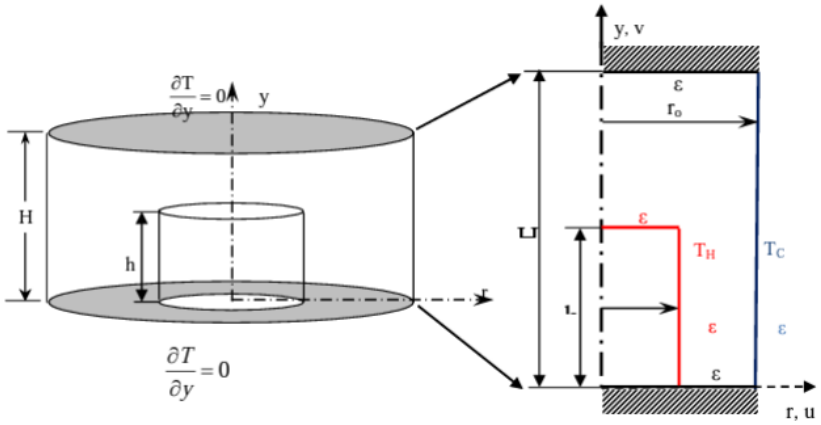
Abstract: The two dimensional study of coupled radiation and natural convection in vertical cylindrical annular enclosure filled with Cu-water nanofluid under magnetic fields is numerically analyzed. The vertical walls are maintained at different uniform hot and cold temperatures, TH and TC, respectively. The top and bottom walls of the enclosure are thermally insulated. The governing equations are solved numerically by using a finite volume method. The coupling between the continuity and momentum equations is effected using the SIMPLER algorithm. Numerical analysis has been carried out for a wide range of Rayleigh number (103 ?Ra?106), Hartmann number (1 ?Ha?100) and nanoparticles volume fraction (0 ???0.08). The influence of theses physical parameters on the streamlines, isotherms and average Nusselt has been numerically investigated.

Keywords: Computational fluid mechanics; Coupled Radiation and Natural Convection; Nanofluid; Magnetic Field; Finite Volume Method



Graphical abstract

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Effect of the Atmospheric Boundary Layer on a Wind Turbine

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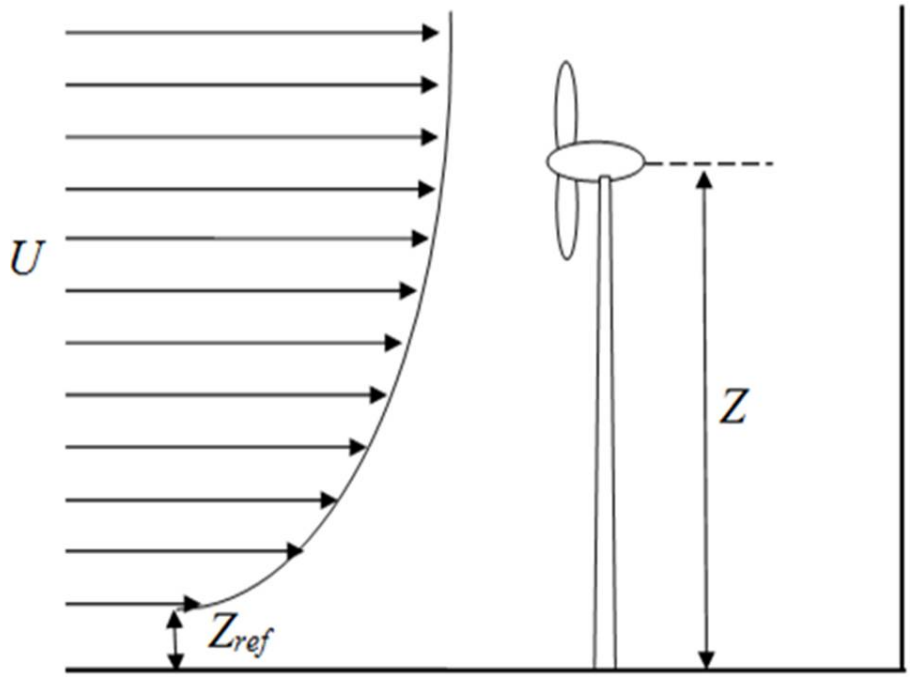
Abstract: To produce electricity from the wind, horizontal axis turbines exceeding 80 m in height are often used. Entirely immersed in the atmospheric boundary layer, these wind turbines undergo the same changes as the speed of the wind in a wind farm. In this context comes our study for the effect of the atmospheric boundary layer on the energy production for a single wind turbine, then generalize it to all the wind turbines of the farm. Using the logarithmic profile of wind speed in the atmospheric boundary layer, data from two types of wind turbines; NREL-V and ENERCON-E2 are introduced in a computer program for the calculation of the developed power. The results obtained are compared and discussed.

Keywords: Wind turbine, atmospheric boundary layer, wind energy, wind park, wind speed profile.



Graphical abstract

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Cooling of an agricultural greenhouse, comparative study

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Abstract: The objective of this study is to test the reliability of an agricultural greenhouse occupied by a cooling system. The study is based on the comparison of the results obtained in two greenhouses with and without a cooling system. .the results obtained are compared with a control greenhouse (without cooling system)

Keywords: Agricultural greenhouse , with and without cooling system ,

Graphical abstract

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Repowering of a wind farm in Sidi-Daoued -Tunisia

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Abstract: This project seeks of studying the repowering of two 1st phases of wind farm in Sidi-Daoued, which have reached the end of their life (20 years); it aims to identify three new configurations and to simulate different techno-economic scenarios to determine which types of turbines are the most optimal for a repowering project

Keywords: : wind energy, power, repowering., simulation SAM

Graphical abstract

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Parametric study of a vertical air-to-ground heat exchanger

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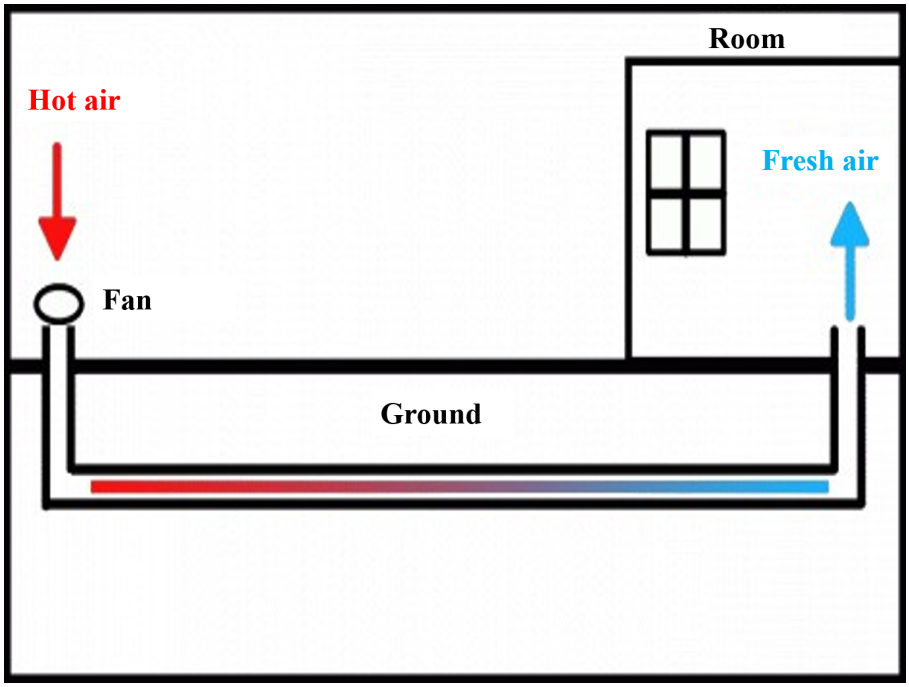
Abstract: The cooling of premises, together with increased energy consumption and therefore greenhouse gas emissions, is an important part of global warming. The Canadian/Provençal well can be an interesting alternative. The aim of this work is to characterize a vertical air-to-ground heat exchanger that cools the ambient air before it enters a room. The thermal behavior of a heat exchanger consisting of two concentric tubes through which the hot air, introduced through the air gap, is first cooled by transferring heat to the ground before exiting through the inner tube. The influence of the air flow rate, the diameter and the length of the cylinder is then studied.

Keywords: Air flow, Canadian well, cooling, heat exchanger.



Graphical abstract

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Linear Fresnel Concentrator Receiver: Sensitivity Analysis based on Thermal Resistance Model

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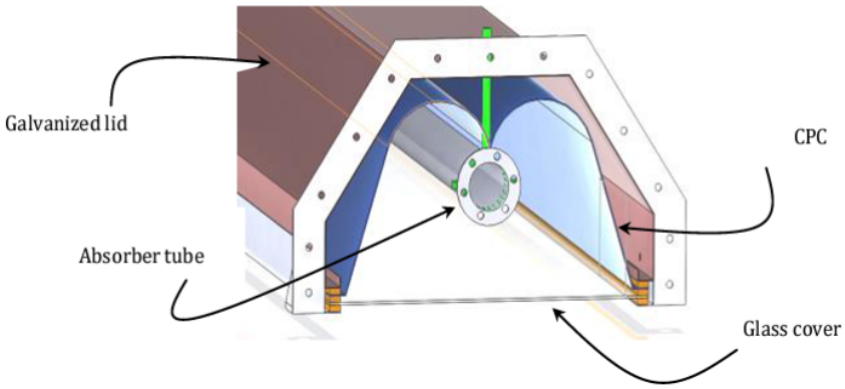
Abstract: The present paper aims at developing novel simplified transient model to investigate the dynamic behavior of a no vacuum mono-tube receiver equipped with a compound parabolic collector. Considering the intermittency of solar radiation, the prediction of receiver thermal behavior is critical for linear Fresnel concentrator design and operation. In this viewpoint, the focus of this research is to determine whether or not the steady-state assumption has an effect on the receiver performances. Unlike the current models accounting for all the receiver components, the proposed model considers the absorber tube as the main node and focuses on the heat transfer fluid temperature distribution, the remaining components form an equivalent thermal resistance through which heat loss occurs. Based on real solar data, the model computes receiver performance using the measured overall heat loss coefficient. The receiver response at steady and transient states has been conducted and discussed according to several design parameters including the heat transfer fluid nature and flow rate, the receiver length, and the absorber tube thickness. For the same working conditions, synthetic oils fluid allow achieving higher efficiencies whereas molten salts enables reaching higher outlet temperatures. For the metal wall thicknesses ranged between 2 and 3 mm and the fluid outlet temperature ranged between 250 and 300 °C, the receiver thermal efficiency during the day remains quasi constant close to 75%. The impact of the absorber tube thermal inertia has been investigated by analyzing the dynamic behavior under various close-to-real-world scenarios. Results have shown that the steady state assumption has no influence if the metal wall tube thickness is lower than 3 mm.

Keywords: Linear Fresnel Concentrator, Receiver, Absorber tube, Heat Transfer Fluid, DNI, Thermal efficiency.



Graphical abstract

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Experimental Evaluation of the Thermal Performances of no vacuum Compound Parabolic collector Receiver

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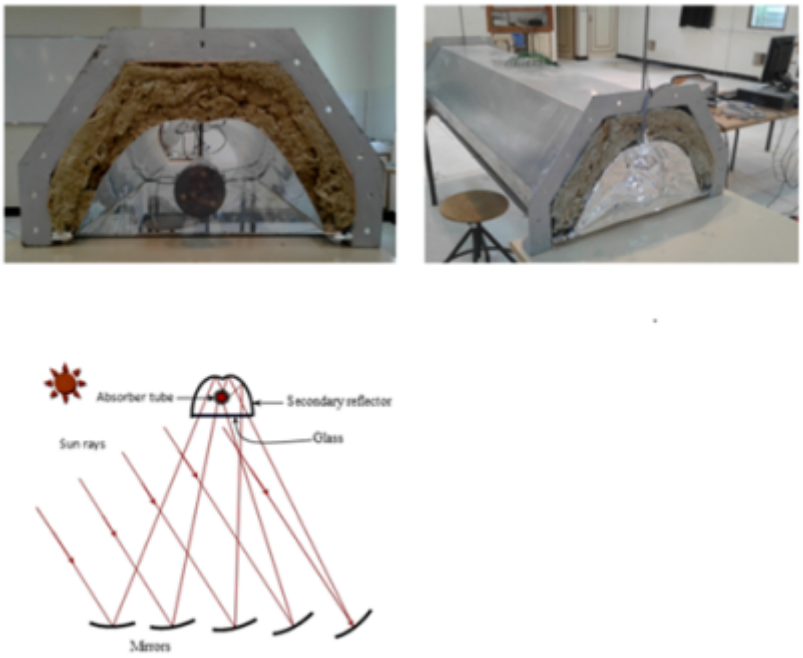
[2] *Mohammed VI Polytechnic University (UM6P), Lot 660, Hay Moulay Rachid, 43150, Ben Guerir, Morocco*

Abstract: Linear Fresnel concentrator (LFC) systems have been identified over recent years as among the most promising concentrated solar power (CSP) plants in terms of thermal efficiency and economic viability. The receiver is considered among the critical component of a Linear Fresnel Concentrator. In this context, this paper presents an experimental evaluation of thermal performance of the CPC type receiver used in linear Fresnel concentrators. For this purpose, an experimental prototype of 70 mm of tube diameter, 500 mm of aperture and equipped with secondary reflector, is used to characterize the global heat losses of trhis type of receiver. The overall heat loss coefficient was determined at different absorber temperature ranged between 60 °C and 260 °C. The heat loss coefficients measured were varied from 4.7 to 8.5 W/m2.°C. Therfore, mathematical correlations allowing the calculation receiver thermal losses towards the external medium are performed.

Keywords: Linear Fresnel Concentrator, Receiver, Absorber tube, heat loss coefficient, experimental thermal performances evaluation



Graphical abstract

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Effect of PCM mass on the performances of LaNi5-metal hydride pump

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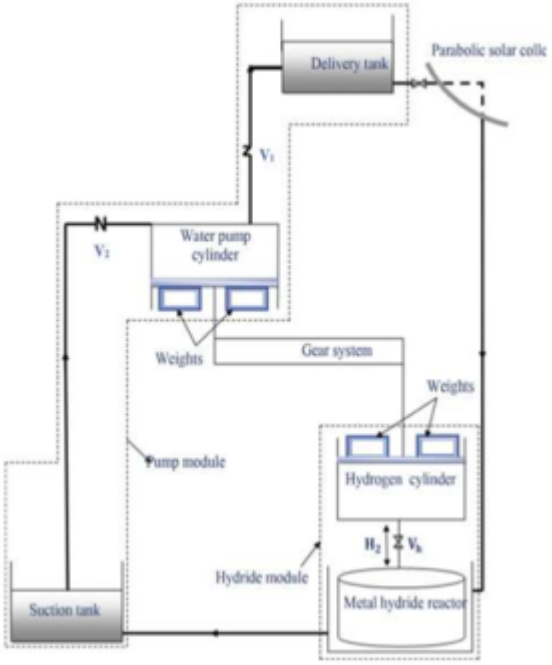
Abstract: Heat management in metal hydride water pumps is essential for enhancing system efficiency and reducing pumping time. With previously developed pumps the heat of the absorption reaction is lost for each cycle, resulting in reducing energy efficiency and increasing the pumping time of the system. The present paper aims at developing a new concept of a metal hydrid pump equipped with a phase change material (MHP-PCM: Ba(OH)2-8H2O). This system stores the heat released during the absorption of hydrogen and to restore it later during the desorption process (pumping water), this pump use 1Kg of LaNi5 as metal hydrid.

Keywords: Metal hydride pump, LaNi5, PCM: Ba(OH)2-8H2O, Pumping time, Pump efficiency



Graphical abstract

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An experimental performance of a solar air heater integrated with an internal heat storage tank made of finned phase-change material PCM

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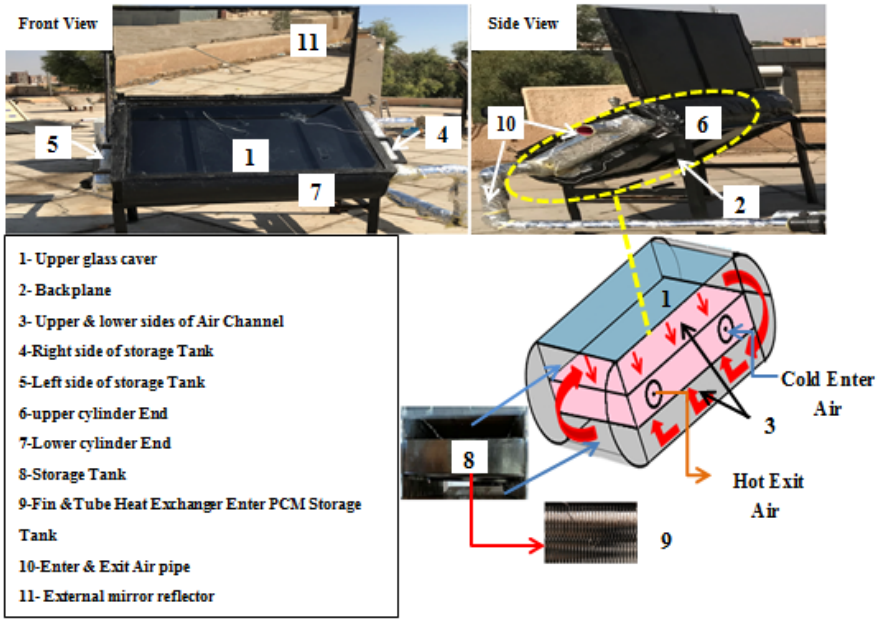
[2] *Mechanical Engineering Department ,College of Engineering,Tikrit University, Iraq*

Abstract: This study presents an experimental investigation of a new closed collector–storage solar air heater design integrated with thermal storage including a heat exchanger (CCSSAHSIWHE) immersed in RT42&RT50 (paraffin wax), manufacture and test two similar device under prevailing weather conditions of Tikrit- Iraq (34.67° N, 43.65° E) during winter and summer seasons to clarify the effect of new design - direct and indirect heating of the thermal storage on the storage power quantity from incident solar radiation and accumulator power during charging period and thermal losses power from all external surfaces of devices as well as the effect of change the system joining (separately or series) on the air temperature difference during discharge period using same flow rate 0.025kg/s. The results showed the effectiveness of the design, the percentage of net thermal energy (stored) from solar radiation RT42 & RT50 was (74-88) % & (65-83)% in summer and winter, respectively, which is large compared with the lost power, as well as the large cumulative energy. While the highest air temperatures difference of RT42 & RT50 in separately joining was (20) ? & (28) ? respectively.

Keywords: : Solar air heater, Energy storage, Flat plate, heat Exchanger, PCM



Graphical abstract

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Effect of water layer thickness on the performance of triangular solar still with concave absorber

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[3] *LPQ3M Laboratory, University of Mascara, Mascara, ALGERIA*
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Abstract: The majority of anterior experimental and numerical works have been executed on single-sloped solar stills to study the influence of various parameters on its thermal performance. One of these parameters that has received more attention in the literature is the brine layer thickness. The objective of this work is to study experimentally the effect of water layer thickness on the thermal performance of three similar triangular solar stills with concave absorber that were constructed in the Laboratory of Electro-Mechanic Systems (LASEM) at the National School of Engineers of Sfax (ENIS), and tested with three different thicknesses of seawater, namely 3, 5 and 7 cm. This study shows the importance of seawater thickness on the thermal performance (temperature of vapor, temperature of seawater and temperature of the four glass sides, and productivity of distillate water) of triangular solar still with concave absorber.

Keywords: Triangular solar still; Performance; Brine thickness; Distillate water; Desalination.

Graphical abstract

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Numerical study of parameter's effect on the performance of a parabolic dish system

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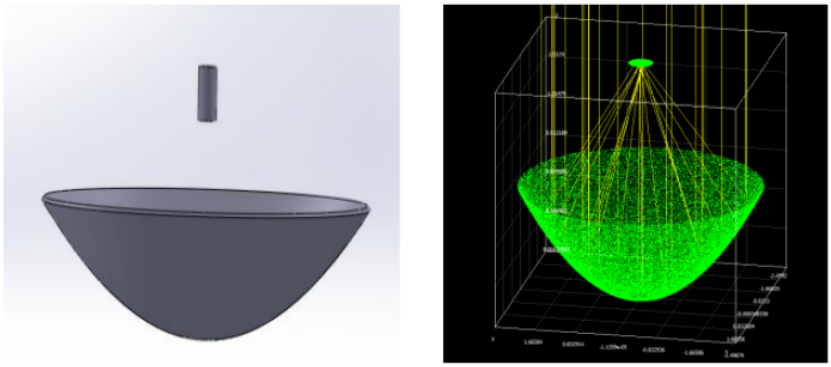
Abstract: In this study, the parabolic dish's performance is analyzed. To achieve this goal, a Monte Carlo ray-tracing method is used. This technique is widely used to calculate the concentrated solar heat flux distribution on the focal plane of a parabolic dish. This application allows us to predict the concentrated solar heat flux map for each configuration. The effect of the rim angles of parabolic dish and of parabolic dish diameter's has been investigated to identify the most efficient configuration. Three different values of rim angle are studied: ?= 30°; ? =45° and ? =70°. It was noted that the concentrated solar heat flux increases with the enlarging of rim angle. In the other hand, three different values of parabolic dish diameter are tested: D=3; D=5 and D=7. It has been found that the solar heat flux increases with augmenting of the parabolic dish diameter.

Keywords: Parabolic dish; Monte Carlo ray-tracing method; Solar energy; Rim angle; Parabolic dish diameter.



Graphical abstract

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Backstepping control of a doubly fed induction generator based on WECS

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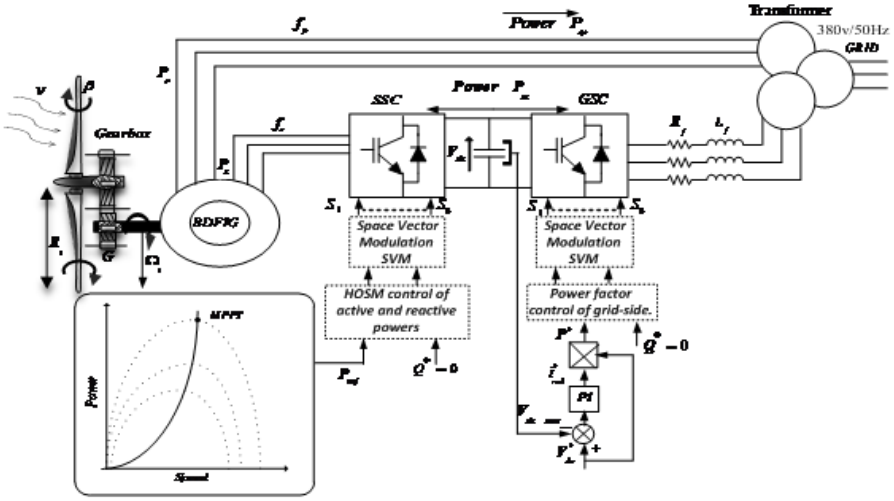
[1] *Department of Automatics and Electromechanical, Faculty of Science and Technology,Ghardaia,Algeria*

Abstract: This work presents a hybrid control technique for a doubly fed induction generator (DFIG) utilized in wind energy conversion systems (WECS). The study's main goal is to develop a method of control that will be applied to a bidirectional converter supplying a DFIG using a combination of vector and backstepping control. Initially, a vector control strategy was used to provide a decoupled active and reactive power with a proportional-integral compensator (PI). A backstepping approach been employed to improve some of the PI compensator's shortcomings in terms of robustness, transient responsiveness, and steady state error. For the overall required performance, a simulation study on the DFIG generating both real powers extracted from the turbine and the needed reactive power revealed good results as compared to those obtained by employing a PI compensator.

Keywords: backstepping, doubly fed induction generator, vector control, active and reactive power, back-to-back converter.



Graphical abstract

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2-way fluid-structure interaction simulation of a wind H-Darrieus turbine with a flexible blade

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[2] *Laboratory Mechanical research of Sousse (LMS)-ENISO- University of Sousse*
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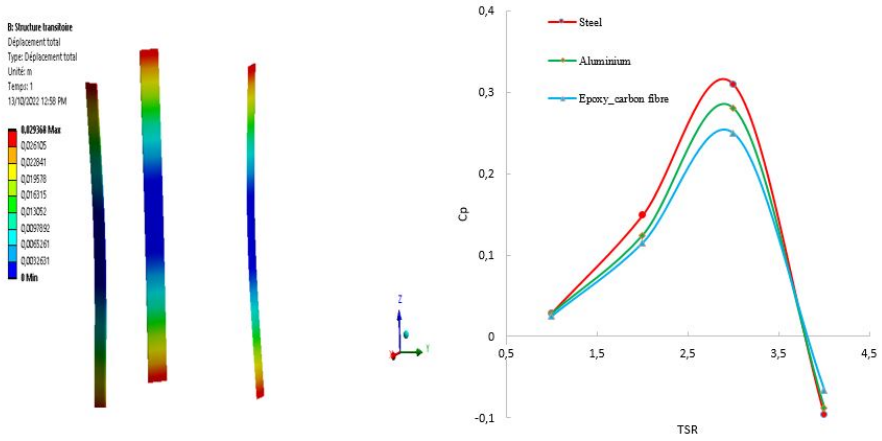
Abstract: For a very long time, vertical-axis wind turbines were regarded as one of the primary ways to harness wind power. Because of their capacity to function in challenging and chaotic environments, they have garnered a lot of respect in the urban setting. The performances of wind turbines are affected by a number of aerodynamic factors. Due to the growth in wind turbine size and the propensity for using lightweight materials in contemporary rotor designs, the blades are susceptible to deformations that can be severe and important. These deformations can affect the flow around the rotor and may have an impact on aerodynamic performance. We present in this study a transient two-way coupled fluid-structure interaction analysis of an H-Darrieus rotor to characterize the deformation of the blades for different materials and to understand the effect of these deformations on the rotor performances. This study uses Ansys Workbench to perform a transient two-way coupled FSI analysis on the H-Darrieus rotor. Through the use of a deforming mesh technique, structural and fluent data were sent from one to the other. The URANS equations control the airflow around the rotor, and a k-? turbulent model are used to close the problem. It is shown that the elasticity affects the performance of the H –Darrieus turbine and the power coefficient decrease with deformation.

Keywords: Renewable energy, Vertical wind turbine, Two-way fluid-structure interaction (FSI), blade deformation



Graphical abstract

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Fuzzy Logic Controller Optimized by ACO for Decentralized Source Based on a SOFC

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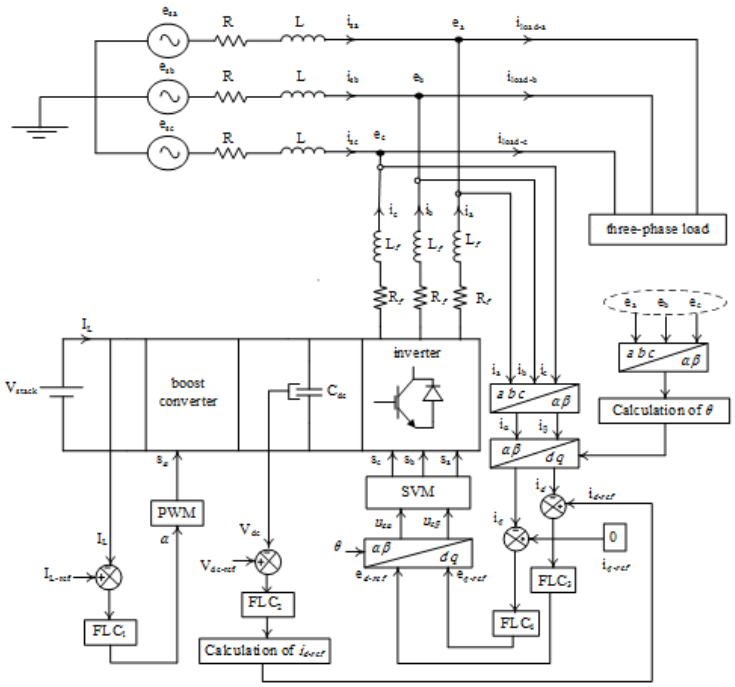
Abstract: This paper will investigate the efficiency of an optimal fuzzy logic controller (FLC) for a decentralized source which is established on the basis of a solid oxide fuel cell (SOFC) that is linked to the electrical network through a voltage inverter and a boost converter. To serve the purpose of this research, a ant colony optimization (ACO) is applied in order to adjust the parameters of the membership functions (the centers and the widths of the gaussian membership functions in inputs and output) for the purpose of improving the efficacy of traditional fuzzy logic controller. The given control methods have proved to be effective drawing from simulation results, and show that fuzzy logic controller tuned by ant colony optimization is better and more robust than the traditional fuzzy logic controller for decentralized source based on a SOFC. The performance of the proposed algorithms has been analyzed based on two performance indices ISE and IAE, the optimized fuzzy controller gives better performance than a conventional fuzzy controller without optimization in terms of ISE and IAE.

Keywords: Solid oxide fuel cells, Genetic algorithm, Fuzzy logic controller



Graphical abstract

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Fuzzy Logic Power Control of a doubly fed induction generator based on WECS

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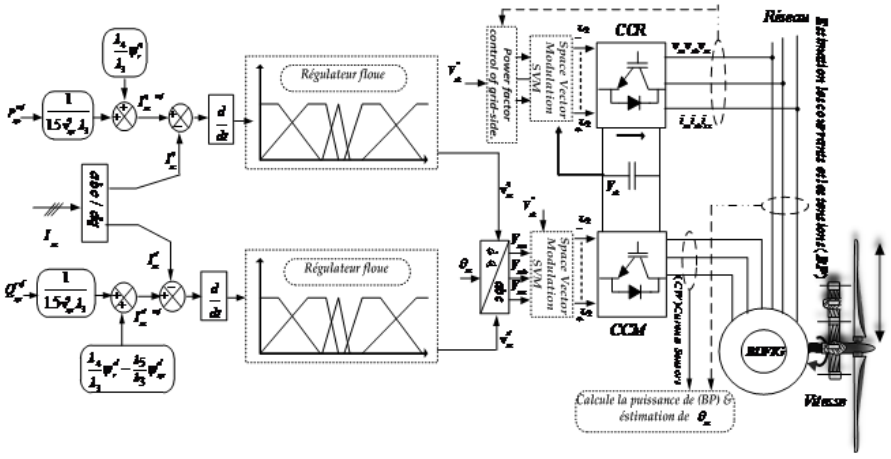
Abstract: The control of a Wind Energy Conversion System (WECS) based on the Double Fed Induction Generator (DFIG) under balanced network conditions is the topic of this paper. To enhance the performance of the wind system and capture a most energy at certain wind speeds, a Fuzzy Logic Control (FLC) based on stator flux-oriented vector govern was used to control the active and reactive powers transferred between the generator and the grid. A simulated research on the DFIG generating both real powers recovered from the turbine and the required reactive power demonstrated good results when compared to those produced by applying a PI compensator for the overall required performance.

Keywords: Fuzzy logic, doubly fed induction generator, Wind energy conversion systems vector control, active and reactive power, back-to-back converter.



Graphical abstract

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Effect of radiation on the performance of a simple-passe solar air heater

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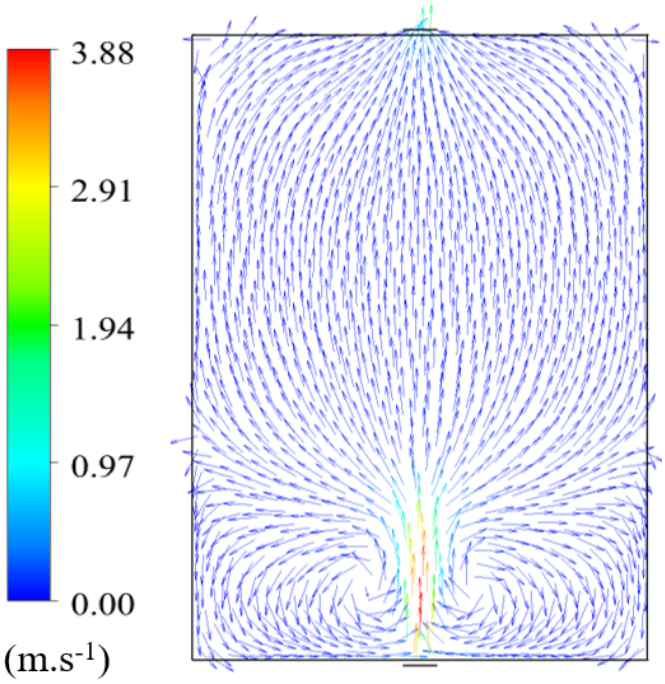
Abstract: This work is developed in our Laboratory of Electro-Mechanical Systems (LASEM) to investigate the performance of the solar air heater. This device captures solar energy and stores it for use in various industrial processes, such as heating buildings or drying the nutrient products. In order to improve the performance of the solar air heater, we are interested on the selection of the optimal model. Particularly, we focus our attention on the analysis of the radiation effect. These simulations were developed by using the commercial CFD code Ansys Fluent.

Keywords: Solar air heater; Solar energy; Solar radiation; Performance; Ansys Fluent.



Graphical abstract

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Interface model effect on Banki micro hydro-turbine

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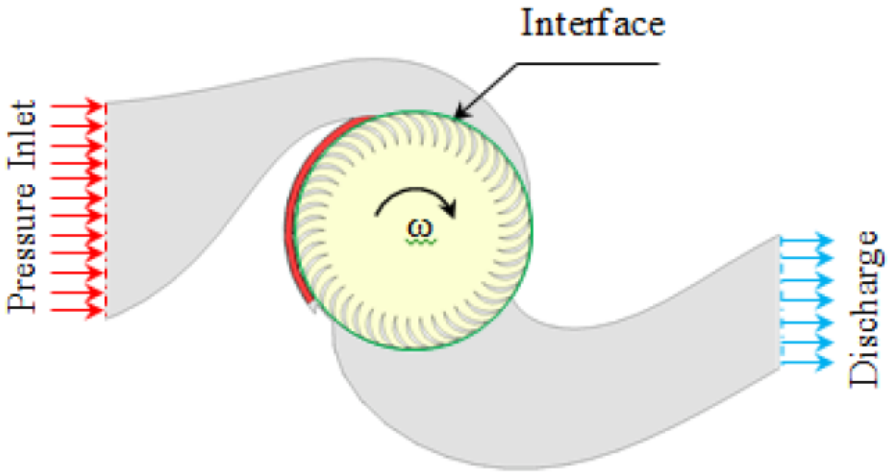
Abstract: Banki micro hydro-turbine is a cross flow hydro-turbine, which converts the potential energy of the waterfall into mechanical energy, in order to generate electricity. In this paper, the study of a new simple Banki turbine with positive outlet pressure is carried out using the commercial software Ansys CFX 17.0. The performance analysis of the considered turbine was performed based on the interface model effect. Two possible models are accessible in ANSYS CFX solver: Frozen Rotor and Transient Rotor-Stator. A comparison with the experimental results performed the validation of the numerical method. The present study indicated that the Frozen Rotor model is sufficient to predict the efficiency of the considered turbine but the Transient Rotor-Stator model presents a good match with experimental data.

Keywords: Banki micro hydro-turbine, positive outlet pressure, performance, the interface model, Frozen Rotor, Transient Rotor-Stator.



Graphical abstract

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Prediction of Solar Radiation Using Artificial Neural Network

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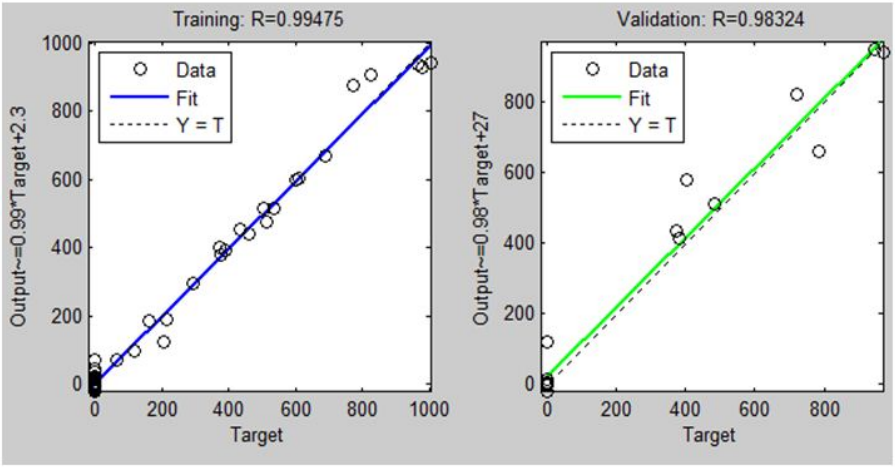
Abstract: Solar radiation predictions are important to achieve our work goals. In this work, the main goal is to propose an algorithm that can be used to predict solar irradiance. Using a dataset consisting of temperature, humidity, wind speed, air pressure, and solar radiation data, an artificial neural network (ANN) model was constructed to efficiently predict solar radiation in the Thira region using the available weather forecast data based on the artificial neuron prediction network in M'sila region. The results obtained made it possible to choose this technique because its advantages fit the problem posed.

Keywords: Solar irradiation; Renewable energies; artificial neural networks (RNN); prediction.



Graphical abstract

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Meshing Effect for the numerical study of A Darrieus Wind Turbine

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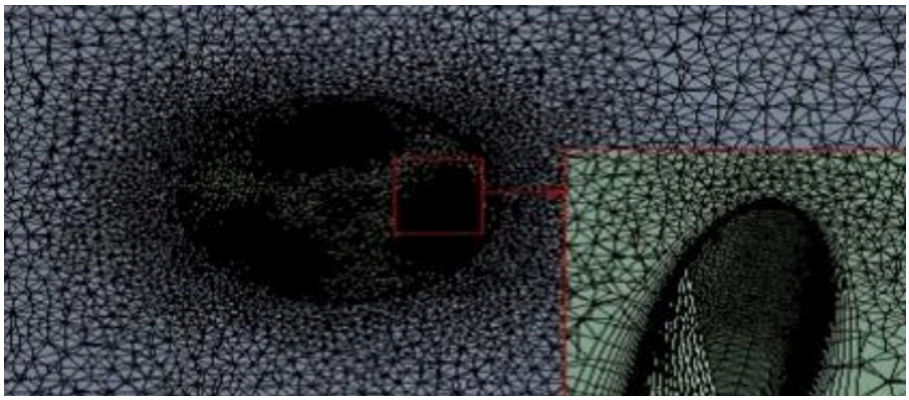
Abstract: With the aim of reducing dependence on fossil fuels for healthy energy production and increasing the share of global renewable energy in global energy production, current energy systems are converted into 100% natural renewable energy power systems, renewable at reduced cost. The development of wind power is very important to solve the energy crisis, reduce environmental pollution and adjust the energy structure. The Darrieus wind turbine (DWT) is a vertical-axis wind turbine that uses the lift forces of the wind, based on a rotor rotating around a fixed rod. This type does needs no orientation mechanism with respect to wind direction, due to the fact that this rotor can take wind from every direction in contrast to others wind turbine type. Also, DWT makes very little noise privileging their placement near populated areas. Those undisputed advantages seem to be the reason why this model is receiving an attention from the industry. The current work aims to develop a numerical model to enhance the aerodynamic performance of a Darrieus wind to affect the rotor efficiency and to increase the power capture. The numericalstudy focused on a three-dimensional model in the unsteady approaches. For this, different meshing has been considered and the numerical results have been compared with the experimental data developed in a wind tunnel. Following these comparisons, we have adopted the model presenting low errors and accepted calculating

Keywords: Darrieus wind turbine, wind tunnel, modeling, meshing effect



Graphical abstract

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Numerical Investigation of Solar Chimney with storage tank

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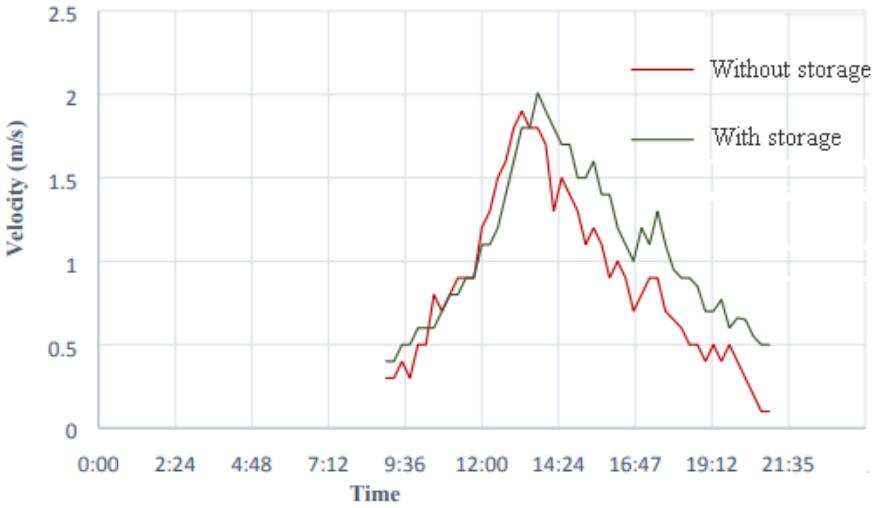
Abstract: Tunisia is the country of the sun par excellence. For a country that does not have a large amount of fossil fuels, it is vital to develop and diversify the sources. It is important to reduce the fuel bill and save the environment. In this article, we present the analysis of the performances of a solar chimney plant supposed to supply in provide the remote villages located in in Tunisia. The obtained results show that the chimney solar power plant can be produced in high quality electricity because it enjoys a significant rate of sunshine exceeding 3000 hours per year. We studied the speed of air flow at the entrance of the chimney and thus its energy productivity, and to increase the duration of operation in the absence of sunlight during the night or the intermittences that occur during the day.

Keywords: Solar chimney power plant, Heat transfer modeling, CFD modeling, Solar energy, Energy Storage.



Graphical abstract

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Modeling of DFIG with converter control used in wind energy conversion system

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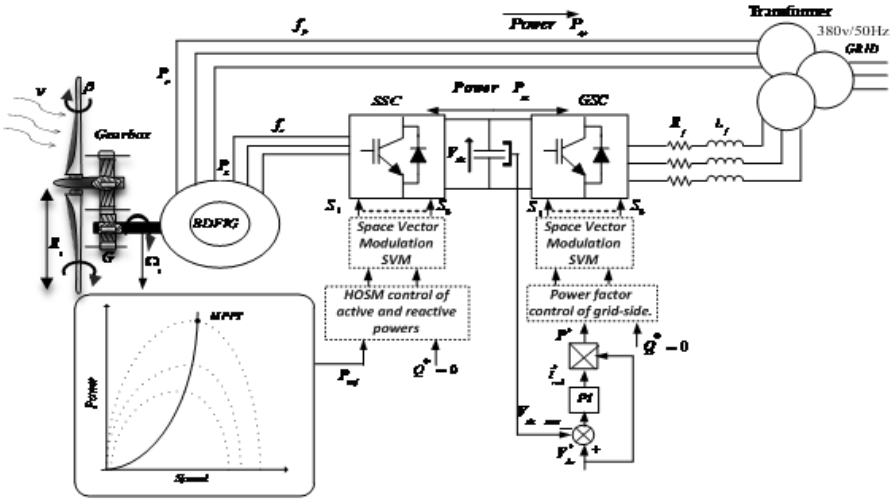
Abstract: Because of the tremendous increase in the usage of fossil fuels and the rapid depletion of natural resources, renewable energy has emerged as an environmentally beneficial alternative form of energy. Wind energy has sparked tremendous attention in recent years as a potential source of power generation with minimal environmental impact and no fuel cost. The most often used wind electric conversion system (WECS) is based on a double fed induction generator (DFIG). The control strategy's main goal is to manage the amount of active and reactive power generated by the doubly fed induction generator and injected into the main grid based on power references obtained from the turbine's mechanical power and the grid operator. The simulation results demonstrated outstanding performance for reference tracking in both transient and steady state conditions. A comparison study was conducted between the suggested control technique and the well-known vector control approach, which demonstrated the advantage of sliding mode control in tracking the supplied references.

Keywords: Turbine; doubly fed induction generator (DFIG); power factor unity; active and reactive power; back-to-back converter



Graphical abstract

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Model tests on a fixed OWC wave energy converter with focus on the oscillating chamber shape effect

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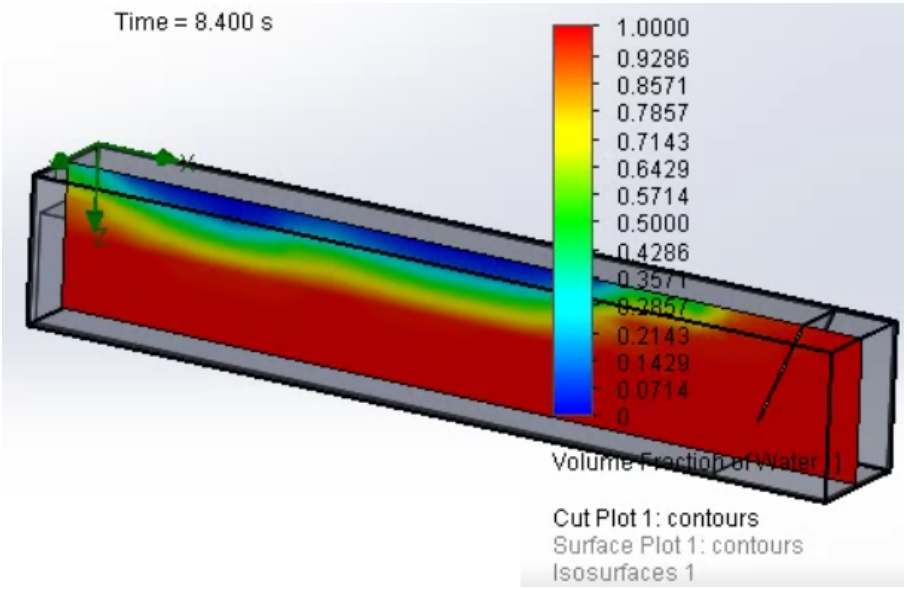
Abstract: Ocean waves arise from the process of transferring energy from the solar to the wind and then to the ocean. Solar energy generates wind that then blows over the ocean, turning the wind power into wave power. This wave energy, once converted, is able to travel thousands of miles with minimal energy loss. Even more significantly, waves are a regular resource of energy whose strength may be predicted precisely days in advance of their occurrence. A variety of techniques have been developed to capture the energy of waves. The oscillating water column (OWC) method in a cavity uses the movement of water in a water column. Particle motion converters obtain energy from moving water particles. The dimensioning of the oscillation chambers and the optimization of their geometrical shapes leads to improvements in the total efficiency of the OWC systems. This paper presents numerical results of a fixed onshore OWC. Tests included regular and irregular waves. The paper deals with a numerical modeling devoted to investigate the effect of oscillating chamber shape on the aerodynamic characteristics of the power take-off (PTO) part and the water free surface elevation.

Keywords: Oscillating water column, Chamber shape, Water free surface, CFD, Power take-off



Graphical abstract

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Experimental analysis flow of a combined three bladed Darrieus and Savonius Water Rotor

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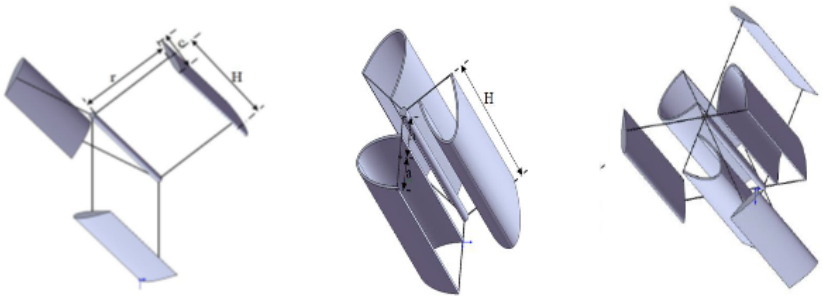
Abstract: Water is one of the renewable sources of foreground, including tapping a sustainable way for the production of electricity will improve the crisis of clean energy without pollution. The energy of water is converted into mechanical energy by a water energy conversion system whose rotor water is the major component, including detailed design study, study of hydrodynamics and flow Physical analysis is important to choose a specific design for a particular field of water. We analyzed the performance of the main types of vertical axis rotor: Darrieus, Savonius and Darrieus-Savonius Hybrid. We stressed the hydrodynamic phenomena that cause the loss of kinetic energy and therefore affect performance. The combined rotor is perfectly good solution to improve the Darrieus starting torque and prevent the loss of kinetic energy to the Savonius rotor.

Keywords: Savonius, Darrieus, Combined, power coefficient



Graphical abstract

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Sustainable environment

Comparative study between electrocoagulation used separately and coupled with adsorption for dairy wastewater treatment using response surface methodology design

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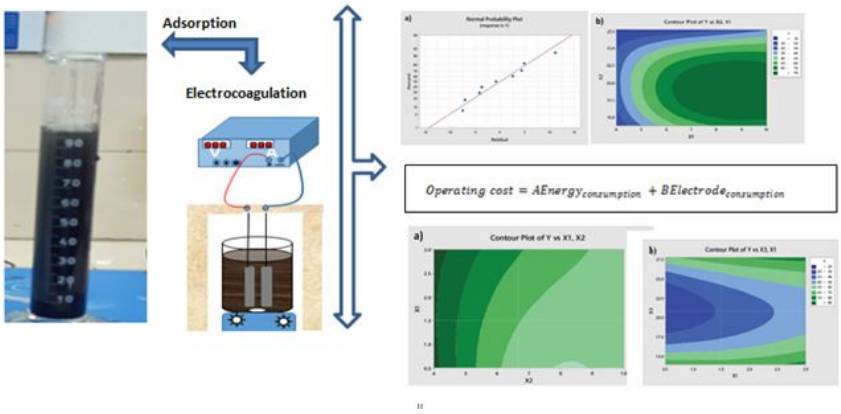
Abstract: Dairy industrial wastewater is characterized by high chemical oxygen demand (COD) and other pollution loads. In this study, electrocoagulation (EC) with aluminum electrodes used unique and combined with adsorption were employed to test either technique is effective for turbidity and COD removal from a simulated dairy effluent (SDW) . A full factorial design was employed to determine the optimum operating parameters of current density and pH for EC technique and granulated activated carbon (GAC) for the coupled process. Results showed that EC reduced turbidity and COD from SDW to 98.75% and 78.09%, respectively, when pH = 4 and with current densities of 20.83–27.77 mA/cm2. The EC/AD process enhanced turbidity reduction to 99.39% and COD removal to 87.12% when small masses of GAC (0.5 to 1.5 g) were used at the lowest applied current density 13.38 mA/cm2. In comparison to classical electrocoagulation using aluminum electrodes in a batch system, coupling electrocoagulation to adsorption technique achieved faster removal of pollutants with lower operating costs. Correlations with the experimental data for the EC process were R2 = 95.78% for turbidity and R2 = 96.22% for COD removal. For the coupled EC/AD they were R2 = 96.61% and R2 = 95.48% for turbidity and COD respectively.

Keywords: Dairy wastewater; Chemical oxygen demand; Electrocoagulation; Adsorption; Full factorial design



Graphical abstract

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Thermal building

Numerical Analysis of the Mixing of Gaseous Contaminant in a Ventilated Room

Moussa Senouci [1], Belkacm Ould said [1] *, Noureddine Retiel [1]

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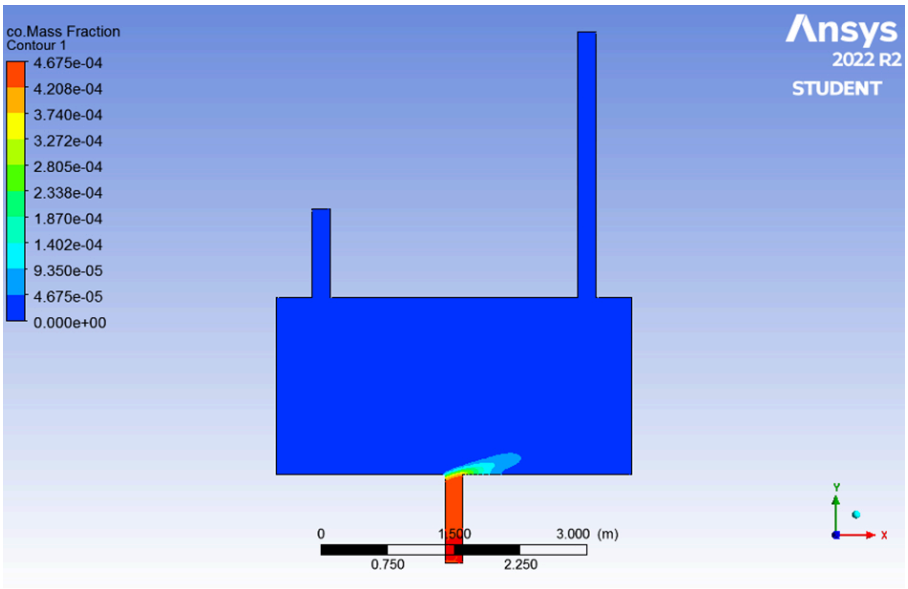
Abstract: Computational fluid dynamics (CFD for short) is used in the present study to calculate and compare carbon monoxide CO concentrations in a two-dimensional room ventilated by dilution ventilation and in the same room ventilated by displacement ventilation. In addition, CFD is used to examine how appropriate is the well-mixed assumption for the case of dilution ventilation with and without a ceiling fan. Locations of people in the room and whether or not the fan is turned on are important factors in the determination of the better ventilation system. The study showed that the lowest CO level is found on the left side of the room with dilution ventilation and the ceiling fan off, however, who may be working on the right side of the room, breathing air with a much higher CO concentration. The stratification imposed by displacement ventilation provides better air quality to both sides of the room, but only near the floor; CO levels are much higher but relatively uniform near the ceiling. This situation is not desirable for rooms with low ceilings as in the present example, but may be preferable for rooms with high ceilings.

Keywords: Contaminant Concentration, Dilution Ventilation, Displacement Ventilation, Air Quality, Indoor Air Pollution, Industrial Ventilation



Graphical abstract

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Numerical Comparison of two Ventilation Strategies in an Engine Laboratory

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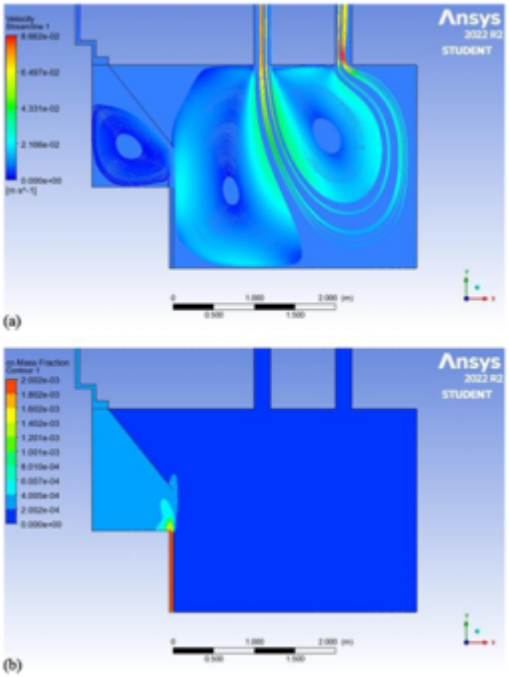
Abstract: In this work, Computational Fluid Dynamics (CFD) is used to investigate the performance of two ventilation strategies in a confined engine laboratory. In the first part of the study, two different ventilation arrangements are proposed to evaluate the ventilation by dilution performance of the lab with fresh air provided and exhausted through two openings located on the ceiling, but it has yet to be decided which of the two will serve as the fresh air supply and which will serve as the room exhaust when the hood exhaust fan is turned off. The first configuration is the better option, seemingly, placing the exhaust near the worker's head permits more fresh air to flow into the breathing zone from below. The second part of the present work consists of the installation the fresh air supply in the center of the ceiling and the room exhaust on the right side of the ceiling with the selection of an appropriate fan for the hood exhaust. Results have shown that the required fan pressure rise is low, only about 200 mPa because of the two-dimensional assumption. A real duct would most likely have a much smaller aspect ratio, or would be round in cross-section, either of which would necessarily increase the velocity and pressure drop through the hood exhaust duct, and would thereby demand a more realistic fan pressure rise.

Keywords: Indoor Air Pollution, Contaminant Concentration, Industrial Ventilation, Computational fluid dynamics (CFD), Confined Environment.



Graphical abstract

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Thermophysical behavior of the sand concrete lightened by treated barley straws in an arid environment

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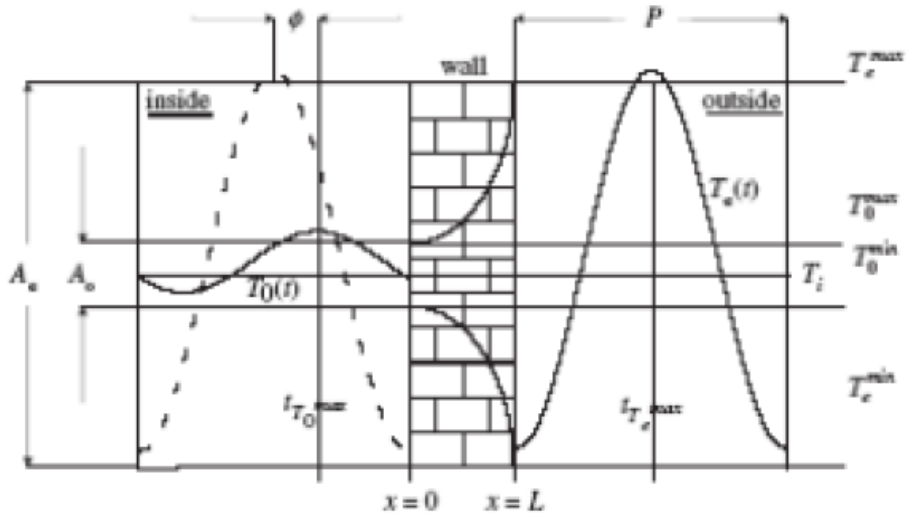
Abstract: In the regenerative and sustainable architecture, the lightweight eco-materials meet all the requirements for the environment, economy and society. In this context, the studied composites intended for the construction of outside walls, are the sand concrete lightened by barley straw without treated (SC-BS) and the sand concrete lightened by barley straws treated with hot water (SC-TBS). The content of barley straws is 15 kg/m3. The objective is to evaluate the thermophysical behavior of the lightweight sand concrete (SC-TBS) for the south wall in an arid environment, on the thermal inertia properties, namely the time lag (?) and the decrement factor (f). Numerical simulation was made by EnergyPlus software, using two concretes to study the effect of the wall thickness, the addition of an air-gap and the double air-gap, designed in Laghouat city (south of Algeria). The results of numerical simulation show that, when the wall thickness increases, the time lag increases and the decrement factor decreases. However, the addition of a double air-gap has further improved the thermal inertia properties compared to the air-gap. The advantage of these results is in favor of lightweight eco-material (SC-TBS), which allows to improve the thermal comfort level and reduced energy consumption.

Keywords: lightweight eco-materials, thermophysical behavior, thermal inertia properties, south wall, arid environment, EnergyPlus software.



Graphical abstract

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Physics

Computational Physics

Effect of bluff-body shape on stability of Methane-Hydrogen-Air flame

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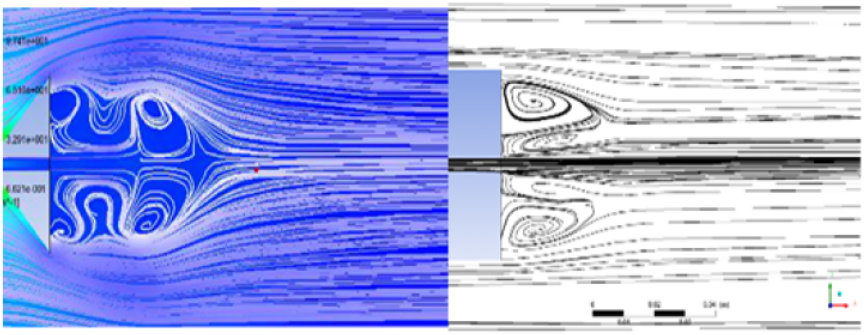
Abstract: : The aim of this study is to perform a numerical simulation of a non-premixed turbulent of syngas combustion. A methane-air flame enriched by hydrogen is considered. The selected axisymmetric configuration is composed by a central injector of methane-hydrogen mixture surrounded by a bluff-body, which is surrounded by a co-axial air jet. The Ansys CFX software is used to solve the governing equations for turbulent reactive flow (Navier Stokes averaged). The Turbulence is modeled using the k-? model. The EDM (Eddy Dissipation model), then the FRC model (Finite Rate Combustion) combined with EDM are used for modeling the combustion phenomena. We analyze the influence of flow strain, heat losses and shape of bluff-body on the flame. The results show some concordance with the temperature profile given by experience to a hydrogen rate of 50%. The flame structure near the bluff body and further downstream shows dependence on the thermal properties and shape of the bluff body.

Keywords: Non-premixed combustion, Hydrogen enrichment, EDM and FRC models, Syngas, bluff-body



Graphical abstract

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Numerical investigation of the flow in a 2D Supersonic Ejector

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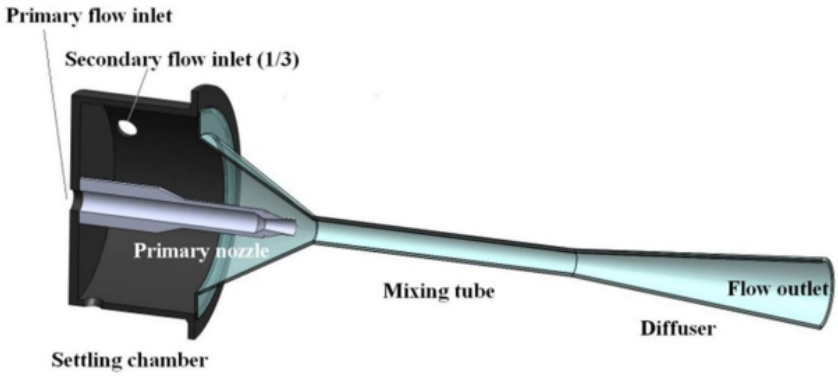
Abstract: The performances of supersonic ejectors are significantly influenced by a number of conditions such as the primary and the secondary pressures, the back pressure and the geometry of the ejector itself. the present paper deals with the Numerical study by CFD of the influence of some operating conditions on the structure of the flow in a 2D supersonic ejector. The experimental and numerical results obtained are in very good coherence. The numerical simulations show the effect of the secondary flow and the back pressure on the flow pattern which explains the differences in the number and the amplitude of the shocks between different flow conditions.

Keywords: Ejector, Supersonic flow, Backpressure, Flow control, CFD.



Graphical abstract

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Numerical simulation of high voltage insulator using comsol multiphysics

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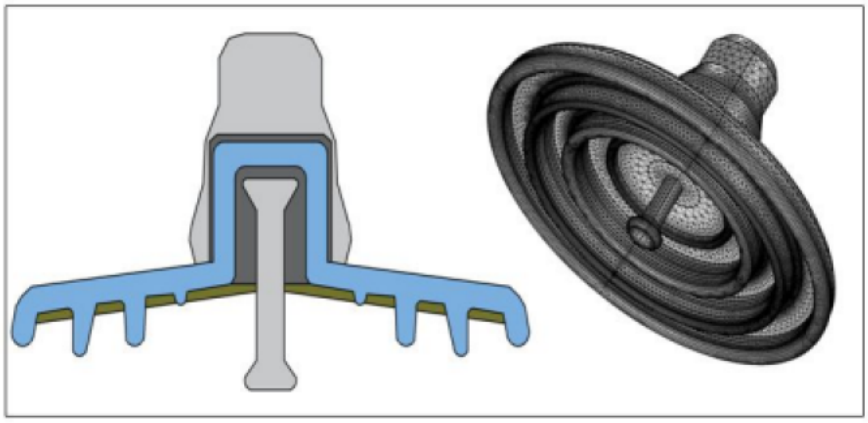
Abstract: In service, the insulators must withstand both electrical stresses under normal operating conditions (over a wide range) and transient over voltages under abnormal conditions imposed by lightning, operating shocks and sandstorms on the insulating surface. This work is devoted to numerical simulation study of the behavior of pollution located on the surface of a high voltage cap and pin insulator used by Algeria's National Electricity and Gas Company. The approach followed and the results presented in this work open several perspectives as well as from the point of view of modeling and numerical simulation of physical phenomena affecting insulators of high voltage transport and distribution lines in humidity conditions (rain, dew…..). Discussions are made between the 2D/3D results to show that the numerical simulation always gives a sense of correct variation.

Keywords: cap and pin insulator, electric field, electric potential, numerical simulation.



Graphical abstract

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Numerical study of dust grains behavior in multi-component plasma sheath

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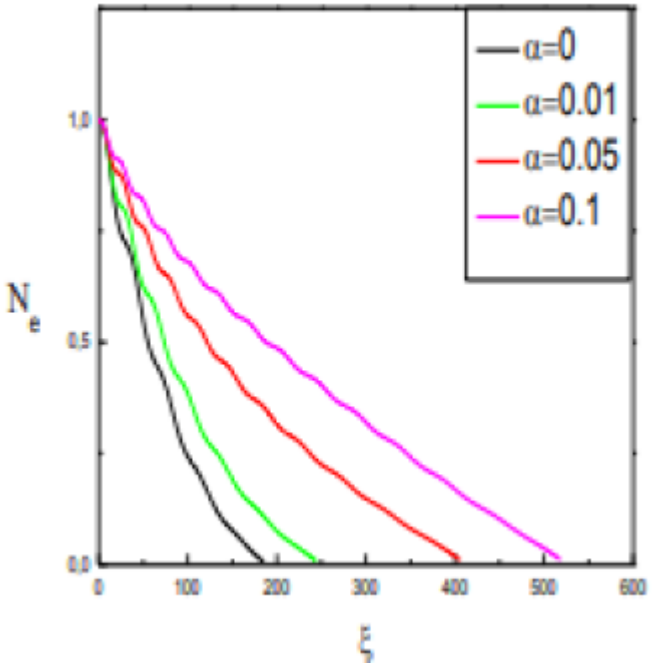
Abstract: he presence of dust grains ranging from nanometers to micrometers in size in the plasma sheath leads to important modifications in the sheath behavior and therefore remains an important and serious problem in the devices of the plasma process and near the insulator materials of fusion reactors. In this work, we present a theoretical model to study the behavior of dust grains in plasma sheath. For this purpose, we consider a non-magnetic plasma consisting of electrons, ions and dust grains with a variable charge. The positive ions and the dust grains are described by fluid equations model, while the electrons are assumed to follow a non-Maxwellian velocity distribution function, modeled by Cairns non-thermal electron distribution. Several forces acting on the dust particles are taken into account. We have solved numerically the basic equations of our model and the effect of different parameters of the plasma on the equilibrium and stability of the dust grains are analyzed and discussed.

Keywords: Dusty plasma plasma sheath dust grains cairns distribution



Graphical abstract

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Stability, phase transition and elastic properties of lithium based compounds

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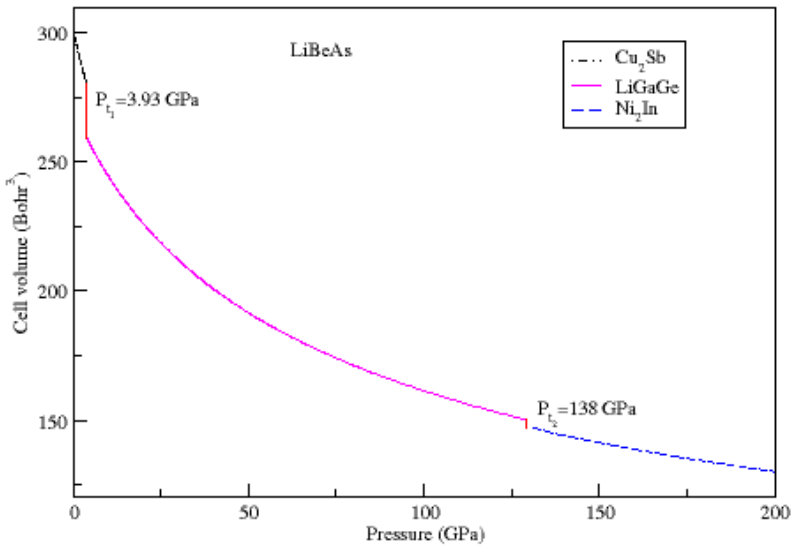
Abstract: We present results on structural stability, phase transition and elastic properties of the LiBeX with X = P and As compounds. The calculations are performed by using the pseudopotential plane wave method based on the density functional theory. Our results show that the Cu2Sb-type structure (P4/nmm) is the most stable one for both studied compounds. The obtained structural parameters and the atomic positions for the stable phase are in good agreement with the measured ones. These compounds exhibit two first order phase transitions. The elastic constants for single crystals are calculated at zero and finite pressure. The bulk modulus, shear modulus and Poisson ratio are determined from the single crystal elastic constants.

Keywords: Ab initio methods, Phase transition, Elastic properties.



Graphical abstract

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Effect of uniform magnetic field on inclined Taylor-Couette flow

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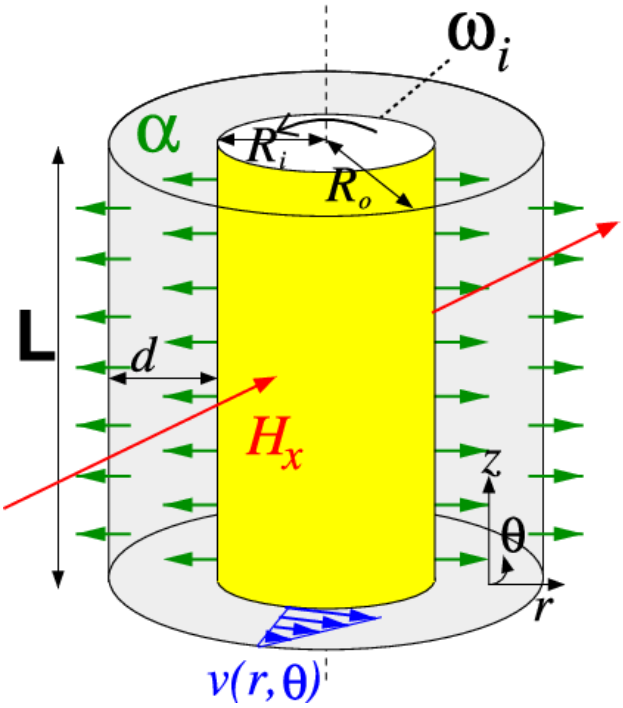
Abstract: This study is focused on effect of an axial magnetic field imposed on incompressible flow of electrically conductive fluid between two vertical coaxial cylinders. External magnetic field is assumed uniform and constant. Numerical calculation was carried out using ANSYS FLUENT calculation software, based on finite volume method. Problem treated considering case of rotating and non-deformable inner cylinder then, rotating and radially deformable and outside is kept fixed with deformation amplitude variation. Fell choice on a structured mesh (hexahedral). Magnetic field deeply affects nature of the flow for low and medium magnetic field values. Magnetic field has a stabilizing effect on Taylor-Couette flow (relaminarization phenomenon) or dissipation of Taylor cells. For large magnetic field values, we found a destabilizing effect with a topological change of the flow.

Keywords: Taylor-Couette instability, Magnetohydrodynamic, vortex, Rotating cylinders



Graphical abstract

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Material Physics

Experimental study and modeling of spinel biomarkers for biomedical applications as fluorescent probes

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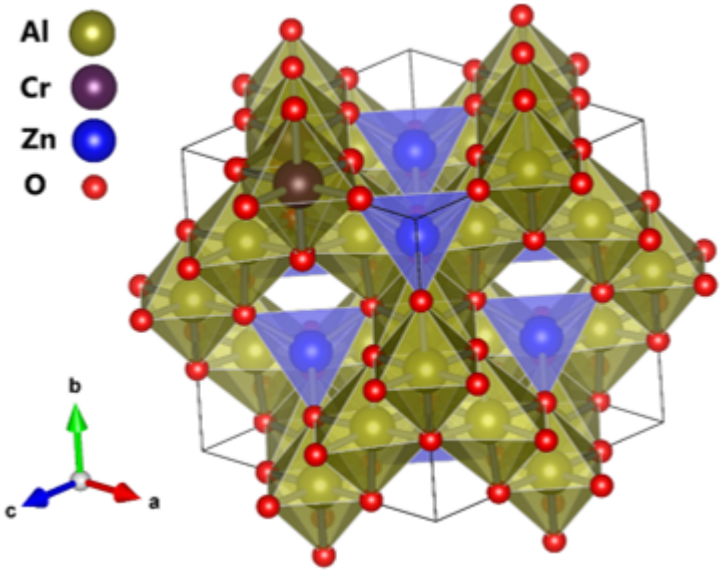
Abstract: The structural vibrational and optical properties of spinels, prepared by a conventionnel solid-solid state reaction, are the objective of this detailed work. A vibrational study, at room temperature, leads to active Raman and infrared (IR) modes. The optical band gap Eg is determined from the reflectance and absorption spectra. Tauc's low confirm the direct transition behavior. The considerable increase in the Urbach energy Eu for ZnAl1.95Cr0.05O4 suggests that disorder and defect concentration have increased compared to ZnAl2O4. From absorption and PLE spectra, the electronic structure of Cr3+ is determined by a crystal field study in Oh site symmetry. The theoretical study leads to a precise attribution of the Cr3+ d-d transitions.

Keywords: UV/Vis. Spectroscopy; Crystal and ligand fields; Transition-metal compounds; ZnAl2O4 spinel, long persistent luminescence



Graphical abstract

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Estimation of the surface condition of the polluted insulators using fuzzy inference system (FIS)

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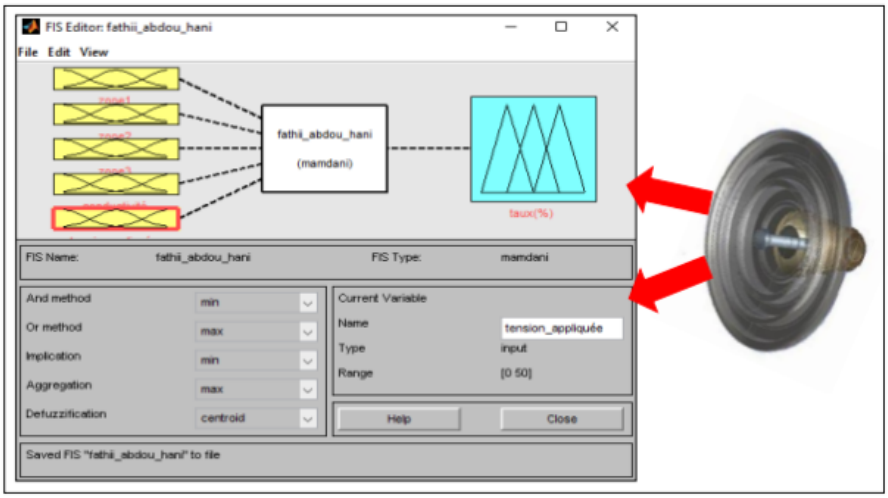
Abstract: The insulator is a solid insulating material which has a very high resistance to the passage of current. It is used to insulate conductors or live parts to prevent current flows. The prediction contains the respective confidence interval based on the fuzzy logic method. Various parameters, such as the conductivity and level of pollution of the triangular membership functions used for the fuzzification process, etc., are assigned different values in order to optimize the estimation of the flashover voltage phenomenon. Additionally, different tests for training the fuzzy system are applied and compared for their appropriateness in accurately predicting the flashover voltage.

Keywords: high voltage insulators, fuzzy logic, polluted level, conductivity.



Graphical abstract

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Experimental investigation of the physico-chemical and mechanical properties of olive pits

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[2] *Laboratory of Applied Mechanics of New Materials (LMANM), University of May 8, 1945 Guelma, Algeria*
[3] *University Larbi Tebessi of Tebassa,Algeria*
[4] *Department of Mechanical Engineering, State University of Amazonas-UEA, Manaus, Brazil*
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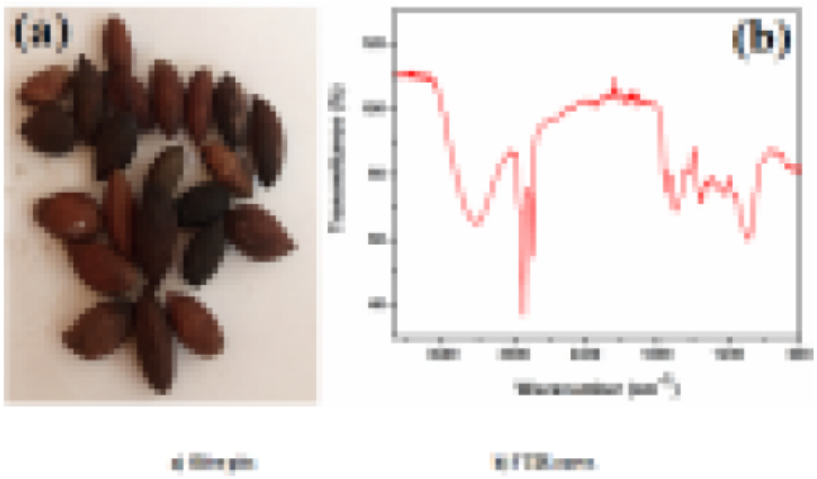
Abstract: ?Abstract: After the olive harvest, part is devoted to the production of olive oil and the other to table olives (pitted and not pitted). This study focuses on the potential for recovery and recycling of certain agricultural waste, such as olive pits, i.e. the solid phase resulting from the pitting of olives. First, the olive pits are recovered, washed, dried, then ground into powder form, and then a physicochemical characterization was carried out to determine their physico-chemical and thermal properties using the humidity analyzer, the Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC). In addition, a study of the mechanical properties in compression of olive pits was also carried out. Due to the dispersions of the experimental results obtained, a statistical study based on the two-parameter Weibull method was used with the aim of correctly evaluating the mechanical characteristics of the olive stones studied. On the other hand, the comparison showed that the experimental values are very close to the average values obtained with the proposed statistical distribution.

Keywords: Agricultural waste, Olive pits, Physico-chemical analysis, Compression properties.



Graphical abstract

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Characterization of NiO thin films prepared by sol-gel spin coating technique: Effect of film thickness

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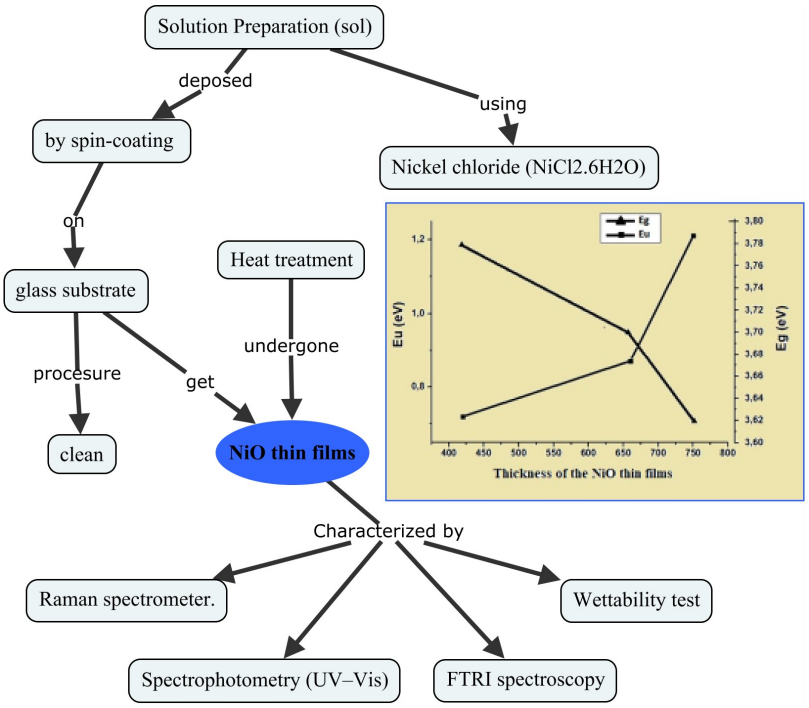
Abstract: Nickel oxide (NiO) is one of the metal oxides that has recently aroused great interest among researchers due to its very interesting physical properties. The objective of our work is to study the effect of thickness NiO thin film on structural and optical properties. The experimental methodology that we followed consisted first in depositing thin NiO layers of different thicknesses on glass substrates by Sol-Gel process and spin-coating technique. In order to study the properties of elaborate thin films, we used several characterization techniques: FTRI spectroscopy, spectrophotometry (UV–Vis), wettability test, and Raman spectrometer. The results obtained showed that the thin NiO films are moderately transparent in the visible and opaque in the UV. The values of the transmittance in the visible range decrease with the thickness and the optical gap varied in the interval of [3.62 - 3.78eV]. The infrared absorption band linked to the Ni-O bond is very close to the blue region, indicating the presence of a nanocrystalline structure. The Raman spectrum showed the presence of carbon in the thicker layers.

Keywords: Film thickness; NiO; Spin coating; Thin film



Graphical abstract

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Prediction of the structural, magnetic and optoelectronic properties of Cd0.75Ir0.25S and Cd0.75Os0.25S: A DFT investigation

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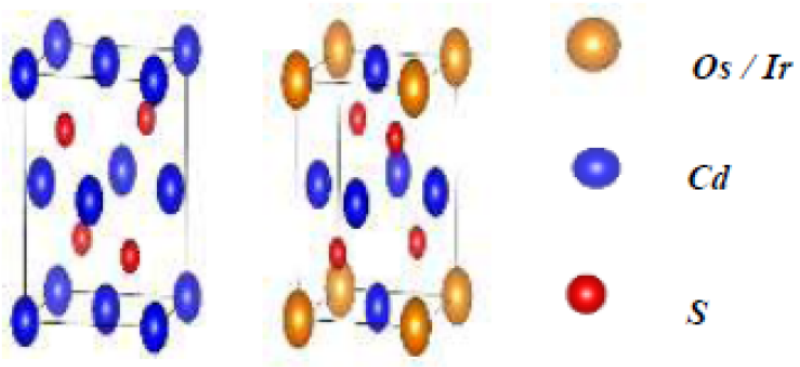
Abstract: Using DFT calculations, we investigated the structural, magnetic, and optoelectronic properties of Cd0.75TM0.25S (TM = Os and Ir) compounds in the zinc-blende phase. The generalized gradient approximation was used to treat the exchange-correlation potential (GGA). Furthermore, the GGA+U+SO approximation (where U is the Hubbard Coulomb energy and SO is the spin orbit coupling) is used to properly treat the d electrons. The calculated total magnetic moments per Os and Ir transition metals are 4.0 B and 3.0 B, respectively, for Cd0.75Os0.25S and Cd0.75Ir0.25S compounds. The calculated total magnetic moments per Os and Ir transition metals are 4.0 B and 3.0 B, respectively, for Cd0.75Os0.25S and Cd0.75Ir0.25S compounds. The results of the formation energy analysis show that the investigated alloys are stable and can be synthesized. The densities of states (DOS) show that by using GGA+SO+U, Cd0.75TM0.25S (TM = Os and Ir) become ferromagnetic-semiconductors, with band gaps of 0.52 for Cd0.75Os0.25S and 0.72 for Cd0.75Ir0.25S. The real and imaginary portions of the dielectric function ? ?(?), ? ??(?) absorption coefficient ?(?), and refractive index n (?) were calculated using a radiation range of up to 30 eV. The observed results for CdS are consistent with previously published experimental and theoretical results. Our findings suggest that these materials could be used in future spintronic devices.

Keywords: DFT; stability; magnetic properties; Half-semiconductor; Spintronics



Graphical abstract

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Considering photocatalytic activity of Bi-doped TiO2 thin films in degradation of rhodamine B under sunlight irradiation

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[1] *Physics Laboratory of Thin Layers and Applications, Biskra University, BP 145 RP, Biskra 07000, Algeria*
[2] *Laboratory of Mechanical Engineering (LGM), Biskra University, BP 145 RP, Biskra 07000, Algeria*
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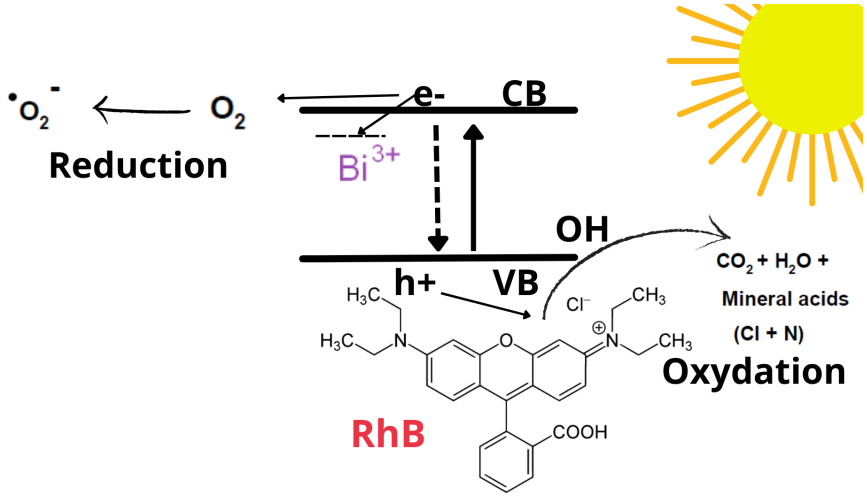
Abstract: In this paper, TiO2 and Bi-doped TiO2 thin films were dip-coated on glass substrates. The films were grown at different concentration of Bisthuth(III) nitrate (0.1, 1, 3, 5, 7 wt. %) to study the effect of Bi doping on the optical, self-cleaning, and photocatalytic properties. XRD patterns show that TiO2 films were grown with unique anatase phase (101). The SEM images show that the surface morphology becomes compact and crack-free at 7 wt. % Bi doping. The EDX analysis reveals that the Ti content increases with by increasing Bi concentration. The photocatalytic test shows that film (~ 312.5 nm) gives high photodegradation of rhodamine B (RhB) under sunlight irradiation due to the high film thickness and indirect gap energy. The increase in film thickness and the decrease of crystal size lead to the low recombination rate of charge carriers (e-/h+).

Keywords: Thin films, Bi-doped TiO2, Film thickness, RhB, Sunlight, Photocatalysis process.



Graphical abstract

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Materials for advanced energy

Latent Heat Thermal Storage in Metal Foam Filled with Nano-Enhanced Phase Change Material

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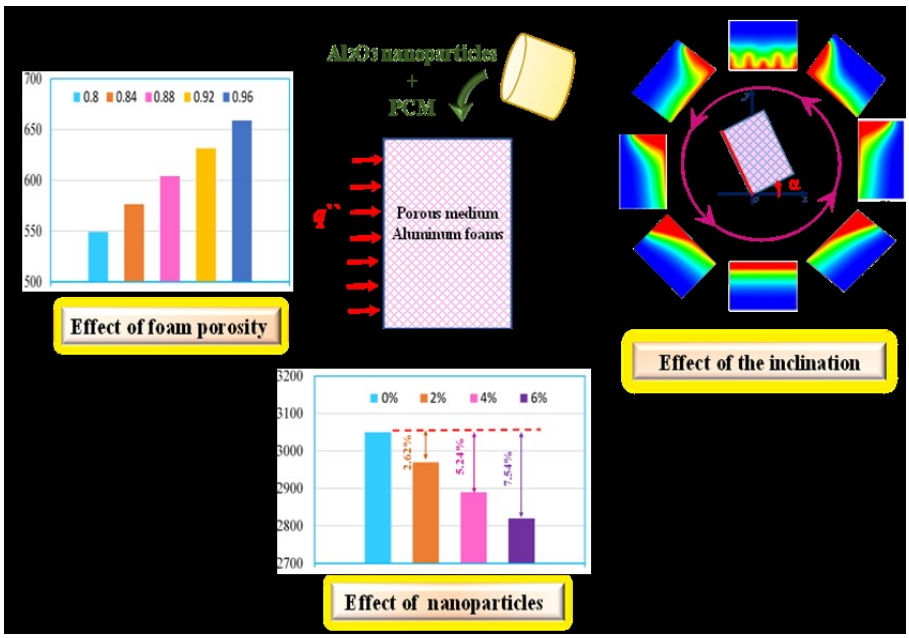
[2] *Energy, Mechanics and Engineering Laboratory (LEMI), M'hammed Bougara Boumerdes University, ALGERIA*
[3] *National School of Marine Sciences and Coastal Development (ENSSMAL), ALGERIA*

Abstract: The melting heat transfer of Al2O3—N-eicosane embedded in a uniform aluminum metal foam was addressed. Aluminum foam is placed in a rectangular shaped. Thermal Energy Storage (TES) unit heated from one side. The finite volume method was applied to simulate natural convection flow and phase change heat transfer in the TES unit. The results showed that the best porosity of the metal foam is for ?=0.8, which leads to a decrease in melting time of 22.8%. The presence of Al2O3 nanoparticles decrease the charging time up to 7.54%. Moreover, the variation of inclination angle induces minimal impact on the phase change rate.

Keywords: Phase change material; Metal foam; Inclination angle; Melting process; Nanoparticles.



Graphical abstract

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Mathematical Physics

Perturbation method applied to interfacial three dimensional waves in the presence of a parallel current

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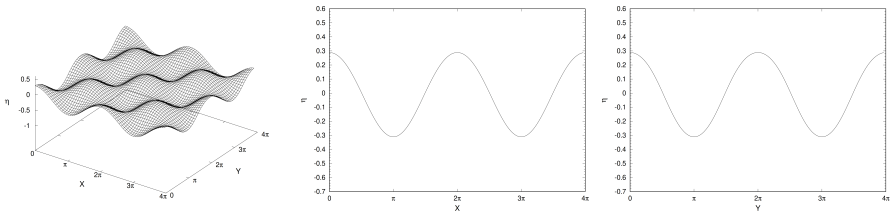
[2] *Faculty of Physics, Theoretical and Applied Fluid Mechanics Laboratory, University of Sciences and Technology Houari Boumediene, Algiers, Algeria*

Abstract: Weakly non-linear behaviour of interfacial short-crested waves with current is presented in this paper. a perturbation method was applied to determine fifth-order solutions. The advantage of this method is that it allows for the determination of the harmonic resonance condition which is one of the major short-crested waves characteristics. We have shown that there is a critical current beyond which steady wave solutions cannot exist. This critical current is associated with the emergence of instability

Keywords: harmonic resonance, short crested interfacial wave, perturbation method, current



Graphical abstract

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Choice of mother wavelet by the wavelet entropy

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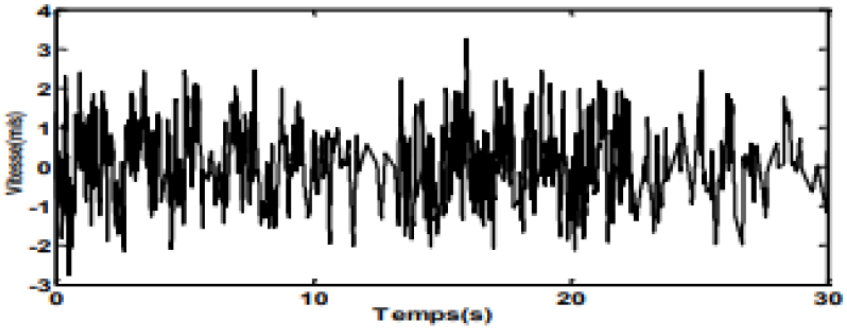
[2] *Theoretical Physics Laboratory, Faculty of Sciences-Physics, University of Bab-Ezzouar, U.S.T.H.B, B.P. El Alia, Algiers.1611, Algeria*
[3] *Faculty of Sciences-Physics, University of Bab-Ezzouar, U.S.T.H.B, B.P. 32, El Alia, Algiers. 1611, Algeria*

Abstract: A many mother wavelets have been proposed for specific problems, such as the Mexican hat, Morlet and Gaussian wavelets. The choice of the best mother wavelet depends on the kind of information that we want to extract from the signal. In our work, we propose to select the best even order derivative of the Gaussian wavelet for detecting the most important scales of a turbulent flow based on the wavelet entropy.

Keywords: Continuous wavelet transform, Morlet wavelet, The eighth derivative of a Gaussian wavelet, Turbulent flow, Wavelet entropy.



Graphical abstract

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Physical Characterization

Physical characterization of polymers exposed to corona discharge

El Hadi Belhiteche [1] *, Sébastien Rondot [2], Philippe Dony [2], Mustapha Moudoud [3], Omar Jbara [2]

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[2] *Materials and Mechanical Engineering Laboratory, UFR Sciences, University of Reims, France*
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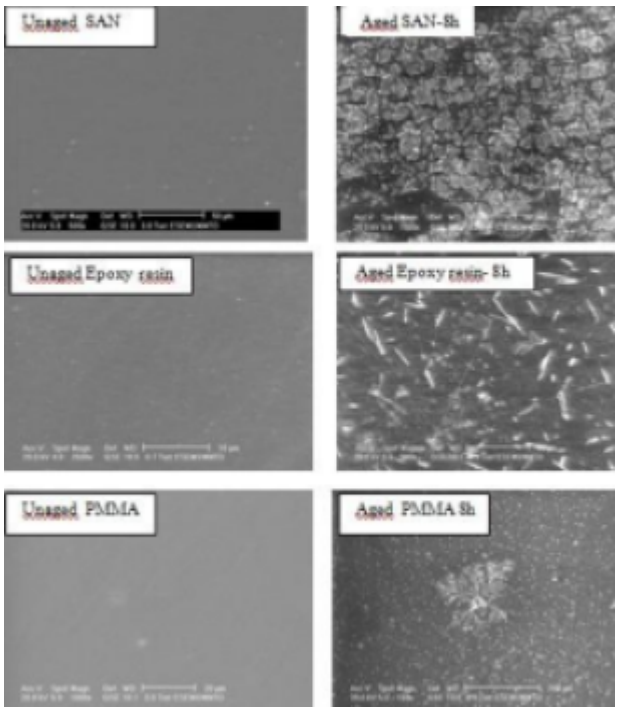
Abstract: Polymers have many advantages over conventional insulation such as glass, porcelain and impregnated paper. They have better mechanical properties, lower wettability and they are lighter and carried out more easily. However, they are vulnerable to the action of surface discharges which are responsible for their degradation. A discharge, which occurs on the surface of the polymer, causes aging followed by the destruction of the insulator, whose physicochemical mechanisms are not yet well understood. The work in this paper is a comparative study to better understand the effects of the corona discharge on polymethyl methacrylate (PMMA), styrene acrylonitrile (SAN) and epoxy resin. The insulation performance of these three materials was evaluated through scanning electron microscopy observations and dielectric spectroscopy. Polymers subjected to a corona discharge undergo a degradation which results in the rupture of some chemical bonds and the formation of hydroxyl groups OH which could enhance surface conduction. For the Polymethyl methacrylate, we highlighted the phenomenon of degradation by a significant development of trees on the dielectric surface. We observe that the permittivity decreases with the increase of both the frequency and the aging time under corona discharge.

Keywords: Corona discharge, electrical aging, polymers, surface degradation, trees.



Graphical abstract

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Fluids and Structure

Computational fluid & structure dynamics

Study of a cavitation pocket in a turbulent flow

Hatem Kanfoudi [1] *, Marwa Ennouri [1], Ridha Zgolli [1]

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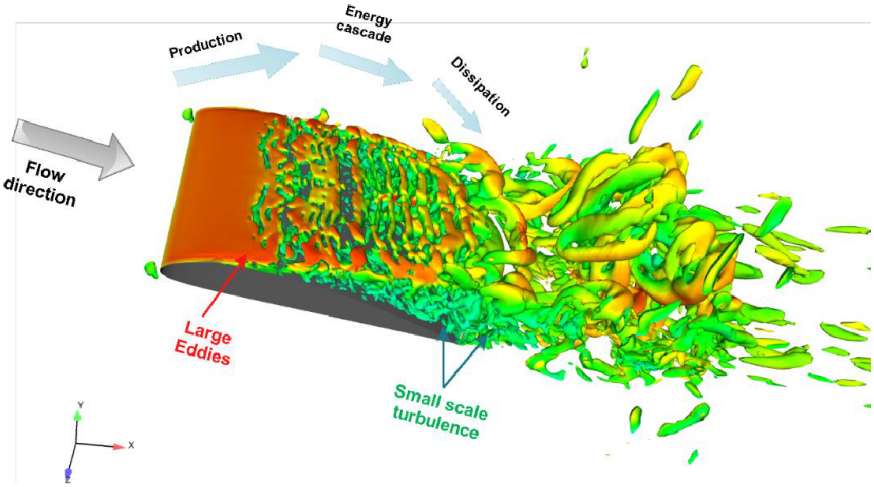
Abstract: In order to accurately and reliably analyze in details the cavitation mechanism and their impact on flow structures, a threedimensional unsteady cavitating turbulent flow around the three-dimension Clark-y hydrofoil is investigated be using a PartiallyAverage Navier Stokes (PANS) model based on Shear Stress Transport (SST). To track the interface of liquid and the vapor, a Volume of Fluid (VOF) model is employed based on homogeneous mixture approach. To capture the interaction between the cavitation and the flow structure a bridging method (PANS) between RANS and DNS have been chosen. This technique is able to resolve the unsteady turbulent structures by employing a more consistent methodology. The numerical results show the capability of the presented model to predict the re-entrant jet and cavitation cloud shedding accurately. Furthermore, the results show that the production of the vorticity it is mainly occurring in the center of the cloud cavity.

Keywords: CFD, turbulence, LES, cavitation



Graphical abstract

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Appraisal of solar desalination efficiency using a 3D CFD validated model

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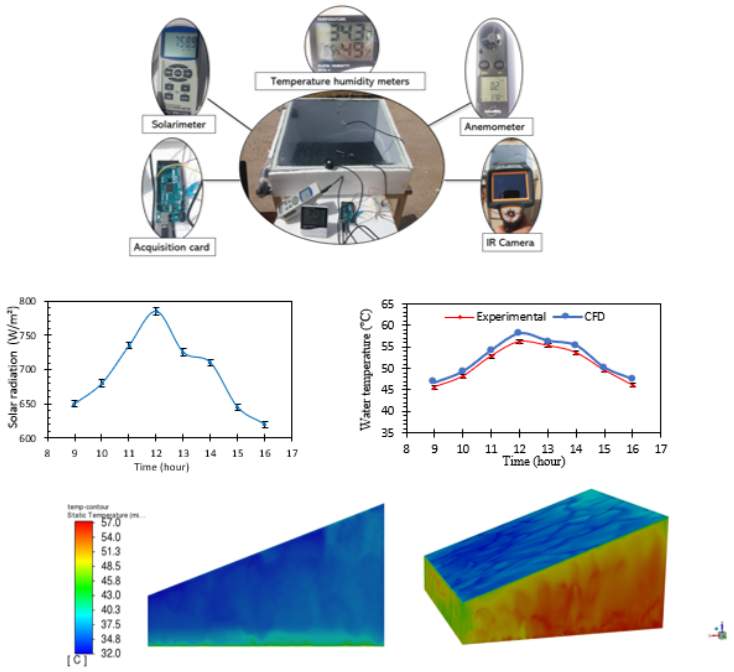
Abstract: The purpose of this study is to assess the efficiency of solar still using a developed and validated computational fluid dynamics (CFD) model. The solar radiation intensity has been experimentally measured on 7th April 2021, at the national engineering school of Gabes, Tunisia. Temperature distribution on all solar still parts is experimentally measured. Solar radiation intensities were modeled using the discrete ordinates (DO) model. In ANSYS Fluent, the volume of fluid VOF model has been used to model water and air-vapor mixtures as two phases. The turbulence model used in this study is the k- ? RNG. The mass transfer under evaporation and condensation of water was modeled using the species transport equation and Lee model. Results show that the maximum solar radiation is 785W/m² reached at noon. CFD results show that the maximum temperature is in the basin of the solar still which reaches 58.1°C and 56.4°C at 12 a.m and 1 p.m, respectively.

Keywords: CFD, DO, Solar Still, Water Desalination.



Graphical abstract

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Air out-flow in the ventilation channels of a disc brake

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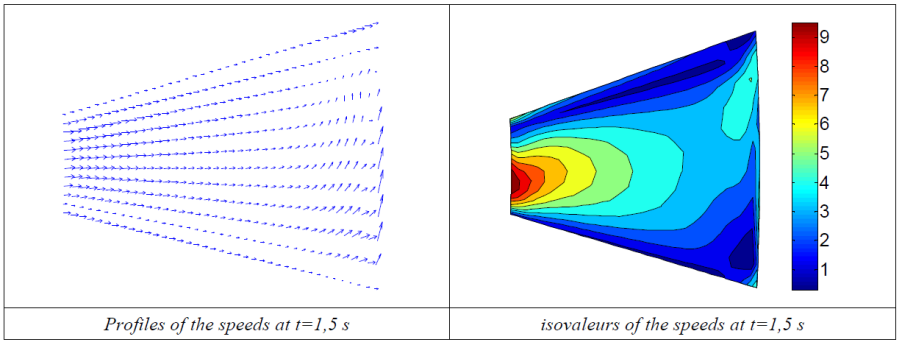
Abstract: The system of braking, of the cars increasingly rapids, took advantage of very renovation that it is in the domain of the order of the brake, the tires, or the friction quality of the two antagonists disk-pad. However the major problem limiting the life span of a brake again is gone up it thus of the level of the temperature, modifying the thermal and mechanical features of the disk. Has this effect a lot of works have been established for the determination of the temperature of the disc brake. But in spite of the importance of the cooling of the disk, none of the authors studied the phenomenon of the convection produced by the rotation of the disk, that is himself in phase of braking or in phase of acceleration. Of this fact, the goal of the present work, is the survey of the streamlined structure of the air out-flow in one channel of cooling of a ventilated disc brake. This survey is established by numeric simulation way, in return for the method of the finite volume. The results descended of this survey, permit to calculate the coefficient of exchange precisely in order to simulate the disk thermal behaviors and to study the influence of the shape and the ventilation channels number on the propagation of the heat in the braking system.

Keywords: hydrodynamic, unsteady state, temperature, disk brake.



Profiles of the speeds at t=1,5 s | *isovaleurs of the speeds at t=1,5 s*

Graphical abstract

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A CFD modelling on Effects of Ejection Angle of a Co-flow on the Thermal Characteristics for a Combined Wall and Offset Jet Flow

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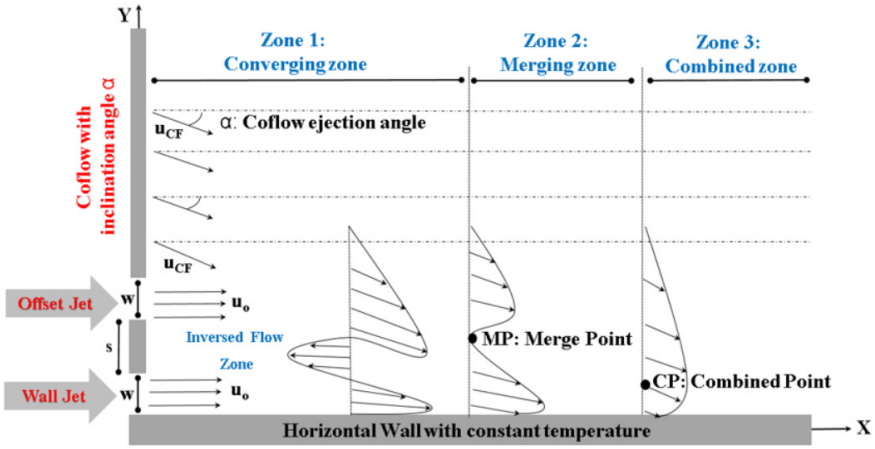
Abstract: In the present study, a CFD simulation of a flow combined an offset jet and a wall jet (noted dual-jet) with the presence of co-flow is carried out. The effect of the intensity of the co-flow CFV (co-flow velocity) as well as its ejection angle ? on the heat transfer exchanged in dual-jet flow is also performed. The present simulations are carried out for a Reynolds number Re=15000, a nozzle-to-nozzle spacing equal to 4 times the thickness of the nozzle, a co-flow velocity CFV=10% - 40 % and a co-flow ejection angle ?=0o - 40o. The results of this computational study clearly show an intensification of heat transfer exchanged between the flow and the wall by increasing the co-flow velocity CFV as well as its ejection angle ?.

Keywords: CFD; Co-flow; Thermal Characteristics; Combined Wall; Offset Jet Flow



Graphical abstract

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Numerical Simulation of CaSO4 Crystallization Fouling on Heat Transfer Surfaces

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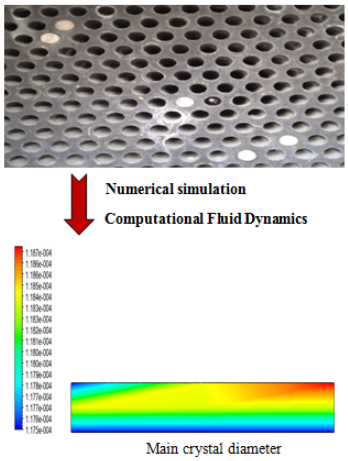
Abstract: The deposition of material present in the flowing fluids onto the surfaces of various internal parts of heat exchangers is the main reason for thermal efficiency reduction. This phenomenon of deposition is known as fouling. Among various type, crystallization fouling on heated surfaces of heat exchangers is generally caused by the super-saturation of inversely soluble salts as calcium sulfate. The crystallization fouling phenomenon could be understood prominently by numerical investigations. In the current work, CFD modeling is used to study the crystallization fouling of calcium sulfate. 2D modeling of tube heat exchanger geometry is employed to simulate the crystallization fouling. This technique is used to identify the regions where different parameters have the greatest effect on fouling.

Keywords: Crystallization, Heat exchanger, Heat transfer, Fouling, CFD, Calcium sulfate.



Graphical abstract

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Experimental investigation techniques

A Design Of Experiment Study Of Plasma-Sprayed Alumina-Titania Coatings Using Taguchi's Technique

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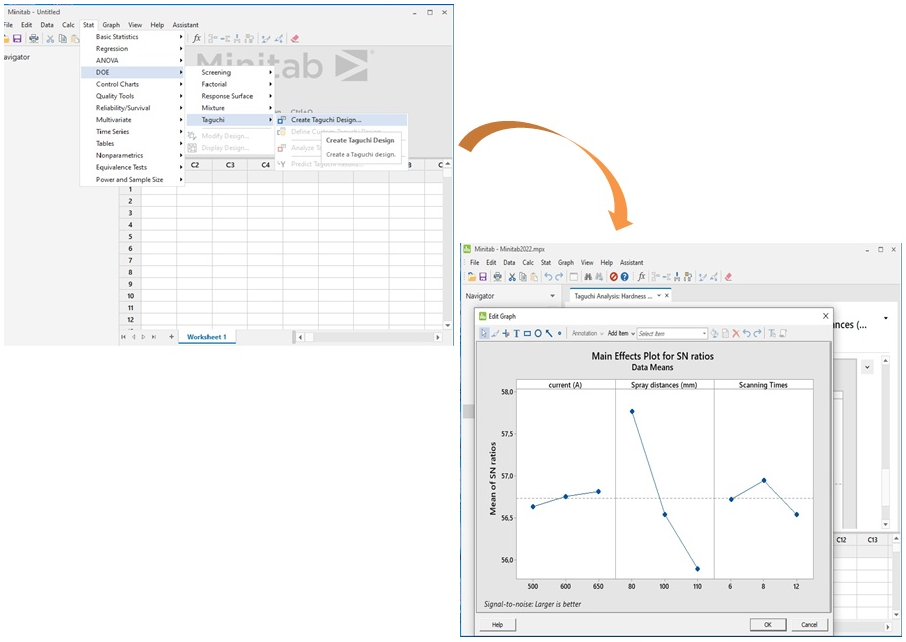
[4] *Science and Technics Department, Faculty of Science and Technology, University of Mohamed Boudiaf M'sila - Algeria*

Abstract: Atmospheric plasma spraying has been used to deposit alumina and titanium oxide (Al2O3-3wt% TiO2) coatings on commercial SS304 stainless steel substrates. The design of the Taguchi L9 experiment protocol was used to optimize the parameters of the coating process. Three factors were studied in this investigation: spray distance, arc current, and coating scan times. The reaction of plasma-sprayed coatings was evaluated by porosity, adhesion strength, and micro-hardness. In addition, the relationship between independent variables and product responses is established using the regression analysis method. Higher arc current, shorter scanning times and medium spray distance provide optimum performance of low porosity, high adhesive strength, and high micro-hardness.

Keywords: Atmospheric Plasma Spray (APS), Coating, Alumina-Titania, Design of Experiments (DoE), Taguchi design.



Graphical abstract

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Modelling the full-scale reverse osmosis system using new computational modelling technique

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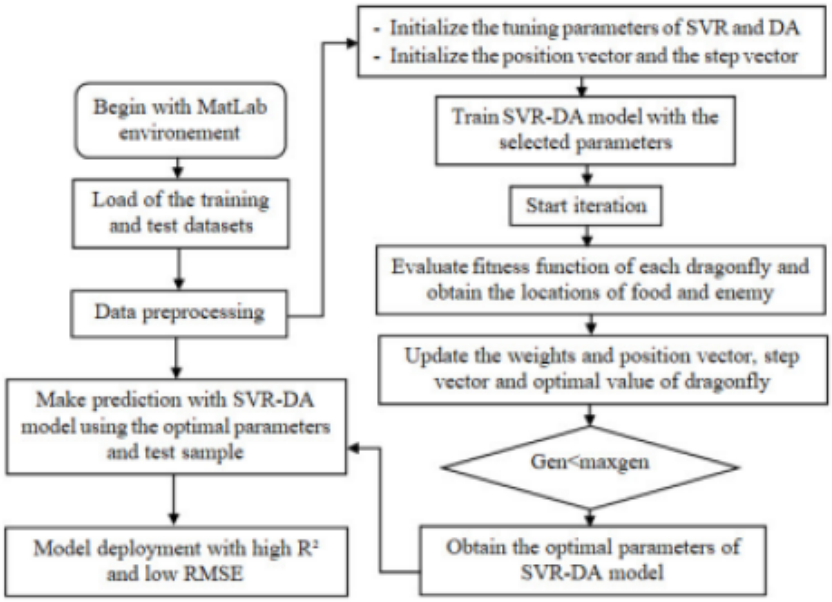
Abstract: The aim of this work is to use a novel technique named support vector machine (SVM) coupled with very recent optimisation method to tune the hyper-parameters of the model which is dragonfly algorithm (DA). This work was done based on an experimental data done on full-scale reverse osmosis system to treat water for a pharmaceutical use. The data set contains two sets, an input set which includes important parameters that control the reverse osmosis system and the output set which includes the performance of the system. The SVM-DA was trained using 80% of the dataset and tested with 20%. The statistical comparison in terms of regression coefficients and different errors demonstrated the efficiency of the obtained model in comparison to literature. The obtained model can be used to predict the performance of reverse osmosis system without knowing the details of the phenomena via using convivial graphical interface.

Keywords: Reverse osmosis, support vector machine, dragonfly



Graphical abstract

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Electro-intensification of mechanical dewatering during the application of electrical tomography technique

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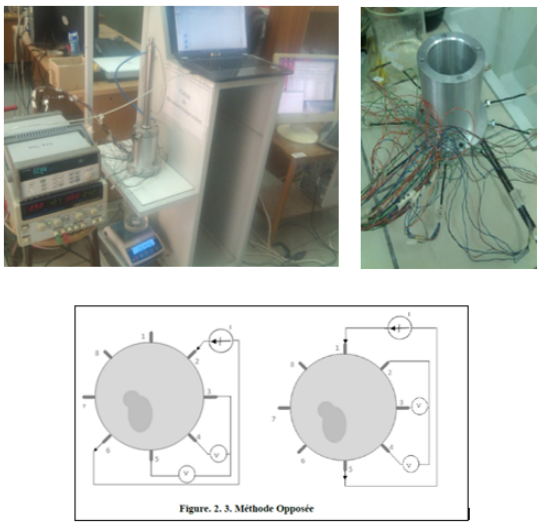
Abstract: During the application of the electrical resistance tomography technique proposed to control the internal parameters during mechanical dewatering an electro-intensification of the process was investigated. The performance of the mechanical dewatering process was investigated using this technique. The influence of the pressure variation applied to the compression mechanism is evaluated. The effect of the use of the electrical resistance tomography technique has been analyzed. Experiments show that a gain of 11.53% on the amount of water separated for cellulose was acquired. Also, it is remarkable that the duration of the filtration phase has decreased caused by the intensification using electrical current injection.

Keywords: Mechanical dewatering, Electrical resistance tomography, Intensification, Talc, Cellulose



Graphical abstract

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Application of desirability function to optimizing cutting parameters when turning Ft-25 gray cast iron by GC1690 tool

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Abstract: In order to machine high quality mechanical parts with high productivity; the cutting regimes should be correctly chosen. The aim of this work is to optimize the technological parameters, surface roughness (Ra) and productivity (Prod), when turning gray cast iron Ft-25 with GC1690 coated ceramic insert, depending on the variation of cutting parameters (cutting speed (Vc), feed rate (f) and depth of cut (ap)). The Box-Behnken design L15 (3^3) was used. The desirability function method was applied to optimize the cutting regime, in order, obtain the optimal cutting.

Keywords: GC1690, Ft-25 cast iron, cutting parameters, optimization, Box-Behnken design, roughnes, productivity.

Graphical abstract

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Fluid and structure interaction

Fluid structure interaction of the turbulent flow around an obstacle

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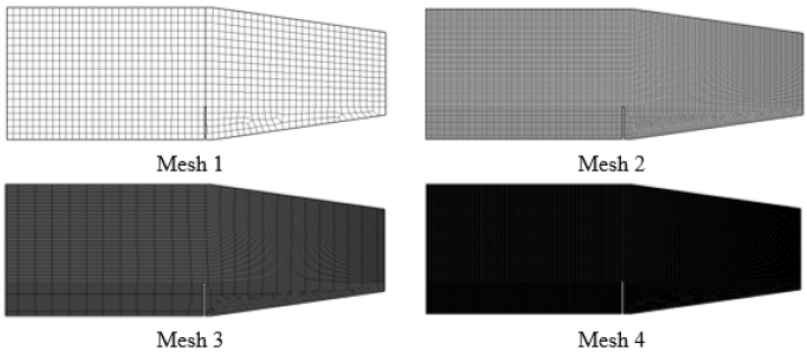
Abstract: In the present paper, we are interested in studying three different configurations. The first is a barrier-free diffuser, the second contains a rigid obstacle and the third is with a flexible obstacle using the Sliding Mesh (SM) model. The turbulent flow is numerically predicted by resolution of the URANS equations in conjunction with the standard k-? turbulent model. These equations are solved by a control volume discretization method. The effect of these obstacles is predicted by the finite elements. The numerical results from the coupling algorithm fluid-structure in the workbench ANSYS 16.2 were carried out in the diffuser and around the each of the obstacle. A comparative study between these three configurations is carried out using a means velocity profiles as well as the spatial distribution of the dynamic pressure, the turbulent characteristics and the average vortex.

Keywords: FSI, CSD, CFD, obstacle, turbulence, Sliding Mesh, URANS, ANSYS workbanch



Graphical abstract

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Turbulent flow characteristics and aerodynamics forces effects of the wind acting on the tall building structure

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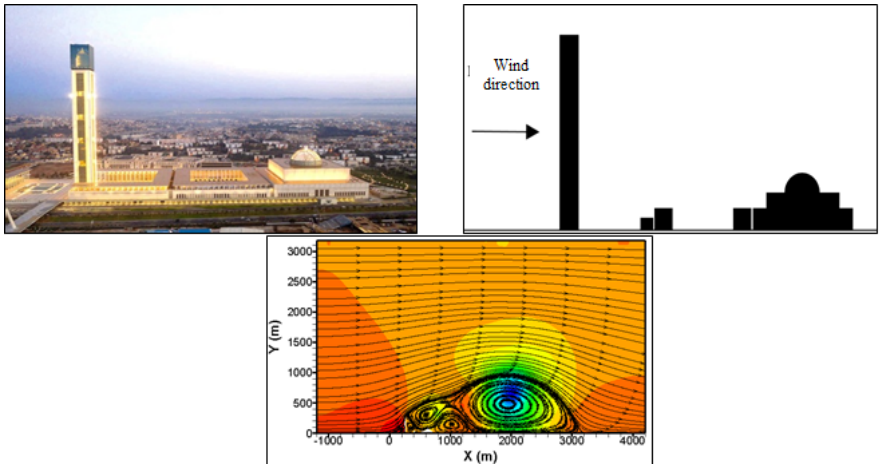
Abstract: Recently, Algeria built the third largest mosque in the world with the highest minaret with a height of 264 m. However, the impact of the wind flow on the tall building generates turbulent flow with an important vortices structure which are shed downstream mosque, This work presents a numerical study of full-scale two-dimensional turbulent wind flow around the Great Mosque of Algiers. The numerical simulation is achieved by the finite volume method through Ansys/Fluent Software and the turbulence modeling is considered by the URANS approach coupled to the k-? realizable model. Through the numerical results, we represent the structures of the mean and fluctuating wind flow around the building, and we estimate the unsteady forces exerted by the impact of the wind flow on the minaret. This gives us access to understanding the physical phenomena of the wind flow around large-scale buildings.

Keywords: Wind flow, Building, Numerical simulation, Turbulence, Aerodynamic force.



Graphical abstract

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Effects of gravity on transient evolution of gas-liquid interface in capillary tube

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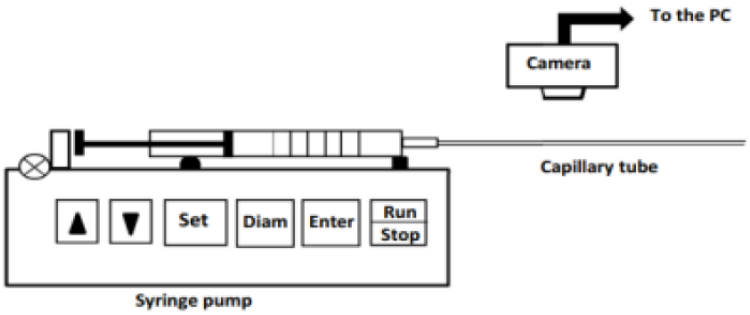
[2] *University of Gabes, National Engineering School of Gabes, LR18ES34, 6072 Zirig, Gabes, Tunisia*

Abstract: In this paper, we investigate the dynamics of the drainage of a transparent capillary tube (radius 0.4 mm). A non-wetting fluid (gas) displaces a wetting fluid (oil). The gas phase is continuously injected at an extremity of the capillary tube (inlet tube) at a constant injection-rate , ranging from 0.1 to 10 ml/h. Oil phase, initially filling the tube, leaves the system at the second opened extremity (outlet section). We consider in this work the compressibility of non-wetting fluid (gas), viscous forces in the liquid column, capillary forces and gravity. The effect of gravity, on the progress of the gas-liquid interface has been investigated. It is found that gravity forces cannot be neglected when studying the drainage in capillary tube.

Keywords: Two-phase flow, capillary pressure, capillarity, drainage, meniscus, gravity



Graphical abstract

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Influence of the rotation frequency on the flapwise deformation of a flexible wind turbine blade

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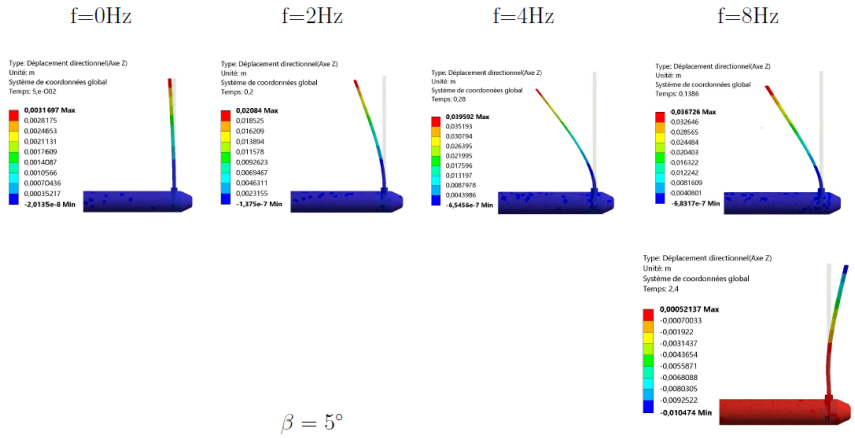
Abstract: We present in this work a numerical investigation of fluid structure interaction to study the elastic behavior of flexible rotor. The principal aim is to provide the effect of the aero/hydrodynamic parameters on the bending deformation of flexible rotors. This study is accomplished using the strongly two-way fluid structure interaction (FSI), developed by the ANSYS Workbench software. This method is used for the coupling the fluid solver to the transient structural solver to study the elastic behavior of flexible rotor in water. In this study, we use a moderately flexible rotor, modeled by a single blade with simplified rectangular geometry. In this work, we focus on the effect of the rotational frequency on the flapwise bending deformation. It is shown that the blade deforms in the downstream direction and the amplitude of these deformations increases with the rotational frequencies. Also, from a critical frequency, the blade begins to deform in the upstream direction.

Keywords: Numerical simulation, flexible blade, fluid structure interaction, Ansys workbench, flapwise deformation.



Graphical abstract

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Numerical analysis of the fluid-structure interaction in the environment of gas turbine flame tubes

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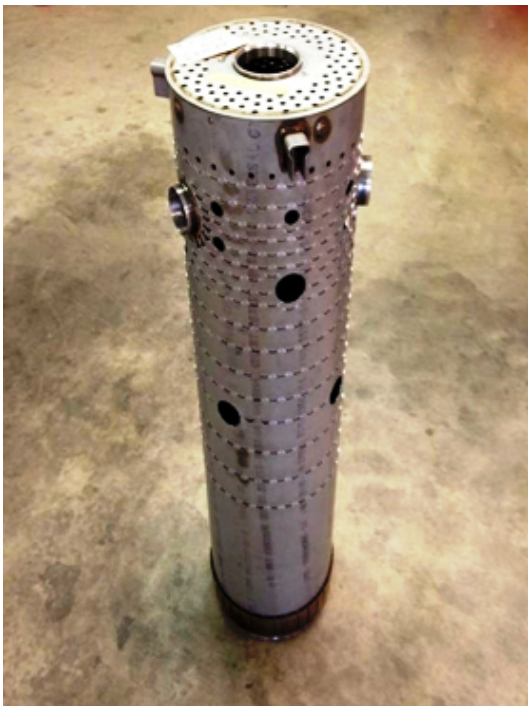
[2] *Department of mechanics Faculty of Technology, University of Blida 1, Blida 09000, Algeria*

Abstract: In this research paper, we propose to numerically analyze the fluid-structure interaction within a MS5002B gas turbine combustor, for two types of LHE flame tube designs (4 and 3 dilution holes). These chambers consist of two main components: the fuel injector and the flame tube. The flame tube is a cylindrical tube with several holes of different sizes. Some of the holes are used to supply the chamber with the air necessary for combustion and flame dilution, while the others are used to cool the chamber walls and protect them from the hot combustion gases. The different numerical simulations have allowed to control the temperature profiles and to conclude on the effect of the geometry of the tube on the reduction of the noxious emissions and the instability of the flame as well as the efficiency of the turbine.

Keywords: Gas turbine, Flame tube, Combustion, Dilution holes, CFD



Graphical abstract

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Heat and mass transfer

MHD mixte convection of nanofluid in a cavity with a heat-generating element

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[2] *Laboratory of Materials and Energy Mechanics, Faculty of Technology, University of Bejaia, 06000 Bejaia, Algeria*
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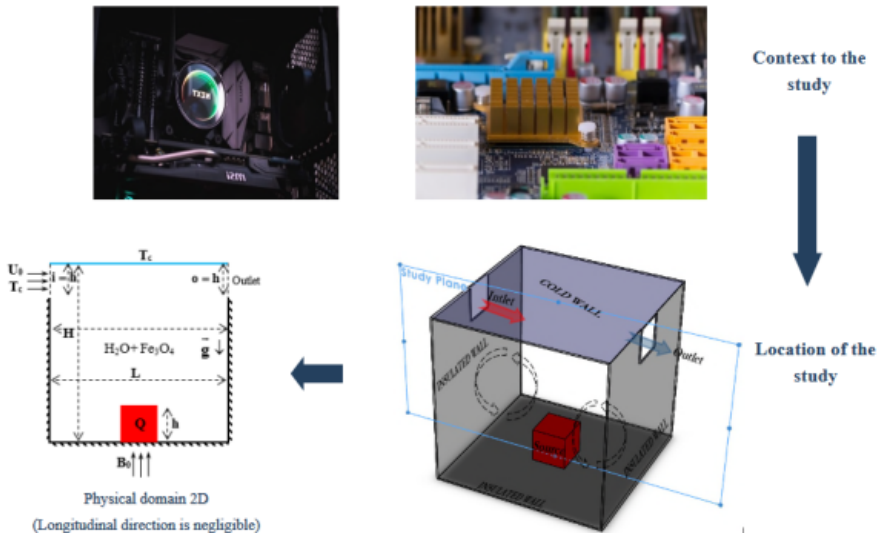
Abstract: The efficiency of computer and electronic equipment is closely linked to the design of heat sinks. To remove heat from electronic equipment and reach an appropriate temperature, various techniques remain. In this context, the present study is devoted to the problem of cooling a heat source, by two-dimensional modelling of the dissipation performance of a solid element subjected to internal heat generation. The numerical simulation is based on the finite volume method of mixed convection inside an open cavity containing the heating element and filled with a nano-fluid of ferrous character, the whole is traversed by a vertical magnetic field. The dimensionless governing equations under Boussinesq's approximations are solved by the SIMPLE algorithm. The effects of the relevant parameters, Reynolds number and Hartmann number are studied by keeping the Rayleigh number constant (Ra=106), all this for a fixed size and position of the source. The numerical results are discussed in terms of current lines, isotherms, Nusselt number along the hot surface. The results highlight the performance status of the enclosure and revealed the optimal operating parameters.

Keywords: MHD, Mixed Convection, nanofluid, Heat-generating source, open cavity.



Graphical abstract

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Thermal diffusion and diffusion thermo effects on thermosolutal mixed convection using Lattice Boltzmann Method (LBM)

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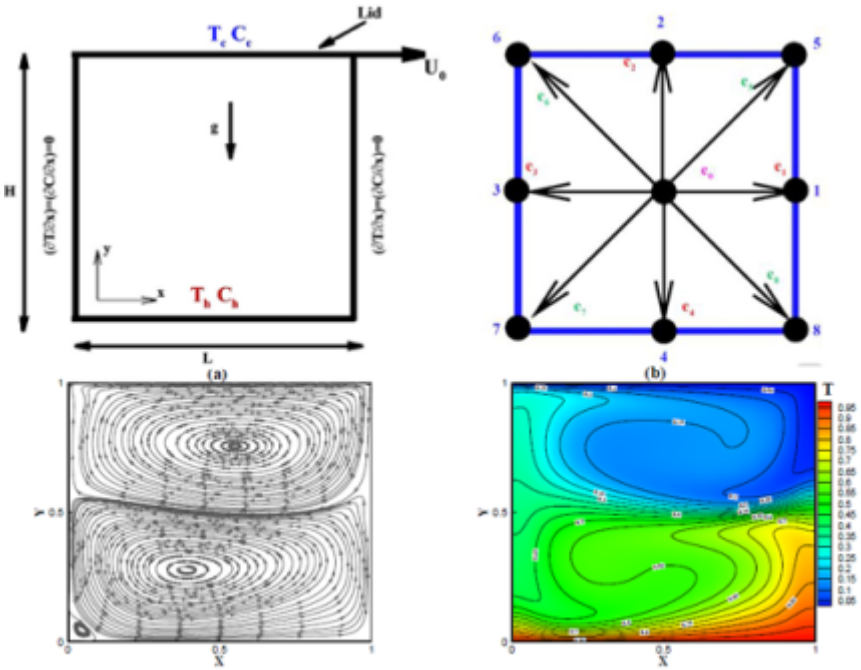
[2] *Laboratory of Renewable Energies and Advanced Materials, International University of Rabat (UIR), Rocade Rabat-Salé, 11100, Rabat-Sala El Jadida, Morocco*

Abstract: Thermosolutal mixed convection in presence of thermodiffusion (Soret effect) and diffusion thermo (Dufour effect) effects in two-dimensional lid-driven rectangular cavity is studied numerically. A hybrid scheme with multiple relaxation time lattice Boltzmann method (MRT-LBM) is used to obtain the velocity field while the temperature and concentration fields are deduced from energy and species balance equations by using the finite difference method (FDM). Results are presented in terms of streamlines, isotherms and Nusselt numbers dependence on various dimensionless parameters. The results showed that the Soret and Dufour numbers have great effects on the flow structure and heat and the mass transfer.

Keywords: Heat and mass transfer, Soret and Dufour effects, Driven cavity, Lattice Boltzmann Method (LBM), Finite Difference Method (FDM).



Graphical abstract

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Soret- Dufour Effect on natural Convection Past a Vertical Plate in Non-Darcy Porous Medium Saturated With Buongiorno Nanofluid in the Presence of Viscous dissipation

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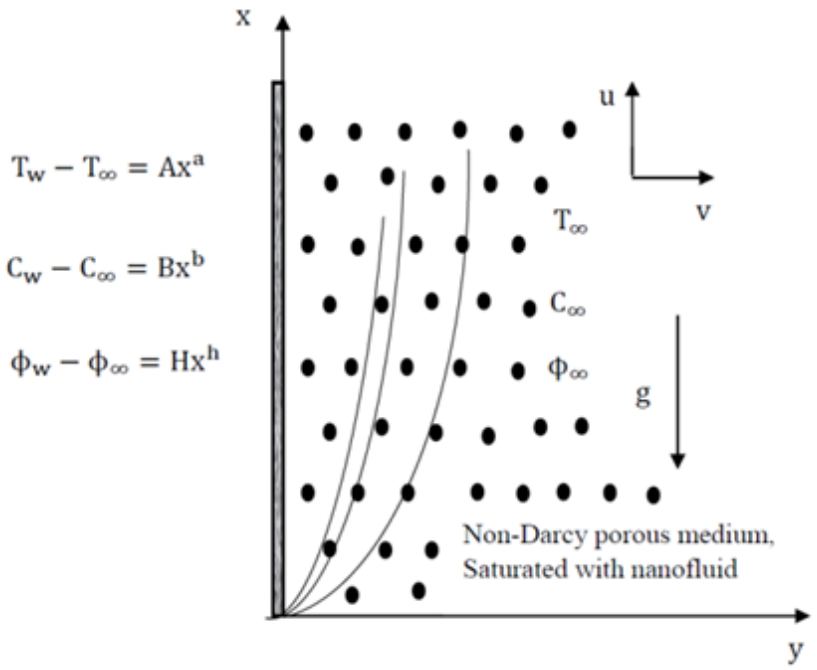
[2] *Laboratory of Mechanics, Materials and Energetic, Faculty of Technology, University of Bejaia, Algeria*

Abstract: A numerical analysis was performed to study the effects of combined double diffisive and viscous dissipation under non-uniform wall boundary conditions over a semi-infinite vertical plate embedded in a non-Darcy porous medium fig.1. Coupled heat and mass transfer of free convective boundary layer with viscous nanofluid are considered. The model used for the nanofluid includes the effects of Brownian motion and thermophoresis mechanisms, while the Darcy-Forchheimer model is used for the porous medium. The governing partial differential equations are transformed into the ordinary differential equations using an appropriate similarity transformations and the resulting system of equations is then solved numerically by the finite-difference method via bvp4c solver. In order to get a clear insight on the physics of the problem, a parametric study is performed Fig. (2-6) and obtained results highlights how the governing parameters affects the heat and fluid flow in terms of local Nusselt and Sherwood numbers.

Keywords: Heat and mass transfer; porous media; nanofluid; viscous dissipation



Graphical abstract

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Using PCA and PLS on Operating Data to Predict the Fouling Resistance in Cross-Flow Heat Exchanger

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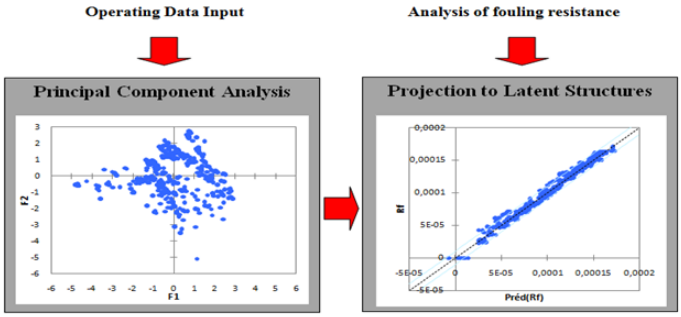
[2] *CMGPCE Laboratory,French Institute of Refrigeration (IFFI), National Conservatory of Arts and Crafts of Paris(CNAM), HeSam University, 292 Road Saint-Martin, 75003 Paris, FRANCE*

Abstract: One of the most frequent problem in phosphoric acid concentration plant is the heat exchanger build-up. This problem causes a reduction of the performance of this equipment and an increase of energy losses which lead to damage of the apparatus. In this study, estimation of fouling resistance in a cross-flow heat exchanger was solved using Projection to Latent Structures (PLS). Before modeling, Principal Component Analysis (PCA) was used to study the effect of each operating parameter on the fouling resistance. The PLS model developed showed a good prediction of the deposition phenomenon with a correlation coefficient r2 and a predictive ability equal to 0.992 and 87%, respectively.

Keywords: Heat exchanger, fouling resistance, Principal Component Analysis, phosphoric acid concentration loop, modeling, Projection to Latent Structures.



Graphical abstract

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Heat Transfer Enhancement with Magnetic Field of Swirling Nanofluid Flow

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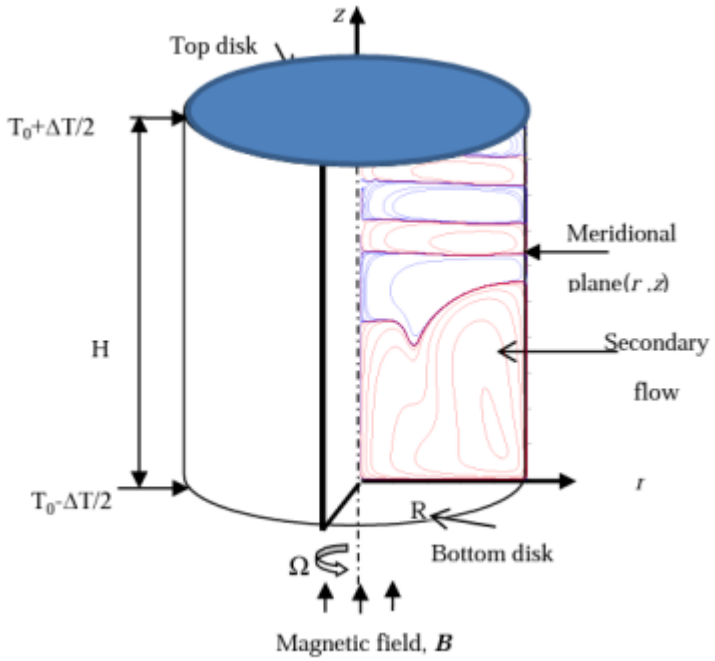
Abstract: The Effects of electrical conductivity of walls on both heat transfer enhancement and fluid layers produced in a cylindrical container are numerically analyzed. The governing equations that describe the combined problem (MHD and mixed convection) under the adoptive assumptions are solved numerically by the finite volume technique. Calculations were made for fixed Reynolds number (Re=1000), and solid nanoparticle (copper) with volume fraction (? = 0.1). A decrease in the mean Nusselt number was found with the increase of the Richardson number due to stratification layers. These latter limits the heat transfers between the hot and cold zones of the cylinder. The results indicate that the Nusselt number gets bigger within a certain range of Hartmann numbers, and especially when the rotating lid is electrically conducting. Indeed, average Nusselt number decreases while the Hartmann number increase after it exceeds a critical value. Finally, the electrical conductivity of the rotating lid plays an important role in heat transfer enhancement in nanofluid swirling flow.

Keywords: electric conductivity, enhancement, nanofluid, magnetic field, swirling flow



Graphical abstract

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Sensitivity Analysis of Artificial Neural Networks Output in Simulation of the Cross-Flow Heat Exchanger

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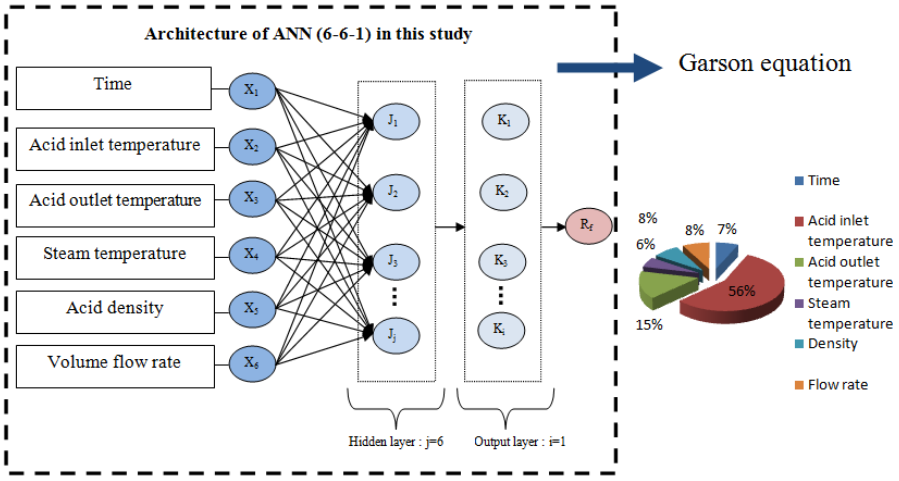
Abstract: The aim of this work was to model and predict the fouling resistance from operating data collected in phosphoric acid concentration plant by applying artificial neural networks. Prediction of fouling resistance by neural networks had six input variables (time, acid inlet and outlet temperatures, steam temperature, acid density and volume flow rate) and one output variable. Results showed that a good prediction model could be obtained by networks with single hidden layer. The neural network configuration that gave the best prediction for fouling resistance was one with 6 neurons in hidden layer for one output variable. From the results, the conclusion was that artificial neural networks are a good prediction tool for the selected network output. Also, this predictive capability allowed the application of the Garson's equation for estimating the contribution of selected process parameters on the defined output with satisfactory accuracy.

Keywords: Estimation, modeling, neural networks, Garson equation, fouling resistance, phosphoric acid concentration plant.



Graphical abstract

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Linear and non-Linear Stability Analysis of Double-Diffusive Convection in a Shallow Horizontal Rectangular Cavity Uniformly Heated and Salted From the Horizontal Sides and Filled with non-Newtonian Fluids

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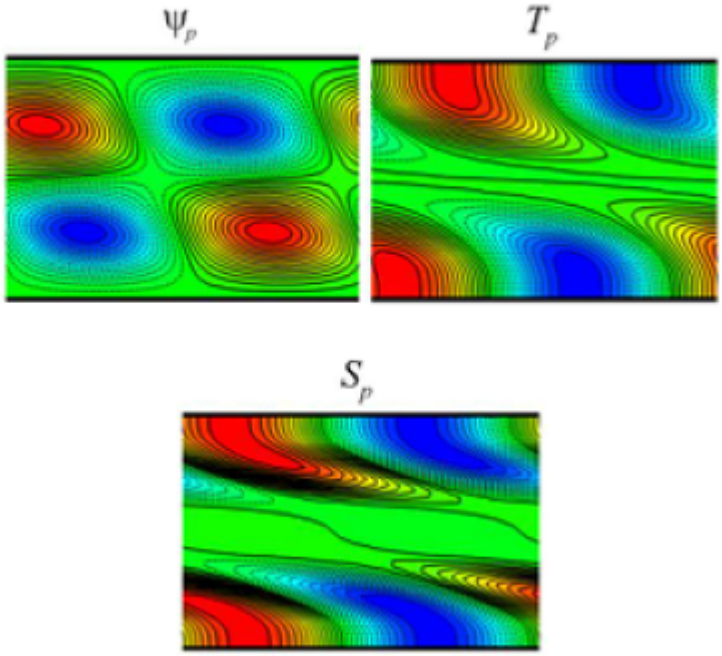
Abstract: The onset of non-linear convection in a horizontal porous layer saturated by non-Newtonian fluid is studied. The shear-thinning behavior of the fluid is described by the Carreau-Yasuda model, which includes the effect of the rheological parameters of the fluids. Constant fluxes of heat and mass are imposed on the horizontal walls of the enclosure. A new bistability phenomenon arise when the system has two steady-state solutions occurring under the same condition. The governing parameters of the problem under study are the Rayleigh number, the buoyancy ratio,the Lewis number, the normalized porosity of the porous medium and the rheological parameters of the Carreau-Yasuda mode. This work focuses on the effects of Carreau-Yasuda rheological parameters on the convective flows that occur when the thermal and solutal buoyancy forces are opposing and cooperative. By considering an infinitesimal perturbation, the linear stability analysis of the diffusive and convective states is conducted based on the finite element method. The linear stability theory is used to predict the critical Rayleigh number for the onset of motion from the rest state as well as the onset of Hopf bifurcation. The effect of varying the parameters of the Carreau-Yasuda model on the bistability region and the subsequent convective heat and mass transfer were found to be significant.Overall, the Carreau-Yasuda rheological parameters have a strong influence on the thresholds of convection.

Keywords: non-linear convection, Carreau-Yasuda model, porous layer, non-Newtonian fluid



Graphical abstract

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Calcium sulfate fouling on two different heat exchanging surfaces

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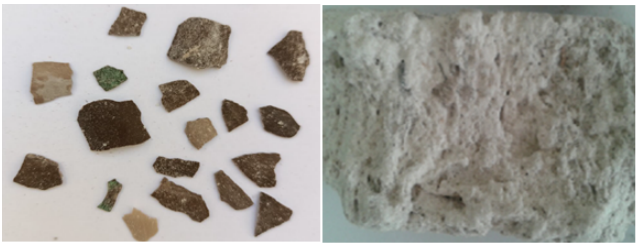
Abstract: Heat exchangers fouling in phosphoric acid concentration plant were employed to investigate the mineral scale deposition on two different heat exchangers pipe surfaces. Progressive fouling deposition on different material surfaces under the similar solution conditions were observed and analyzed. Measurable data which allowed determining the progressive build-up of scale deposits, as well as the composition of the deposits were studied after a production cycle by analyzing the deposited scale. In this study, the artificial calcium sulfate deposit on different material surfaces is considered as it is one of the major constituents of the most scales found in heat exchanging equipment. The calcium sulfate deposition rates on two different metal surfaces (graphite and stainless steel) were investigated. The results illustrated an upward trend for fouling rate with time. The deposition on the surfaces showed an asymptotic growth. However, deposition on stainless steel metal surfaces did not follow the typical thermal conductivity trends over deposition as its surface was altered by corrosion effects.

Keywords: Heat exchanger, Fouling, Deposit, Phosphoric acid concentration plant, Calcium sulfate, Surface materials.



Graphical abstract

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Performance of Salinity Gradient Solar Pond with Vertical and Inclined Walls

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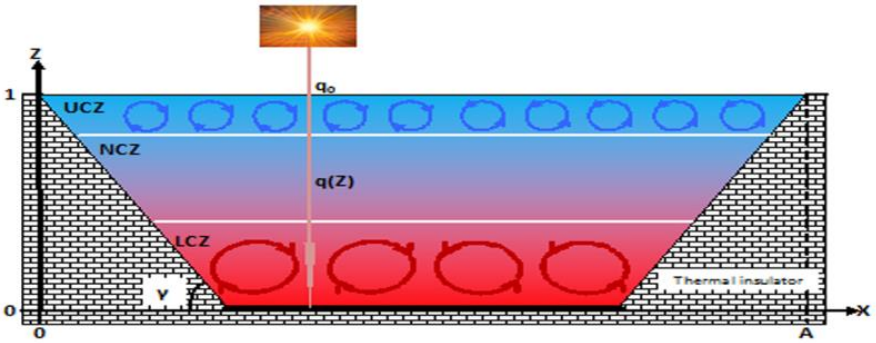
Abstract: In this paper, thermosolutal natural convection in salty water-filled, salinity gradient solar pond with vertical (?=90°) and inclined (?=45°) walls is numerically studied. A finite-volume method is used for solving numerically the mass, momentum, thermal energy, and mass transfer governing equations in transient regime. The salinity gradient solar pond consists of three distinct zones: Upper Convective Zone (UCZ), Non–Convective Zone (NCZ) and Lower Convective Zone (LCZ). The vertical and inclined walls of the salinity gradient solar pond are thermally insulated and impermeable. The bottom of the solar pond is thermally insulated, impermeable, and painted in black. This work shows the importance of tilt angle in the increase of temperature in the LCZ. It shows also that the salt concentration decreases in the LCZ with the increase of tilt angle.

Keywords: Salinity gradient solar pond; Tilt angle; Solar energy; Thermosolutal natural convection; Transient regime; Numerical simulation



Graphical abstract

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A Numerical Study on the Effect of Radiation on Natural Convection in a Two-Square Duct Annuli Filled with a Semi-Transparent Fluid

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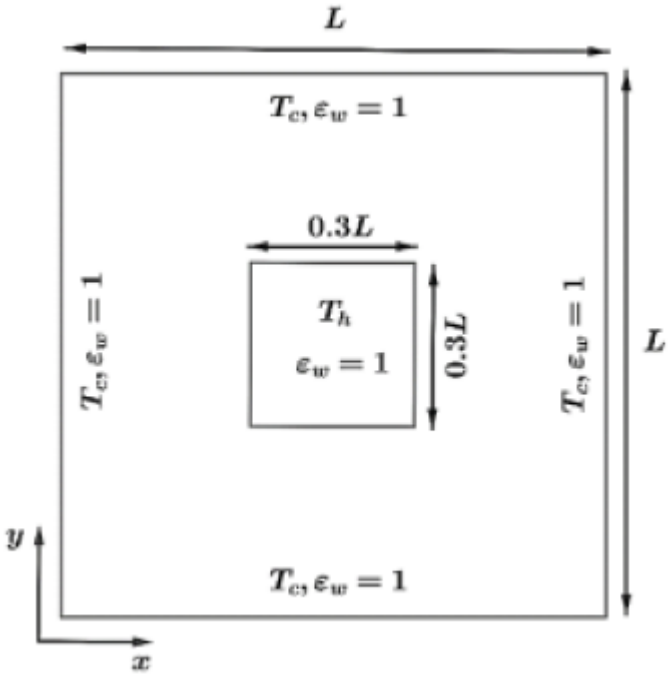
Abstract: In the present study, a numerical investigation of natural convection and volumetric radiation interactions has been analysed in an annulus between two isothermal concentric square ducts filled with a semi-transparent medium. Two-dimensional solution was obtained using a discrete ordinates method based on a combined finite volume-immersed boundary method. The fluid is assumed to be gray absorbing-emitting and non-scattering and all walls are gray, diffuse and opaque. The Rayleigh number is fixed to 106, and a study of the effect of three optical thicknesses ?=0.2-1-5 is performed on the thermal and dynamic fields and consequently on the heat transfer rate has been examined. A pure natural convection case has been shown for a comparative study. It is found that the radiation has a large influence on the flow and surface averaged Nusselt number and especially for high Rayleigh numbers.

Keywords: Natural convection; Participating medium; Volumetric radiation; Iimmersed boundary; Discrete ordinates method; Square ducts.



Graphical abstract

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Intensification of heat exchange by using a ferro-fluid under the effect of a magnetic field

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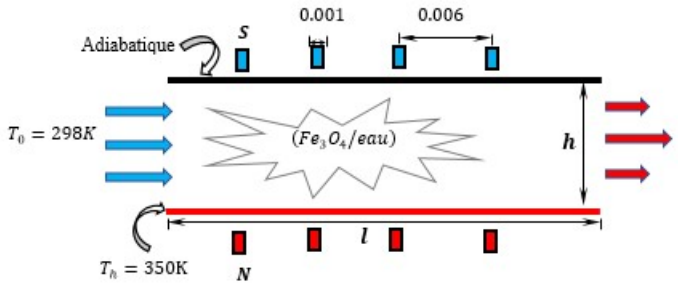
Abstract: The objective of this work is the study of a ferrofluid (water/Fe 3O 4) circulating in a channel in the presence of several identical magnetic sources. The problem studied was solved using the CFD code. The results show that the addition of magnetic nanoparticles affects the flow structure and improves heat transfer. A powerful and beneficial cooling system is obtained by increasing the intensity and number of external magnetic sources

Keywords: Mini-channel; Ferro-fluids; vortex generator; Magnetic source; Magnetic body force; Entropy generation; Bejan number; Performance criterion



Graphical abstract

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Numerical study of a heat exchanger using a phase change material (PCM)

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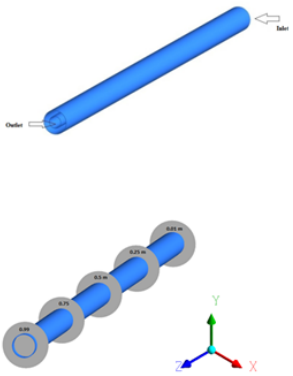
Abstract: Among the various thermal storage solutions, phase change materials (PCMs) have recently become more widely used, covering a wide range of operating temperatures. The application of PCMs as energy storage materials has aroused the interest of various industries and researchers. The solid-liquid transition property of the phase change material can be used in various industrial applications as an energy storage medium. In this regard, a numerical simulation of a PCM fusion process is carried out in the ANSYS Fluent environment. In our study we took a case of a heat exchanger, we made the study of a concentric tube with double diameter, of length of one horizontal meter in copper, by trying three different types of PCM (organic, inorganic and eutectic (organic + inorganic)) plus the reference case (water-water). In these studies we have done the heating and cooling of the water in the inner tube and the PCMs in the outer tube. The results describe the thermal behavior of an PCM fusion process and could be further integrated into any simulation of heat exchanger storage charge processes. Analysis shows that the results for both cases are indeed physical reality.

Keywords: Heat exchanger, heating, Cooling, Phase change materials (PCM), ANSYS Fluent, Temperature.



Graphical abstract

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Optimization of fouling resistance in cross flow heat exchanger using experimental design and response surface methodology

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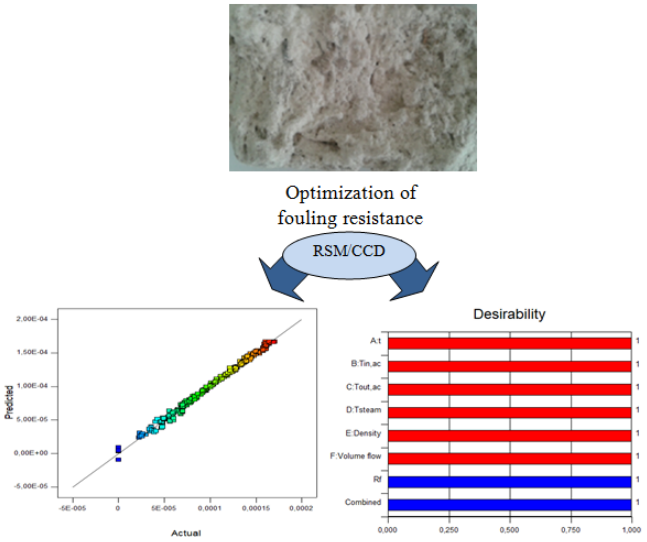
Abstract: In this present study, the fouling resistance inside the cross flow heat exchanger in phosphoric acid concentration plant has experimented at selected levels of time, acid inlet and outlet temperatures, steam temperature, acid density and volume flow rate by RSM based on Central Composite design. The findings revealed a more substantial linear effect at the fouling resistance by chosen process parameters. ANOVA results showed that the presented correlation can estimate fouling resistance with high accuracy. Moreover, the highest fouling resistance of 2.4 10-4 m2.K/W is achieved under the optimum values of 5.571 h of time, 77.863 °C of acid inlet temperature, 83.039 °C of acid outlet temperature, 116.806 °C of steam temperature, 1627.99 kg/m3 of acid density and 2747.36 m3/h of volume flow. The optimization result compared with the confirmatory experiments, and it yielded less than 1% error which ensures a better agreement with the predicted results.

Keywords: Heat exchanger, fouling resistance, Phosphoric acid concentration plant, response surface methodology, central composite design, optimization.



Graphical abstract

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Detection of Fouling in Cross-Flow Heat Exchanger in Phosphoric Acid Concentration Plant using Artificial Neural Networks

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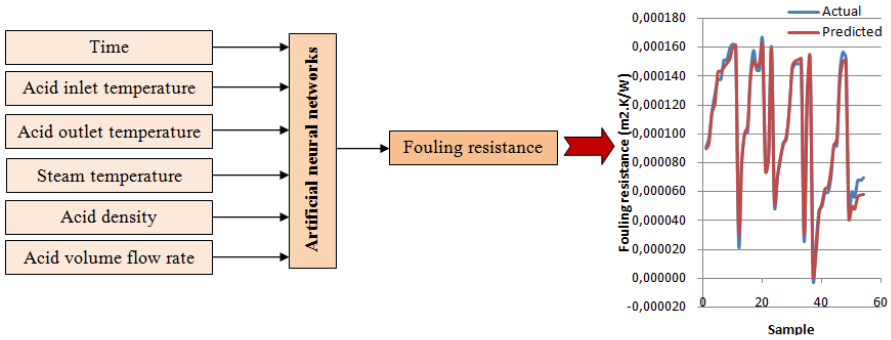
[2] *National Conservatory of Arts and Crafts of Paris, France*

Abstract: The purpose of this work is to establish a model for continuous detection of fouling formation on heat exchanger in order to schedule preventive maintenance for the cleaning of this equipment. To achieve this objective, an Artificial Neural Networks (ANN) approach was developed to predict the fouling resistance in cross flow heat exchanger of the phosphoric acid concentration plant. The network was designed and trained by using 361 experimental data points that were collected from the phosphoric acid concentration plant. These data are used for training, testing and validation of ANN. The comparison of statistical criteria of different networks shows that the optimal structure for predicting the fouling resistance is the network with 6 hidden neurons which has been trained with BFGS algorithm and hyperbolic tangent transfer function for the hidden and output layers. The heat exchanger performance is assessed by comparing results of the predicted and experimental data of fouling resistance. The developed model can reduce the performance degradation due to fouling.

Keywords: Heat exchanger, fouling resistance, artificial neural networks, phosphoric acid concentration plant, modeling.



Graphical abstract

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Heat transfer coefficient estimation and performance evaluation of cross flow heat exchanger using normal distribution analysis

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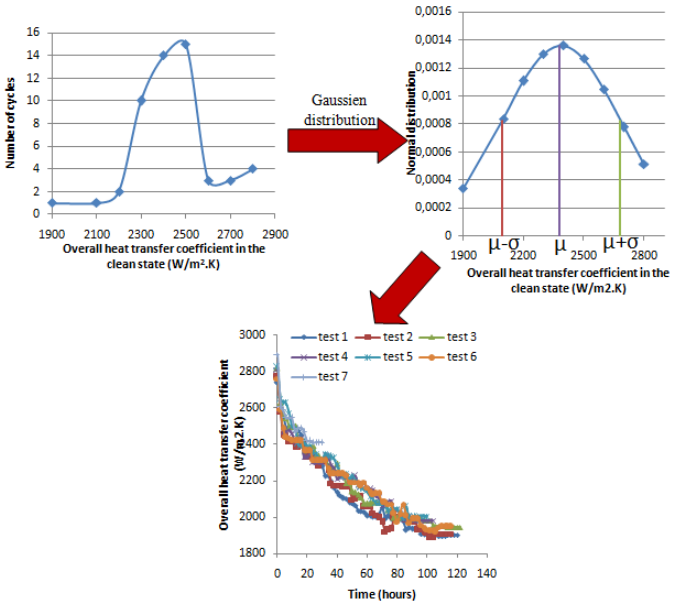
Abstract: Chemical industries consist of a set of heat exchangers, which are used to preheat the phosphoric acid. Fouling in heat exchangers is a complex phenomenon due to the acceleration of many mechanism across tubes of heat exchangers. This study was undertaken to estimate heat transfer coefficients and evaluate performance of the heat exchanger in the phosphoric acid concentration plant. In this context, several operating parameters of the concentration plant were collected in the aim to calculate the overall heat transfer coefficients. Then, a normal distribution was used to determine the interval of the overall heat transfer coefficient where the heat exchanger is effectively and properly cleaned. It was found that for the values comprising between 2682 and 2975 W/m2.K, the heat exchanger is in their effective performance. Moreover, according to the obtained results, the evolution of the overall heat transfer coefficients is studied over time. It was seen that the heat transfer coefficient of heat exchanger declines considerably during the operation period due to fouling.

Keywords: Heat exchanger, fouling, phosphoric acid concentration plant, overall heat transfer coefficient, performance, normal distribution.



Graphical abstract

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Natural convection in a rectangular cavity with an alveolus of different positions

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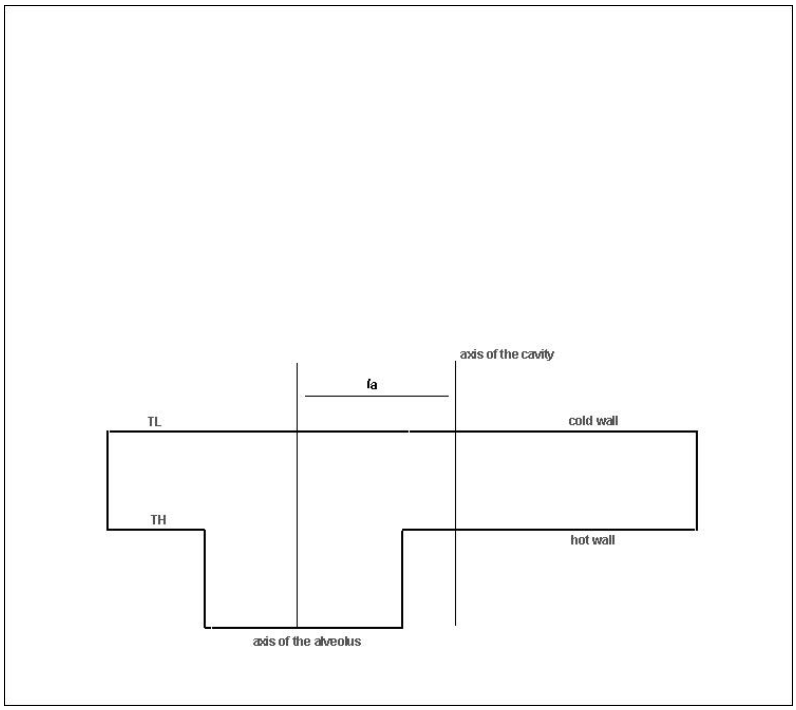
Abstract: In this work, the main objective is to study numerically laminar natural convection in a rectangular air-filled cavity, provided with a rectangular alveolus on bottom wall. Finite volume method is used to analyze influence of the cell position with different ratios of misalignment for different numbers of Grashof (104?Gr?2x105). Flow fields, temperature distribution, average and local Nusselt numbers are presented. Results show a close relationship between flow regim through Grashof number and heat transfer and rapprochement of alveolus on one of the side walls improves heat transfer in enclosure.

Keywords: : Natural Convection, Cavity, Alveolus, Finite Volume Method



Graphical abstract

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Thermal Transfer on a wall corrugated

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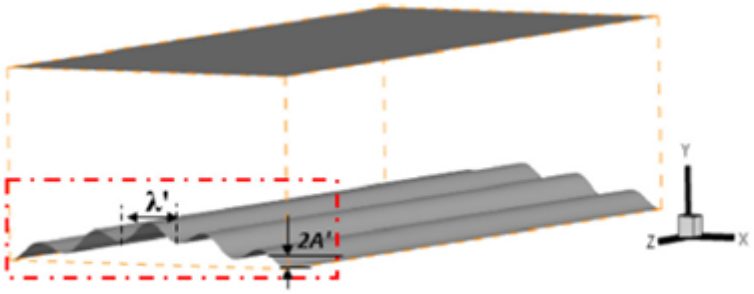
Abstract: This paper aims to determine the flow characteristics and thermal performance of plate heat exchangers. The study is divided into two parts. In the first part, four different shapes of corrugated boundaries have been recommended, rectangular, trapezoidal, triangular, and sinusoidal shapes. In addition, an artificial roughness has been introduced to improve heat transfer within corrugated channel. In the second part, a corrugated wall was used at the inlet channel. Numerical results are presented as Nusselt number (Nu) and friction factor (Cf) using the commercial software ANSYS-FLUENT where the Reynolds number is ranged between 3000 and 12000. The results of this investigation reveal that the overall thermal performance improves greatly by 50% due to the use of the sinusoidal artificial roughness and added undulations in the inlet channel. It is also observed that the latter case with the ratio A"/?" = 0.05 is the optimal design for the plate heat exchanger.

Keywords: Amplitude, Artificial roughness, Corrugated wall, SST, Nusselt number, friction coefficient



Graphical abstract

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Numerical studies on the influence of Y-shaped fin arrangement on the melting performance of a vertical PCM enclosure

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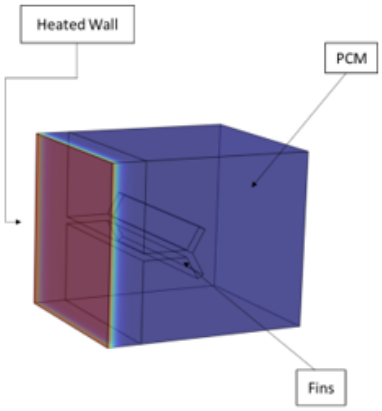
[2] *Laboratory of Electromechanical Systems (LASEM), National School of Engineers of Sfax, University of Sfax, Tunisia*

Abstract: The most common type of energy storage is Latent heat thermal energy storage systems (LHTES) that use phase transition materials (PCMs) are regarded as one of the most efficient energy storage approaches. The capacity of LHTES to retain thermal energy with minimum temperature fluctuation is its primary benefit. The effect features and mechanism of fin position on phase change material melting behavior in vertical rectangular containers with different Y-shaped wings locations were computationally investigated using an enthalpy-porosity approach. Under a heat source input of 1000 watts per square meter, the RT 27 was used as the PCM and it was tested at time increments of 10 minutes, 30 minutes, 50 minutes, and 60 minutes. It was discovered that the fin placement influences the natural convection process, resulting in various PCM melting rates. Furthermore, the bottom fin placement has the strongest heat transfer enhancement performance, lowering melting period by 11% compared to the top fin placement scenario. In addition, the impact of wing position becomes more pronounced when located in the bottom half of the surface. It was determined that the placement of the wings might be improved to increase total latent heat storage effectiveness

Keywords: Y-shaped fins; PCM; liquid fraction; melting process; thermal energy storage fin location; melting; rectangular enclosure; numerical simulation



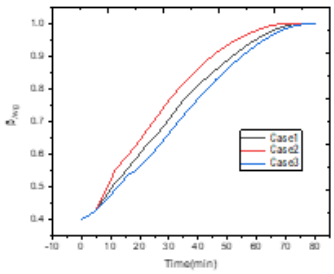


Figure 5: Melt fraction as a function of time for all cases

Graphical abstract

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Numerical investigation on effect of fins orientation on melting performance of NEPCM in an annulus enclosure

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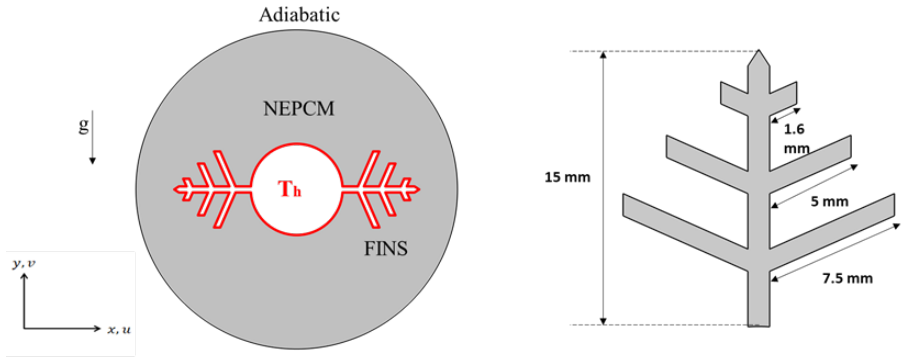
Abstract: Latent heat thermal energy storage systems (LHTES), which utilize nano-enhanced phase change materials (NEPCMs), are one of the most popular methods for storing energy. The capacity of NEPCM-based LHTES to store thermal energy with little temperature fluctuation is its key benefit. The features and mechanism of fin orientation on NEPCM melting behavior in annulus enclosures were investigated numerically using the enthalpy-porosity technique. The investigation used paraffin wax enriched with Cu nanoparticles packed in an annular space with a finned tube at different orientations. Due to the presence of natural convection, it was discovered that the melting rate seen in the top portion of the investigated annulus is much higher than that observed in its lower half. The whole NEPCM takes 274, 206, and 138 minutes to melt in examples 1, 2, and 3, respectively. It was determined that the phase transition process may be greatly sped up if the fins are placed vertically. When the fins were oriented vertically as opposed to horizontally, the overall melting time was decreased by 49.63%.

Keywords: branching fins; PCM; liquid fraction; melting process; thermal energy storage.



Graphical abstract

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Technologies, Product and management

Industrial and production technology

Disassembly process time evaluation and its potential improvement on production lines

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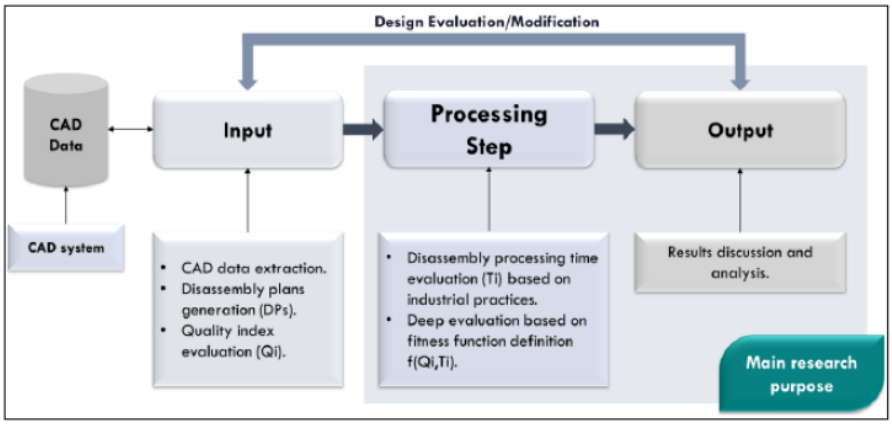
Abstract: Disassembly is one of the most important processes in maintenance and recycling of industrial products. For reasons of efficiency, it is mandatory to optimize its activities by reducing: tools's changing/directions, process variation, wastes, etc. The simulation of Disassembly Plan (DP) allows the predefinition of problems from the design phase in order to avoid them as much early as possible. This research paper proposes an analytical formulation which combines two principal parameters: The index of processing Time (Ti) and the index Quality (Qi) in order to select the optimal disassembly plan. The Failure Mode, Effects and Criticality Analysis method is implemented to compute Qi. Ti is obtained according to real production activities (workspace, layout, tools, machines, etc.). Based on 5S method, the workspace can be optimized which directly impacts the timing index and impact the selection of the best DP. A gear box is used to show up the importance of the proposed approach.

Keywords: Evaluation of disassembly plan, Quality rate, index of Operating time, KAIZEN, Lean thinking.



Graphical abstract

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Optimization of Cutting Parameters for Removal Rate of Medium Carbon Steel C-45 in CNC Turning Machining by Using Taguchi Method

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[2] *College of Reengineering Technology-Janzour Libya*
[3] *High Institute of Industrial Technology-Engila*
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Abstract: The goal of this paper is to increase the precision of CNC turning parameters with a high material removal rate for the components constructed of medium carbon steel C45 utilizing a carbide cutting tool (coated insert cemented carbide) which has high resistance of deflection, wear and fraction on CNC turning operation with coolant. To obtain the rapid rate of material removal, the Taguchi method was used for the optimization of the turning experiments based on a full factorial design, to determine three different parameters and levels by using orthogonal arrays, 9 experiments. The three parameters which were conducted (feed rate, cutting speed, and cut depth) were important, the cutting parameters were selected as follows: Feed rate (0.075, 0.100, 0.125mm), cutting speed (166.24, 180.70, 197.32 m/min), depth of cut (0.5, 0.75, 1.0 mm) these parameters were chosen according to SANDVIC tool manufacturing company. A series of turning experiments were performed to measure the material removal rate. The MINITAB statistical software was used to calculate the ratio of signal to noise (S/N), and analysis of the variance (ANOVA), the best at their best, and the effect of the process parameters on high material removal rate was obtained. The experiment of the rate of material removal, the feed (0.125mm/rev), cutting speed (197,32mm/min), and cut depth (1.0mm), and was conducted in experiment number seven (7). Confirmation of the experiment to obtain optimal varying process parameter values was carried out to demonstrate the effectiveness and efficiency of the employed Taguchi method as a tool to measure material removal rate.

Keywords: CNC, Taguchi method, SANDVJC, MLNLTAB, level, parameters, speed, feed rate, depth of cut

Graphical abstract

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Maintenance and reliability

Fault analysis of induction motor drive fed by PMW voltage source inverter

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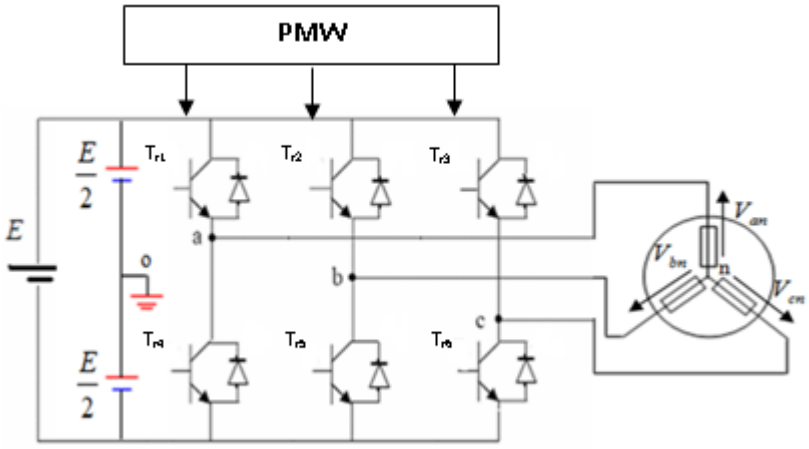
[3] *Department of Electrical Engineering L2GEGI Laboratory, Faculty of applied science, University of Tiaret, Algeria*

Abstract: Fault diagnosis technique of electrical drives is becoming more and more important, since voltage fed converter system has become industrial standard in many applications. In this paper, we present a technique method based on spectral analysis of stator currents to detect broken rotor bars fault in the rotor of motor and an open circuit fault in IGBTs of inverter. Therefore, the proposed diagnostic method this allows detection to view motor and inverter AC currents in the time independent realm by using cycle-by-cycle single point symmetry of the current spectrum. The simulation results show that the presented algorithm is effective and accurate.

Keywords: Induction Motor, inverter, PMW, broken rotor bars, switch open fault, Concordia transform.



Graphical abstract

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Materials and engineering technologies

Adhesion strength and corrosion resistance of hydroxyapatite coating for biomedical implant applications

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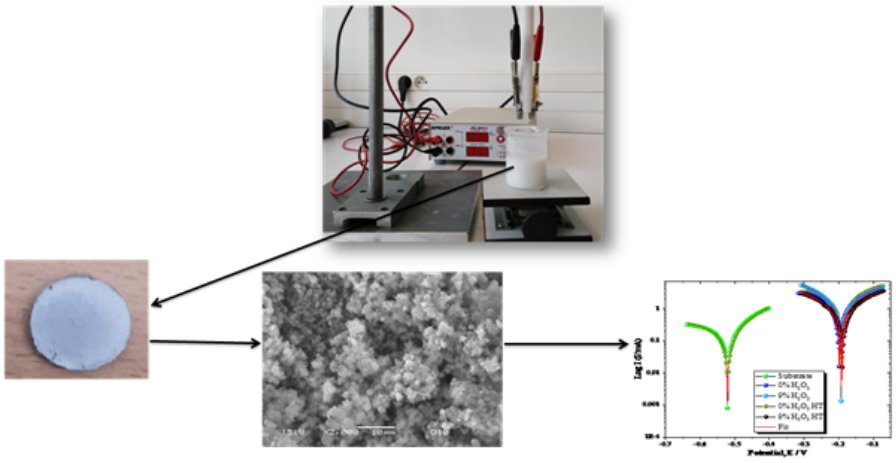
Abstract: In this study, the aim is to investigate the influence of heat treatment and H2O2 amount on the adhesion and corrosion behavior of HaP coatings developed by pulsed electrodeposition. The surface morphology, structural properties of HAP coatings were assessed using scanning electron microscopy associated with X-ray microanalysis (SEM-EDXS) and X-ray diffraction (XRD). Sstach tests were carried out for the analysis of adhesion behavior. The corrosion resistance of the coatings was studied by electrochemical tests. The obtained results showed that with 9% H2O2, the HAP film presented a compact and homogeneous microstructure. The film also showed crystal growth: stoichiometric hydroxyapatite (HaP) and ?-tricalcium phosphate (?-TCP). Critical load (LC3) was increased from 7.95 N to 10.3 N. In fact, the heat treatment was effective in enhancing the passive layer resistance and reducing the corrosion current density (Icorr) compared to the substrate. Due to the decrease in Icorr, the polarization resistance ecreased and reached a maximum of 38.81 ?•cm2 for the 9%H2O2 coating. These results show that the corrosion behavior of the Hap thin film was affected by the presence of H2O2 and thermal treatment.

Keywords: hydroxyapatite, scratch test, corrosion, hydrogen peroxide.



Graphical abstract

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The effect of adding different types of natural fibers on the mechanical properties of mortars

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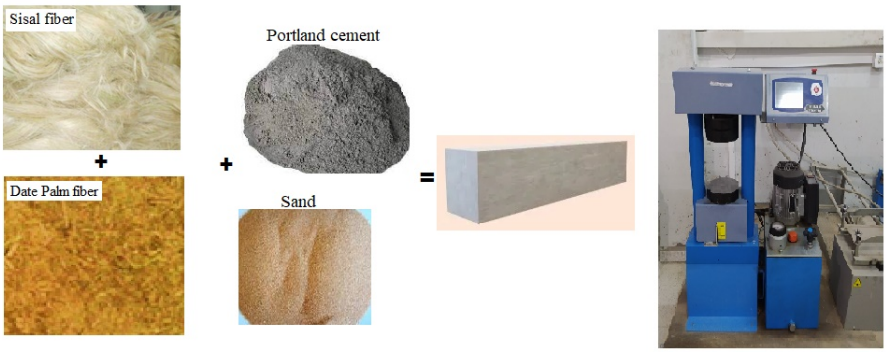
[2] *Department of Science and Technics, Faculty of Science &Technology, University Mohamed El BachirEl Ibrahimide B.B.A 34030, Algeria*

Abstract: The aim of this work is to evaluate the effect of natural fibers: sisal and palm fibers on the different properties of mortars have been studied through a number of tests. Properties investigated include compressive strength, and flexural strength, Sisal fiber was used at three percent of the total mix weight (0.5, 1, and 1.5%, respectively), while palm fiber were added (3 and 6%, respectively) by weight. The results obtained show that the mortar reinforced with sisal and palm fibers improved flexural strength without a significant alteration in compressive strength occurred. The results also show improvements in mortar impact resistance by the addition of sisal and palm fibers, which give a maximum increase of 117.8 and 283.6%, respectively for 1.5% sisal fiber and 7 .5% palm fiber.

Keywords: Natural fibers, Date Palm fiber, Sisal fiber, Compressive strength, Flexural strength, Mechanical properties



Graphical abstract

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Thermal characterization of bio sourced materials reinforced with date palm fibers

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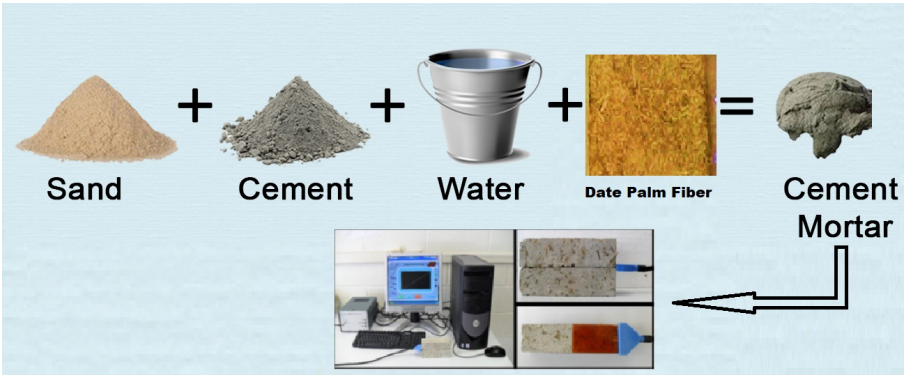
[2] *Department of Science and Technics, Faculty of Science &Technology, University Mohamed El BachirEl Ibrahimide B.B.A 34030, Algeria*

Abstract: This work focuses on the thermal characterization of biomaterials based on mortar and date palm fibers (DPF). The objective is to evaluate the thermal insulation properties of this material for the thermal insulation of buildings. The volume percentage of date palm fibers in the test samples ranged from 0% to 40%. The thermal characteristics of these samples were determined experimentally in terms of conductivity, diffusivity, capacitance and effusivity. The results show that date palm fibers have a positive effect on the thermal properties of biomaterials. Indeed, it considerably improves the insulating power of the mortar, increases the damping rate of heat diffusion and makes the mortar lighter. The DPF also improves the ductility of the mortar.

Keywords: Natural fibers, Date Palm fiber (DPF), Thermal characterization, bio sourced materials, conductivity, diffusivity, capacitance, effusivity.



Graphical abstract

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Email: samirbenaniba@yahoo.fr

Characteristics of mortars reinforced with date palm fibers

Samir Benaniba [1] *, Mokhtar Djendel [2], Oussama Kessal [2], Rabah Boubaaya [2], Driss Zied [1]

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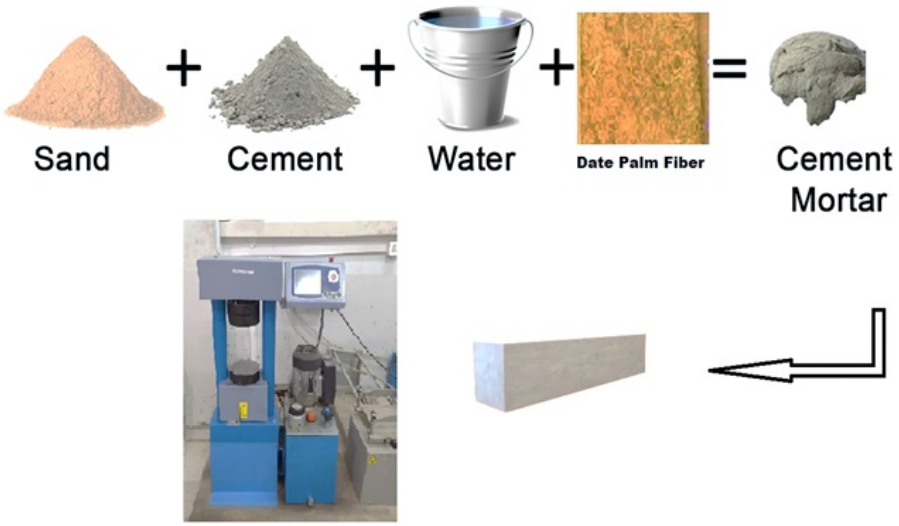
[2] *Department of Science and Technics, Faculty of Science &Technology, University Mohamed El BachirEl Ibrahimide B.B.A 34030, Algeria*

Abstract: This work focuses on the mechanical characterization of composite materials based on mortar and of date palm fibers (DPF). The objective is to evaluate the properties and the mechanical performances of this material. The volume percentage of date palm fibers in the test samples ranged from 0% to 30%. Mechanical characteristics of these samples were determined experimentally in terms of the flexural and compressive strength of the samples was systematically evaluated. The results show that DPF date palm fibers have a positive effect on the mechanical properties of the materials. The DPF also improves mortar ductility while respecting the mechanical requirements of the construction materials.

Keywords: Date Palm fiber (DPF), mechanical characterization, flexural strength, compressive strength, mechanical properties of mortar



Graphical abstract

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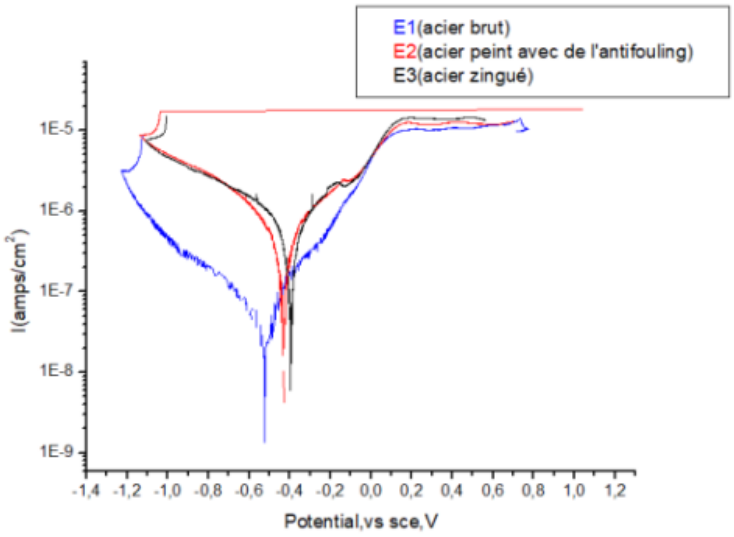
Corrosion Resistance of HSLA Steel After Combined Surface Treatment In Simulated Seawater

Arwa Toumi [1] *, Chokri Boubahri [1], Jalel Briki [1]

[1] *Energy and Environment Research Unit, Enit BP 37, 1002 Tunis Le Belvedere, Tunisia*

Abstract: This paper presents an environment friendly technique to enhance the corrosion resistance of high strength low alloy steel (known as HSLA steel) grade NV EH32 used in the construction of ship hulls. The experimental procedure consists of using zinc particles deposits on the surface of the metal after being shot peened. This surface treatment shows considerable results by decreasing the pores and residual stress resulting from the cold rolling process. Thus, it showed excellent corrosion resistance in electrochemical tests and a good adherence with the base metal particles. Besides accelerated corrrosion test revealed that the shot-peened Zn coating can effectively protect HSLA steel from corrosion.

Keywords: corrosion resistance, surface treatment, shot peening



Graphical abstract

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Email: arwatoumi123@gmail.com

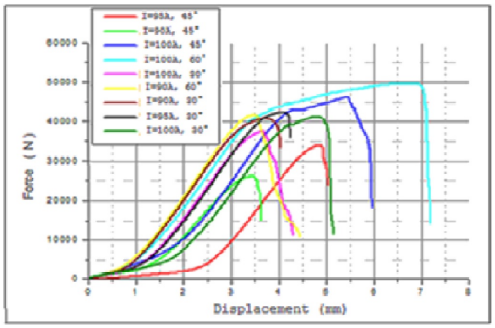
Technological Parameters Effect on Structural and Mechanical Properties of Assembled steels obtained by Manual Electric Welding Process

Younes Benarioua [1] *

[1] *Department of Mechanical Engineering, Faculty of Technology, University of M'sila, Bordj Bou Arréridj Road, 28000 M'sila, Algeria*

Abstract: Welding is the technic of assembling more metal parts with or without bring metal. The several welding processes have been regrouped into a group of fusion welding. This last is based on the principles of heat application to assemble the materials to be welded. Different welding processes are determined by the thermal energy source whether it results from electrical, chemical and mechanical energy, with a variety of different techniques available. The aim of this work is to study the effects parameters of electrical manual welding as current, arc voltage and type of chamfer on the structural and mechanical properties of welding seam of steel parts assembled by manual arc welding was investigated in this study. Three types of current, three types of potentials and three types of chamfers were chosen during this study. After analyzing by various characterization technics of all samples assembled by the welding process mentioned, the three technological parameters of current, arc voltage and chamfer kind selected in this study were optimized.

Keywords: Welding, Current, Voltage, Chamfer, Steel.



Graphical abstract

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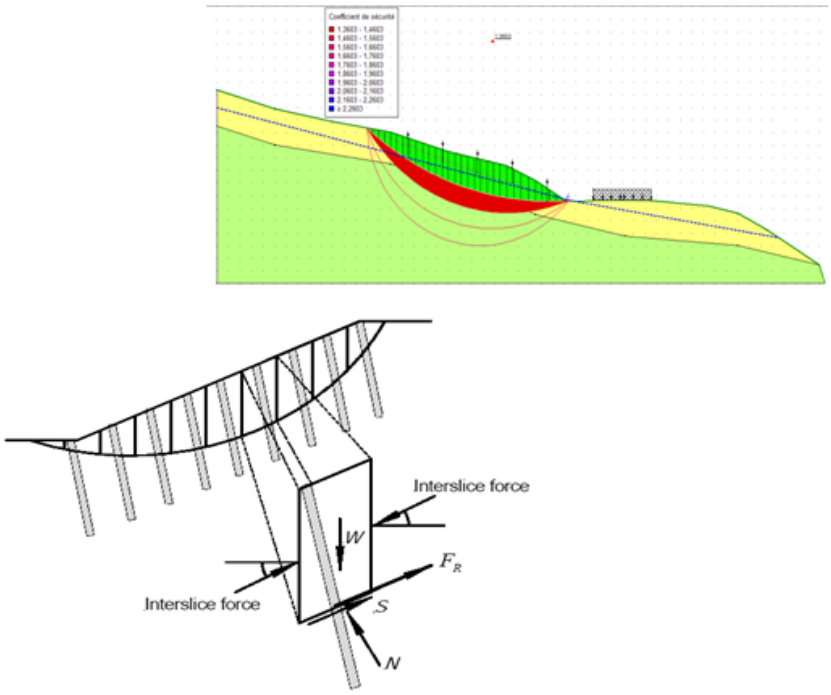
Reinforcement of unstable slopes with recycled plastic pins RPP

Fatima Zohra Benamara [1] *, Chiraz Kechkar [1], Ghania Nigri [1], Messaouda Bencheikh [1], Mohamed Salah Nouaouria [1]

[1] *Laboratory Civil and Hydraulic Engineering (LGCH), 8 mai 1945 University, Guelma, Algeria, B.P. 401, 8 mai 1945 University, Guelma, ALGERIA*

Abstract: Failure slopes pose a risk to public and private infrastructure. The cost of maintenance slopes along highways, roads, railway tracks is very important. To solve these problems, recycled plastic reinforcing pins (RPP) are installed in the slopes to intercept potential sliding surfaces and provide the resistance necessary to maintain slope stability over the long term. Recycled plastic pins (RPP) act as side piles. The slope stability study was carried out by varying the spacing and lengths of the recycled plastic pins (RPP). In order to evaluate the safety factors, the reinforced slope was analyzed by the limit equilibrium methods Bishop, Fellenius and Junbu implemented in the Slope program integrated in the Geostudio 2012 software. The results obtained will be interpreted to determine the effect of the variation in spacing and lengths of the RPP on the stability of the slopes. Therefore, show the value of using recycled plastic in the manufacture of recycled plastic pins (RPP) which reduces the volume of plastic waste.

Keywords: Geostudio 2012, Safety factor, Slopes Stability, Recycled plastic pins RPP, Reinforcement



Graphical abstract

***Corresponding author:** Fatima Zohra Benamara
Email: benamara_fati2003@yahoo.fr

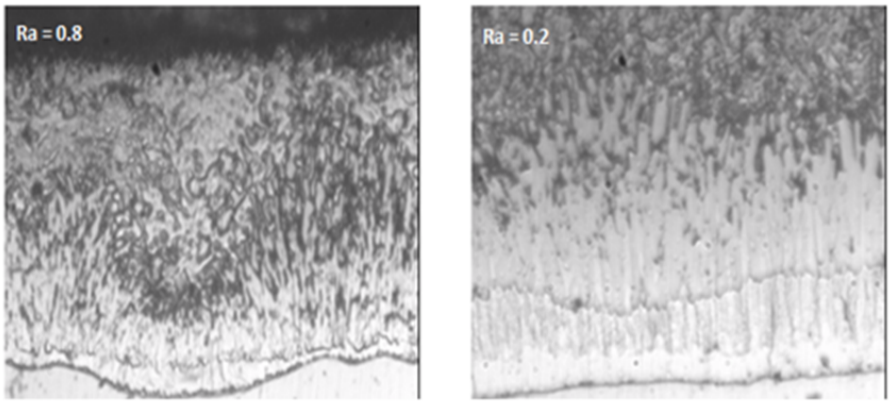
Effect of surface roughness of steel on structural and mechanical properties of galvanization coatings

Younes Benarioua [1] *

[1] *Department of Mechanical Engineering, Faculty of Technology, University of M'sila, Bordj Bou Arréridj Road, 28000 M'sila, Algeria*

Abstract: Zinc and some of its alloys have a number of characteristics that make it well suited for use as a protective coating against the corrosion of steel substrates under severe atmospheric conditions. The metal zinc, which represents the main galvanization element offers then a cathodic protection to the ferrous materials. Because of these excellent characteristics, galvanization coatings are expected to be used for different protective applications fields. The aim of this research work is to study the effect of surface roughness of steel substrate on structural and mechanical properties of intermetallic compounds of galvanization coatings obtained at different immersion time. After a best preparation of here surfaces by different roughness process, various steel of substrates were galvanized by immersion in a molten zinc bath maintained at 450°C During the galvanization process, the chemical reactions that take place between the steel and the liquid zinc give rise to the formation of different intermetallic. Thus, three phases of Gamma, Delta and Zeta are produced on the steel substrate. Theses metallic compounds have been coated then by a solid solution of iron in zinc Eta). These intermetallic compounds are hard and fragile and the product that is obtained is not suitable for working, since this would inevitably lead to cracking and detachment of the coating. The morphology and thickness of phases formed the coatings at different parameters took place with scanning optical microscope. Finally the hardness of coatings was measured with a Vickers hardness tester.

Keywords: Steel, zinc, galvanization, iron



Graphical abstract

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Email: benariouayounes@yahoo.fr

Effects of partial discharges on epoxy resin used in the insulation of electrical machines

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[2] *Laboratory of Materials and Mechanical Engineering, UFR Sciences, University of Reims, France*
[3] *LATAGE Laboratory, University of Mouloud Mammeri , Tizi-Ouzou, 15000, Algeria*

Abstract: In electrical machines, particularly those used in the medium and high voltage range, partial discharges between turns and between turns and ground constitute a significant cause of the aging of insulators. In this work, we present the results of an experimental study on the effects of partial discharges on the electrical and dielectric properties of insulating varnishes of electrical machines. The evolution of the intrinsic dielectric properties of these materials such as the relative permittivity, the resistivity and the dissipation factor are measured by the technique of dielectric spectrometry in a frequency range (1kHz – 10 kHz). The results of these measurements are discussed according to the duration of application of the electrical stress. The relative permittivity, the electrical resistivity and the dielectric loss factor depend on the frequency and the duration of the application of the electric field. The state of degradation of the insulator is evaluated by observations with a scanning electron microscope (SEM) and by analyzes by Fourier transform infrared spectrometry (FTIR). The micrographs showed that above a certain voltage value significant erosion occurs on the surface of the dielectric subjected to electric discharges. The discharge currents depend on the duration of application and the applied voltage level.

Keywords: FTIR analyses, partial discharges, surface degradation, SEM micrographs, epoxy resin.

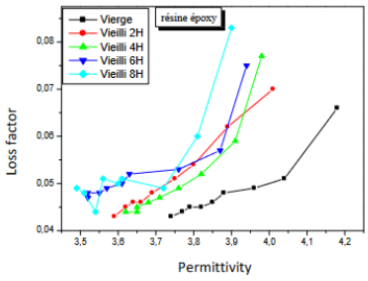

Fig.1. Variation of the loss factor as a function of the permittivity

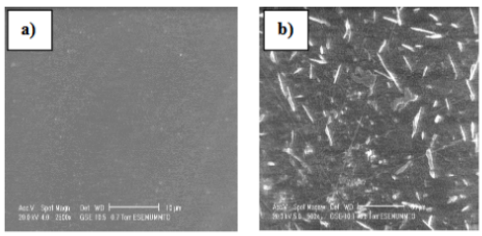

Fig.2. SEM micrograph of Epoxy resin sample: a) un-aged, b) aged for 8 hours of

Graphical abstract

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Email: h.belhiteche@yahoo.fr

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AICME

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Author Index

22	Abderaouf Djeghdjough	ICME2022-003
23	Abderrahim Talha	ICME2022-077
24	Abderrahmane Aissa	ICME2022-054
		ICME2022-098
		ICME2022-101
		ICME2022-137
		ICME2022-144
25	Abderrahmane Benbrik	ICME2022-055
26	Abderrahmane Ghezal	ICME2022-049
27	Abderrahmen Benabed	ICME2022-078
28	Abderrezak Bezazi	Keynote 5
		ICME2022-087
		ICME2022-089
		ICME2022-093
		ICME2022-104
		ICME2022-140
		ICME2022-179
29	Abdessamad Ammani	ICME2022-144
30	Abdessamad Faik	ICME2022-038
31	Abdessamed Atoui	ICME2022-093
32	Abilo Silva	ICME2022-093
33	Abir Yahya	ICME2022-072
34	Aboubaker Essadiq Mazouz	ICME2022-092
		ICME2022-121
		ICME2022-132
		ICME2022-155
		ICME2022-159
		ICME2022-160
35	Adel Sahi	ICME2022-002
36	Ahmed Aboura	ICME2022-181
37	Ahmed Al Mers	ICME2022-038
		ICME2022-040
38	Ahmed Amine Daikh	ICME2022-086

39	Ahmed Ben Cheikh Larbi	ICME2022-010
40	Ahmed Drai	ICME2022-086
41	Ahmed Ketata	ICME2022-144
		ICME2022-146
42	Abedelkader Kirad	ICME2022-109
43	Abir Yahya	ICME2022-072
44	Ahmed Z.dellil	ICME2022-094
45	Akram Aleiah	ICME2022-166
46	Ali Akka	ICME2022-115
		ICME2022-116
		ICME2022-121
47	Ali Benhamena	ICME2022-012
48	Ali Benhaoua	ICME2022-147
49	Ali Bouzidi	ICME2022-116
50	Alia Khanfir	ICME2022-167
51	Amar Abboub	ICME2022-140
		ICME2022-181
52	Amel Miled	ICME2022-042
53	Amina Mataoui	ICME2022-039
54	Amine Charfi	ICME2022-006
55	Amine Haddam	ICME2022-071
56	Amine Khiat sidi mohammed	ICME2022-051
57	Annis Aghbari	ICME2022-017
58	Anouar Nasr	ICME2022-048
59	Antoine Brunet	ICME2022-171
60	Antonio Claudio kieling	ICME2022-179
61	Anurag Dubey	ICME2022-011
62	Aour Benaoumeur	ICME2022-086
63	Aref Maalej	ICME2022-110
64	Arwa Toumi	ICME2022-058
		ICME2022-114
65	Assia Aidoud	ICME2022-014

		ICME2022-025
		ICME2022-105
	B	
66	Bachir Meziani	ICME2022-002
		ICME2022-085
		ICME2022-088
67	Badis Bakri	ICME2022-047
		ICME2022-061
		ICME2022-148
		ICME2022-150
68	Badis Bennecer	ICME2022-075
69	Belhassen Lachhel	ICME2022-162
70	Belkacem Belhadj	ICME2022-062
71	Belkacm ould Said	ICME2022-004
		ICME2022-028
		ICME2022-029
72	Bénilde Costa	ICME2022-045
73	Billal Ariallah	ICME2022-026
74	Bouthayna Mhamdi	ICME2022-016
75	Brahim Mahfoud	ICME2022-019
76	Brahim Necib	Keynote 7
	C	
77	César Alberto Chagoyen méndez	ICME2022-179
78	Chihaoui Salim	ICME2022-169
79	Chiraz Kechkar	ICME2022-097
		ICME2022-117
80	Chokri Boubahri	ICME2022-114
		ICME2022-058
81	Chokri Bouraoui	ICME2022-048
82	Christophe Marvillet	ICME2022-018
		ICME2022-020
		ICME2022-050
		ICME2022-074

122	Haithem Boumediri	ICME2022-089
		ICME2022-179
123	Hajer Souissi	ICME2022-045
124	Hamdi Hinteti	Keynote 10
125	Hamedi Messaoud	ICME2022-085
126	Hamid Abdi	ICME2022-003
127	Hamza Ali Agha	ICME2022-017
128	Hamza Chiboub	ICME2022-144
129	Hanane Chiradi	ICME2022-065
130	Hanen Jrad	ICME2022-175
131	Hani Benguesmia	ICME2022-047
		ICME2022-060
		ICME2022-061
		ICME2022-115
		ICME2022-116
		ICME2022-122
		ICME2022-123
		ICME2022-148
		ICME2022-150
		ICME2022-163
		ICME2022-164
132	Hasna Abid	ICME2022-144
133	Hasnia Hadar	ICME2022-078
134	Hassen Ayed Chraiga	ICME2022-033
135	Hassen Merzouk	ICME2022-134
		ICME2022-181
136	Hatem Bentaher	ICME2022-111
137	Hatem Kanfoudi	ICME2022-067
138	Hatem Mhiri	ICME2022-056
139	Hayet Debbich	ICME2022-010
140	Haythem Nasraoui	ICME2022-154
141	Hedi Kchaou	ICME2022-152
142	Hemza Gherdaoui	ICME2022-102

143	Hiba Cherif	ICME2022-064
144	Hicham Bourouina	ICME2022-133
145	Hocine Bensaha	ICME2022-026
146	Hocine Khelifa	ICME2022-087
		ICME2022-089
147	Hussam Dheyab	ICME2022-053
148	Hyung-Ho Park	ICME2022-140
	I	
149	Ibrahim Mabrouki	ICME2022-013
		ICME2022-182
150	Idir Kecili	ICME2022-034
		ICME2022-035
151	Iman Abdelhadi	ICME2022-163
152	Imen Bahrini	ICME2022-063
153	Imen Belhadj	ICME2022-127
		ICME2022-128
154	Imen Elhamdi	ICME2022-045
155	Ines Amamri	ICME2022-154
156	Ishak Ouzeri	ICME2022-125
157	Ismail Baklouti	ICME2022-144
158	Ismail Boutabba	ICME2022-084
	J	
159	Jalel Briki	ICME2022-058
160	Jalila Sghaier	ICME2022-157
161	Jamel Mars	ICME2022-175
162	Jamil Zinoubi	ICME2022-066
163	José Costa de macedo neto	ICME2022-179
	K	
164	Kamel Bensaid	ICME2022-009
165	Kamel Hamidou	ICME2022-094
166	Kenza Zaibak	ICME2022-070
167	Khadidja Boualem	ICME2022-094
168	Khadidja Kehli	ICME2022-062

169	Khaled Aljaly	ICME2022-166
170	Khaled Souaissa	ICME2022-111
171	Khaoua Laabbed	ICME2022-084
172	Khelafi Mourad Abdelouahab	ICME2022-141
173	Kyu-Yeon Lee	ICME2022-140
	L	
174	Laila Boutas	ICME2022-066
175	Lallouani Hellali	ICME2022-092
		ICME2022-121
		ICME2022-132
		ICME2022-155
		ICME2022-159
		ICME2022-160
176	Lamia Benhamadouche	ICME2022-007
		ICME2022-008
		ICME2022-013
177	Lassad Amami	Keynote 8
178	Lazhar Belabed	ICME2022-014
		ICME2022-105
179	Leila Bechane	ICME2022-122
180	Loukmane Zeddam	ICME2022-109
181	Lwiza Dib	ICME2022-039
	M	
182	M. Moudoud	ICME2022-165
183	Maamar Dakmoussi	ICME2022-170
184	Maamar Laidi	ICME2022-059
185	Mabrouk Hacini	ICME2022-131
186	Mabrouk Mosbahi	ICME2022-151
187	Madiha Khlifi	ICME2022-152
188	Mahdi Aicha	ICME2022-127
		ICME2022-128
189	Maher Dammak	ICME2022-006
190	Malek Abid	ICME2022-110

191	Manar Al-jethelah	ICME2022-053
192	Manel Kharrat	ICME2022-180
193	Marco Sinagra	ICME2022-146
194	Marcos Dantas dos santos	ICME2022-179
195	Mariem Ajmi	ICME2022-161
196	Mariem Ammar	ICME2022-173
197	Mariem Lajnef	ICME2022-151
198	Maroua Saggar	ICME2022-048
199	Marwa Ennouri	ICME2022-067
200	Marwa Ezzine	ICME2022-064
201	Marwa Fakhfekh	ICME2022-110
202	Marwa Hannachi	ICME2022-146
203	Mawloud Hamdi	ICME2022-051
204	Mbarek Marzougui	ICME2022-066
205	Medjahed Bendida	ICME2022-051
		ICME2022-071
206	Meriem Djanette blizak	ICME2022-095
207	Meriem Dorbani	ICME2022-025
208	Messaoud Hamdi	ICME2022-002
209	Messaouda Boutahir Born Bencheikh	ICME2022-014
		ICME2022-025
		ICME2022-097
		ICME2022-105
		ICME2022-117
210	Michel Aillerie	ICME2022-112
211	Mihai Arghir	ICME2022-171
212	Moez Chafra	ICME2022-016
213	Mohamed Aksouh	ICME2022-039
214	Mohamed Ali Jemni	ICME2022-168
		ICME2022-173
215	Mohamed Amine Samet	ICME2022-173
216	Mohamed Athmane Yalles	ICME2022-084
		ICME2022-106

217	Mohamed Batouche	ICME2022-129
218	Mohamed Debiane	ICME2022-031
219	Mohamed Farooq Wani	ICME2022-006
220	Mohamed Ikhlef chaouch	ICME2022-012
221	Mohamed Kaffel	ICME2022-142
222	Mohamed Kharrat	ICME2022-006
223	Mohamed Razak Jeday	ICME2022-018
		ICME2022-020
		ICME2022-074
		ICME2022-076
		ICME2022-083
		ICME2022-172
224	Mohamed Roubehie Fissa	ICME2022-079
225	Mohamed Salah Abid	ICME2022-001
		ICME2022-054
		ICME2022-098
		ICME2022-101
		ICME2022-137
		ICME2022-144
		ICME2022-168
		ICME2022-173
		ICME2022-182
226	Mohamed Salah Nouaouria	ICME2022-117
227	Mohamed Amine Medebber	ICME2022-004
228	Mohamed Razak Jeday	ICME2022-050
229	Mohammed Bettayeb	ICME2022-143
230	Mohammed Bouanani	ICME2022-055
231	Mohammed Cherifi	ICME2022-055
232	Mohammed El Hadi Attia	ICME2022-054
		ICME2022-144
233	Mohammed Mashena	ICME2022-036
234	Mohammed Oubelkacem Azzoug	ICME2022-019
235	Mohammed Sahnoun	ICME2022-098

		ICME2022-101
236	Mokhtar Boudjelal	ICME2022-129
237	Mokhtar Djendel	ICME2022-015
		ICME2022-021
		ICME2022-022
		ICME2022-023
		ICME2022-024
		ICME2022-170
238	Moncef Ghiss	ICME2022-111
239	Moncef Hammadi	ICME2022-127
		ICME2022-128
240	Mondher Wali	Keynote 9
		ICME2022-162
		ICME2022-175
241	Monique Gaspérini	ICME2022-180
242	Mostefa Bendouba	ICME2022-077
		ICME2022-078
243	Mostefa Mohamed Touba	ICME2022-135
244	Mouldi Chrigui	ICME2022-120
245	Mouna Cherifi	ICME2022-100
246	Moundir Dandani	ICME2022-049
247	Mounia Kaddeche	ICME2022-106
248	Mounir Alliche	ICME2022-037
		ICME2022-041
249	Mounir Baccar	ICME2022-052
		ICME2022-053
		ICME2022-142
250	Mounir Trabelsi	ICME2022-177
251	Mourad Abed	ICME2022-101
252	Mourad Maazouz	ICME2022-015
253	Moussa Senouci	ICME2022-028
		ICME2022-029
254	Mustapha Arab	ICME2022-112

255	Mustapha Moudoud	ICME2022-069
		ICME2022-174
256	Mustapha Najjari	ICME2022-063
	N	
257	Nabil Allalou	ICME2022-031
258	Nabil Ben Fredj	ICME2022-009
		ICME2022-111
259	Nabil Kribes	ICME2022-084
		ICME2022-104
260	Nacera Khaldi	ICME2022-025
261	Naima Fouial	ICME2022-068
262	Nasser Bouhemame	ICME2022-087
		ICME2022-089
263	Nassima Guechi	ICME2022-075
264	Nassima Moussaoui	ICME2022-007
		ICME2022-008
265	Nassima M'ziou	ICME2022-148
266	Nesrine Abdelli	ICME2022-002
267	Nidhal Hnaien	ICME2022-161
268	Nizar Aifaoui	ICME2022-127
		ICME2022-128
269	Noël Brunetiere	ICME2022-171
270	Nora Nait bouda	ICME2022-070
271	Noureddine Ait messaoudene	ICME2022-003
272	Noureddine Belghar	ICME2022-118
273	Noureddine Henini	ICME2022-123
		ICME2022-164
274	Noureddine Retiel	ICME2022-004
		ICME2022-028
		ICME2022-029
275	Nouri Alkishriwi	Keynote 2
276	Nourredine AÏt Hocine	ICME2022-011
	O	

		ICME2022-140
293	Philippe Bournot	ICME2022-056
294	Philippe Dony	ICME2022-069
		ICME2022-165
		ICME2022-174
295	Phlippe Desevaux	ICME2022-049
	R	
296	Rabah Boubaaya	ICME2022-015
		ICME2022-021
		ICME2022-022
		ICME2022-023
		ICME2022-024
		ICME2022-170
297	Rabia Ferhat	ICME2022-094
298	Rabiaa Soualmi	ICME2022-055
299	Radhouane Meherzi	ICME2022-114
300	Ramdane Zenasni	ICME2022-030
		ICME2022-051
301	Rania Jradi	ICME2022-018
		ICME2022-020
		ICME2022-050
		ICME2022-074
		ICME2022-076
		ICME2022-083
		ICME2022-172
302	Rayene Boutoutane	ICME2022-079
303	Redha Rebhi	ICME2022-037
304	Rezki Nebbali	ICME2022-034
		ICME2022-035
305	Ridha Boudhiaf	ICME2022-052
		ICME2022-054
		ICME2022-137
		ICME2022-144

306	Ridha Zgolli	ICME2022-067
307	Roqiya Saada	ICME2022-163
	S	
308	Saad Belhamdi	ICME2022-159
		ICME2022-160
309	Saadia Ysbaa	ICME2022-095
310	Sabir Hazourli	ICME2022-100
311	Sabrina Haoues	ICME2022-106
312	Sadam Houcine Sellam	ICME2022-118
313	Said Azem	ICME2022-011
314	Said Zergane	ICME2022-005
315	Salah Chikh	ICME2022-041
316	Salah Guenfoud	ICME2022-093
		ICME2022-100
		ICME2022-102
		ICME2022-136
317	Salah Hanini	ICME2022-059
318	Salah Issa	ICME2022-166
319	Saliha Karfaf	ICME2022-075
320	Salim Belhadi	ICME2022-106
321	Salima Boukour	ICME2022-014
		ICME2022-025
		ICME2022-105
322	Sameh Kessentini	ICME2022-054
323	Sami Zidelmel	ICME2022-023
324	Samia Abdi Ben Nasrallah	ICME2022-063
325	Samir Benaniba	ICME2022-015
		ICME2022-021
		ICME2022-022
		ICME2022-023
		ICME2022-024
326	Samir Habibi	ICME2022-134
327	Sandjak Khaled	ICME2022-141

328	Sarhan Karray	ICME2022-001
		ICME2022-158
329	Sébastien Rondot	ICME2022-069
		ICME2022-165
		ICME2022-174
330	Selma Baali	ICME2022-043
		ICME2022-044
331	Septi Boucherit	ICME2022-106
332	Seyfedine Guesmia	ICME2022-005
333	Siarhei Bosakov	ICME2022-102
334	Sidali Bensedira	ICME2022-125
335	Sidi Mohamed Amine Khiat	ICME2022-030
336	Sihem Kahalaf	ICME2022-151
337	Sirine Chtourou	ICME2022-053
338	Slah Driss	ICME2022-137
339	Smail Boutabba	ICME2022-104
340	Sobhi Frikha	ICME2022-144
341	Sofia Dehaini	ICME2022-179
342	Sondes Ifa	ICME2022-153
343	Sonia Ait saada	ICME2022-035
344	Sonya Redjala	ICME2022-011
345	Soraya Salmi	ICME2022-031
346	Souad Beddiaf	ICME2022-079
347	Soufiene Bettaibi	ICME2022-016
348	Soufounizia Boultif	ICME2022-118
349	Souha Kammoun	ICME2022-045
	T	
350	Taieb Seddik	ICME2022-129
351	Tanmoy Mondal	ICME2022-161
352	Taoufik Kamoun	ICME2022-177
353	Tarek Djoudi	ICME2022-131
354		ICME2022-135
355	Tarek Elbeji	ICME2022-111

356	Toufik Ameur	ICME2022-131
357	Tullio Tucciarelli	ICME2022-144
		ICME2022-146
		ICME2022-151
	V	
358	Valérie Lepiller	ICME2022-049
	W	
359	Wael Ben Amira	ICME2022-110
		ICME2022-111
360	Wahiba Slimani	ICME2022-122
361	Wiem Nasri	ICME2022-140
362	Wissem Zghal	ICME2022-001
		ICME2022-158
	Y	
363	Yacine Belkacemi	ICME2022-108
364	Yallese Mohamed Athmane	ICME2022-169
365	Yasmina Lahiouel	Keynote 4
366	Yassmin Touhami	ICME2022-137
367	Youcef Sayah	ICME2022-123
		ICME2022-164
368	Younes Belbellaa	ICME2022-084
		ICME2022-104
369	Younes Benarioua	ICME2022-043
		ICME2022-044
		ICME2022-096
		ICME2022-119
370	Yousra Filali Baba	ICME2022-038
		ICME2022-040
	Z	
371	Zaher Khantouch	ICME2022-033
372	Zakaria Twaila	ICME2022-033
373	Zidelmel Sami	ICME2022-170
374	Zied Driss	Keynote 6

		ICME2022-089
		ICME2022-093
		ICME2022-102
		ICME2022-153
		ICME2022-047
		ICME2022-152
		ICME2022-054
		ICME2022-137
		ICME2022-146
		ICME2022-150
		ICME2022-151
		ICME2022-154
		ICME2022-182
		ICME2022-052
		ICME2022-098
		ICME2022-101
		ICME2022-021
		ICME2022-022
		ICME2022-024
375	Zohraa Benamar	ICME2022-105
376	Zoubida Haddad	ICME2022-065
377	Zouhayar Al Adel	ICME2022-120

Technical Program

WELCOME TO ICME'2022

REGISTRATION

08H00-12H00

LUNCH TIME

12H15-14H00

OFFICIAL OPENING CEREMONY

14H00-14H30

Chair: Pr. Mohamed Salah Abid & Pr. Zied Driss

(Room 1)

Keynote 1

14H30-15H00

Study of a combustion in sinusoidal chamber of combustion, based on the Finite Volume Method

Laboratory of Pure and Applied Mathematics (L.P.A.M), Department of Mathematics, University Mohamed Boudiaf. M'sila, 28000, ALGERIA

Speaker: Pr. Abdelkader Djerad **Algeria**

Keynote 8

15H00-15H30

Dynamic sealing for turbomachinery

Technical Center of Mechanical Industries (Cetim), Nantes 44000, France

Speaker: Pr. Lassad Amami **France**

Keynote 9

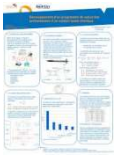
15H30-16H00

On the numerical implementation of a fully coupled model of anisotropic plasticity and continuous ductile damage for material behavior studies

Laboratory of Electro-Mechanic Systems (LASEM), National School of Engineers of Sfax (ENIS), University of Sfax (US), B.P. 1173, Road Soukra km 3.5, 3038 Sfax, TUNISIA

Speaker: Pr. Mondher WALI
Tunisia

COFFEE BREAK & POSTER SESSION



16H00-16H30

ORAL SESSION N°1

16H30-19H00

SS _ Mechanical and physical characterization/ Computational methods in mechanics

Chair: Pr. Zied Driss & Pr. Mondher Walli
(Room 1)

1. **ICME-2022-060:** Numerical simulation of high voltage insulator using comsol multiphysics
   Oussama Ghermoul, Hani Benguesmia
2. **ICME-2022-011:** Mechanical properties of virgin and aged polycarbonate
   Sonya Redjala, Said Azem, Nourredine Ait Hocine, Anurag Dubey
3. **ICME-2022-078:** Mechanical Characterization of Natural Fiber Composite Materials

Bendouba Mostefa, Djebli Abdelkader, Khellafi Habib, , Haddar Hasnia, Benabed Abderrahmen

4. **ICME-2022-122:** Optimization of Photovoltaic Conversion Yield of Cells Solar Hetero junction a-Si :H /c-Si.
   Leila Bechane, Wahiba Slimani, Hani Benguesmia
5. **ICME-2022-075:** Stability, phase transition and elastic properties of lithium based compounds
   B. Bennecer, N. Guechi, S. Karfaf
6. **ICME-2022-088:** Effect of uniform magnetic field on inclined Taylor-Couette flow
   BAHLOULI Abdelhak, MEZIANI Bachir and OURRAD Ouerdia
7. **ICME-2022-086:** MECHANICAL BEHAVIOUR OF E-FGM SANDWICH PLATES UNDER BUCKLING AND RESTING ON NEW ELASTIC FOUNDATION
   Ahmed Draï , Ahmed Amine Daikh, Benaoumeur Aour , Abdelhak Benaoum
8. **ICME-2022-108:** Deterministic approach to cracking in multilayer supports
   Fateh Madani, A.kirad, Y.Belkacemi
9. **ICME-2022-102:** Wavenature of the surface displacements of an elastic half-space with inertial properties
   Salah Guenfoud, Hemza Gherdaoui, Siarhei Bosakov, Abdelouahab Rezaiguia, Debra F. Laefer, Zied Driss
10. **ICME-2022-141:** Influence of Key Parameters on the type of vibration in the dominant modes of bridges
    Ouanani Mouloud, Sandjak Khaled, Khelafi Mourad Abdelouahab
11. **ICME-2022-009:** Improvement of machinability of ground Hardox 500 steel
    Kamel Bensaid, Nabil Ben Fredj
12. **ICME-2022-066:** Intensification of heat exchange by using a ferro-fluid under the effect of a magnetic field
    Laila BOUTAS, Mbarek MARZOUGUI, Jamil ZINOUBI

SS _ Fluid & structure investigations

Chair: **Pr. Sobhi Frikha & Pr. Mariem Ammar**
(Room 2)

1. **ICME-2022-067:** Study of a cavitation pocket in a turbulent flow
   Hatem KANFOUDI, Marwa El Nouri, Ridha ZGOLLI
2. **ICME-2022-120:** APPRAISAL OF SOLAR DESALINATION EFFICIENCY USING A 3D CFD VALIDATED MODEL
   Zouhayar AL ADEL, Abdallah BOUABIDI , Mouldi CHRIGUI
3. **ICME-2022-161:** A CFD modelling on Effects of Ejection Angle of a Co-flow on the Thermal Characteristics for a Combined Wall and Offset Jet Flow
   Nidhal Hnaien, Tanmoy Mondal, Meriem Ajmi
4. **ICME-2022-172:** Numerical Simulation of CaSO4 Crystallization Fouling on Heat Transfer Surfaces
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jeday
5. **ICME-2022-110:** Influence of the rotation frequency on the flapwise deformation of a flexible wind turbine blade
   Marwa Fakhfekh, Wael Ben Amira, Malek Abid, Aref Maalej
6. **ICME-2022-063:** Effects of gravity on transient evolution of gas-liquid interface in capillary tube
   Imen Bahrini, Faycel Khemili, Mustapha Najjari,Abdi Ben Nasrallah Samia, Jemni Abdelmajid
7. **ICME-2022-039:** Turbulent flow characteristics and aerodynamics forces effects of the wind acting on the tall building structure
   Lwiza Dib, Mohamed Aksouh, Amina Mataoui
8. **ICME-2022-081:** Mesoscopic numerical study of nanoscale convective heat in MOS transistor system
   Oussama Zobiri , Abdelmalek Atia
9. **ICME-2022-012:** Numerical analysis of crack nucleation in contact mechanics
   Ali Benhamena, A Baltach, F. Khelil, Mohamed Ikhlef Chaouch
10. **ICME-2022-041:** Effect of bluff-body shape on stability of Methane-Hydrogen-Air flame
    KHELLADI Fatma Zohra, ALLICHE Mounir , CHIKH Salah
11. **ICME-2022-048:** Cyclic plastic deformation response of defective SA333 C-Mn steel
    Maroua Saggar , Anouar Nasr , Chokri Bouraoui
12. **ICME-2022-087:** Experimental investigation of the physico-chemical and mechanical properties of olive pits

Nasser Bouhemame, Abderrezak Bezazi, Hocine Khelifa, Gilberto Garcia del Pino, P.N.B. Reis, Fabrizio Scarpa

SS _ Mechanical and physical characterization / Materials and industrials technologies

Chair: Pr. Mohamed Kaffel & Pr. Sarhan Karray
(Room 3)

1. **ICME-2022-127:** Human-Robot collaboration for disassembly planning in industry 4.0 trend
   Imen Belhadj, Mahdi Aicha, Moncef Hammadi and Nizar Aifaoui
2. **ICME-2022-133:** Design and Correction of Process Nanodefects on Dynamic model of Microbeam Structures
   Hicham Bourouina , Abdelmadjid Boussendel
3. **ICME-2022-162:** Numerical analysis of formability of aluminum AA1050-H14 sheet metal using Cross-Die forming test
   Lachhel Belhassen, Mondher Wali, Fakhreddine Dammak
4. **ICME-2022-157:** Electro-intensification of mechanical dewatering during the application of electrical tomography technique
   Fatma Ouled Saad, Daoued Mihoubi, Jalila Sghaier
5. **ICME-2022-128:** Disassembly process time evaluation and its potential improvement on production lines
   Mahdi Aicha, Imen Belhadj, Moncef Hammadi, Nizar Aifaoui
6. **ICME-2022-010:** Adhesion strength and corrosion resistance of hydroxyapatite coating for biomedical implant applications Hafedh Dhiflaoui, Hayet Debbich, Ahmed Ben Cheikh Larbi
7. **ICME-2022-056:** CFD investigation on the Ranque-Hilsch vortex tube optimum design
   Ons TLILI , Hatem MHIRI, Philippe BOURNOT
8. **ICME-2022-096:** Technological Parameters Effect on Structural and Mechanical Properties of Assembled steels obtained by Manual Electric Welding Process
   Younès Benarioua
9. **ICME-2022-174:** Effects of partial discharges on epoxy resin used in the insulation of electrical machines
   E.Belhiteche, S. Rondot , P. Dony , M. Moudoud, O. Jbara
10. **ICME-2022-065:** Latent Heat Thermal Storage in Metal Foam Filled with Nano-Enhanced Phase Change Material
    Farida Iachachene; Hanane Cheradi; Zoubida Haddad
11. **ICME-2022-095:** Characterization of NiO thin films prepared by sol-gel spin coating technique: Effect of film thickness
    Djanette Meriem Blizak, Saadia Ysbaa

DINNER TIME

19H00

Chair: Pr. Mohamed Salah Abid & Abdelkader Djerad
(Room 1)

Keynote 5
08H30-09H00

The benefit of the use of composite materials in design of modern structures

Laboratoire de mécanique appliquée des nouveaux matériaux, department of mechanical engineering, Université 8 Mai 1945. Guelma, ALGERIA

Speaker: Pr. Abderrezak Bezazi **Algeria**

Keynote 11
09H00-09H30

Numerical and experimental analysis of composites reinforced by curauá and jute fibers

Department of Mechanical Engineering, State University of Amazonas, Manaus, AM, Brazil

Speaker: Pr. Gilberto García del Pino **Brazil**

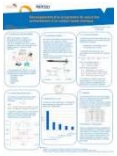
Keynote 2
09H30-10H00

Techno-Economic Analysis of Solar Electricity Generation in Libya

University of Tripoli, Faculty of Engineering, Department of Mechanical and Industrial Engineering Tripoli, Libya

Speaker: Pr. Nouri Alkishriwi **Libya**

COFFEE BREAK & POSTER SESSION



10H00-10H30

ORAL SESSION N° 2

10H30-12H30

SS _ Advanced energy & Materials technologies

Chair: Pr. Mohamed Salah Abid & Pr. Zied Driss
(Room 1)

1. **ICME-2022-114:** Reduction and thermodynamic treatment of NOx emissions in a controlled ignition engine using oxygenated fuels
   Chokri Boubahri, Radhouane Meherzi, Arwa Toumi
2.
3. **ICME-2022-061:** Estimation of the surface condition of the polluted insulators using fuzzy inference system (FIS)
   Hani Benguesmia, Badis Bakri, Fareh Hamrit
4. **ICME-2022-062:** Thermophysical behavior of the sand concrete lightened by treated barley straws in an arid environment
   Belkacem Belhadj, Khadidja Kehli,Mohammed Seghir Ammari
5. **ICME-2022-129:** Prediction of the structural, magnetic and optoelectronic properties of Cd0.75Ir0.25S and Cd0.75Os0.25S: A DFT investigation
   Mokhtar Boudjelal, Mohamed Batouche, Taib seddik
6. **ICME-2022-158:** Numerical simulation of the flow around a wind turbine blade
   Wissem ZGHAL, Sarhan KARRAY
7. **ICME-2022-030:** Reliability and resistance to damage of different types of natural fibers of a unidirectional composite material
   Sidi Mohamed Amine Khiat, Ramdane Zenasni, Hadjar Bennacer, Djanet Khiat

8. **ICME-2022-051:** Influence of the Fiber Geometry on the Effective Mechanical Properties of Hybrid Epoxy Composite Materials
   Zenasni Ramdane, Amine Sidi Mohamed Khiat, Medjahed Bendida, Hamdi Mawloud
9. **ICME-2022-089:** Composite construction materials from plant resources: mechanical characterization and statistical approach
   Hocine Khelifa, Abderrezak Bezazi, Nasser Bouhemame, Haithem Boumediri, Gilberto Garcia del Pino, Paulo N.B. Reis, Fabrizio Scarpa, Zied Driss
10. **ICME-2022-069:** Physical characterization of polymers exposed to corona discharge
    El Hadi.Belhiteche, Sébastien. Rondot , Philippe. Dony , Mustapha. Moudoud, Omar. Jbara
11. **ICME-2022-097:** Stability of Anchored Retaining Walls With Pseudo-Static Method
    Benamara Fatima Zohra, Kechkar Chiraz, Nigri Ghani, Bencheikh Messaouda

SS _ Heat and mass transfer

Chair: Pr. & Pr. Ridha Boudhiaf & Pr. Mohamed Ali Jemni
(Room 2)

1. **ICME-2022-018:** Using PCA and PLS on Operating Data to Predict the Fouling Resistance in Cross-Flow Heat Exchanger
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jedaya
2. **ICME-2022-020:** Sensitivity Analysis of Artificial Neural Networks Output in Simulation of the Cross-Flow Heat Exchanger
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jedaya
3. **ICME-2022-037:** Linear and non-Linear Stability Analysis of Double-Diffusive Convection in a Shallow orizontal Rectangular Cavity Uniformly Heated and Salted From the Horizontal Sides and Filled with non-Newtonian Fluids
   Mounir Alliche, Redha Rebhi
4. **ICME-2022-055:** A Numerical Study on the Effect of Radiation on Natural Convection in a Two-Square Duct Annuli Filled with a Semi-Transparent Fluid
   Bouanani Mohammed , Benbrik Abderrahmane, Soualmi Rabiaa, Cherifi Mohammed
5. **ICME-2022-074:** Optimization of fouling resistance in cross flow heat exchanger using experimental design and response surface methodology
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jedaya
6. **ICME-2022-002:** MHD MIXTE CONVECTION OF NANOFLUID IN A CAVITY WITH A HEAT-GENERATING ELEMENT
   Adel Sahi, Messaoud Hamdi, Nesrine Abdelli, Djamel Sadaoui, Bachir Meziani, Ouerdia Ourrad
7. **ICME-2022-016:** Thermal diffusion and diffusion thermo effects on thermosolutal mixed convection using Lattice Boltzmann Method (LBM)
   Bouthayna Mhamdi, Soufiene Bettaibi, and Moez chafra
8. **ICME-2022-017:** Soret- Dufour Effect on natural Convection Past a Vertical Plate in Non-Darcy Porous Medium Saturated WithBuongiornoNanofluid in thePresence of Viscous dissipation
   Aghbari Anis, Ali Agha Hamza, Sadaoui Djamel
9. **ICME-2022-019:** Heat Transfer Enhancement with Magnetic Field of Swirling Nanofluid Flow
   Brahim Mahfoud, AZZOUG Mohammed Oubelkacem
10. **ICME-2022-071:** Numerical study of a heat exchanger using a phase change material (PCM)
    Medjahed Bendida, Bucuane Enio Valter Felix, Haddam Amine
11. **ICME-2022-028:** Numerical Analysis of the Mixing of Gaseous Contaminant in a Ventilated Room
    Senouci Moussa, Ould Said Belkacem, Retiel Noureddine
12. **ICME-2022-029:** Numerical Comparison of two Ventilation Strategies in an Engine Laboratory
    Senouci Moussa, Ould Said Belkacem, Retiel Noureddine

SS _ Modeling and optimization of energy conversion systems

Chair: Pr. Hedi Kchaou & Pr. Mohamed Kaffel
(Room 3)

1. **ICME-2022-003:** THERMODYNAMIC ANALYSIS OF A PEM FUEL CELL SYSTEM
   Hamid Abdi, Omar Ketfi, Abdellah El-Bey, Abderaouf Djeghdjough, Noureddine Ait Messaoudene
2. **ICME-2022-072:** Numerical investigation of influence of partially blocked gas flow channel on mass transport and performance of solid oxide fuel cell
   Abir Yahya, Hacen Dhahri
3. **ICME-2022-112:** Modelization and Optimization of Photovoltaic modules using Design of experiments approach
   Abdallah Zegaoui, Fatma-Zohra. Kessaissia, Mustapha. Arab, Michel Aillerie.
4. **ICME-2022-035:** Comparative study of two cooling modes of a PV panel
   Sonia Ait Saada, Idir Kecili, Reki Nebbali
5. **ICME-2022-123:** Application of an Intelligent Controller in Shunt Active Power Filter
   Sayah Youcef, Hani Benguesmia, Henini Noureddine
6. **ICME-2022-148:** Prediction of flashover voltage of cap and pin insulator using adaptative neuro-fuzzy inference system (ANFIS)
   Hani Benguesmia, Badis bakri, Nassima M'ziou
7. **ICME-2022-163:** Simulation of Depollution In Electrical Networks Using MATLAB/Simulink Tools
   Hani Benguesmia , Roqiya Saada, Iman Abdelhadi
8. **ICME-2022-164:** Development and control of multi-level converters for power system applications
   Sayah Youcef, Hani Benguesmia, Henini Noureddine
9. **ICME-2022-165:** Effects of partial discharges on epoxy resin used in the insulation of electrical machines
   E.Belhiteche, S. Rondot , P. Dony , M. Moudoud, O. Jbara
10. **ICME-2022-085:** Natural convection in a rectangular cavity with an alveolus of different positions
    MEZIANI B. HAMEDI M., O. OURRAD and SADAOUI Dj.
11. **ICME-2022-052:** Performance of Salinity Gradient Solar Pond with Vertical and Inclined Walls
    Ridha Boudhiaf, Zied Driss, Mounir Baccar

LUNCH TIME

12H30-14H00

Chair: Pr. Zied Driss & Pr. Mondher Walli
(Room 1)

Keynote 7

14H00-14H30

Numerical stress analysis of biomechanical orthotropic hip prosthesis under different torsion couple of forces using the finite element methods

Mechanical Engineering Department, Laboratory of Mechanics, University of Fréres Mentouri Constantine 1, Route de Ain el bey 25000, Constantine, Algeria

Speaker: Pr. Brahim Necib **Algeria**

Keynote 10

14H30-15H00

Experimental analysis and numerical modelling of cold sheet metal stamping

Higher School of Sciences and Technologie of Hammam Sousse, ESST Hammam Sousse, Tunisia

Speaker: Pr. Hamdi Hentati **Tunisia**

Social visit

15H00-18H30

DINNER
19H00

Chair: Pr. Abderrezak Bezazi & Pr. Lassad Amami
(Room 1)

Keynote 6
08H30-09H00

Numerical and experimental study of the aerodynamic and thermal characteristics of a greenhouse

Laboratory of Electro-Mechanic Systems (LASEM), National School of Engineers of Sfax (ENIS), University of Sfax (US), B.P. 1173, Road Soukra km 3.5, 3038 Sfax, Tunisia

Speaker: Pr. Zied Driss **Tunisia**

Keynote 4
09H00-09H30

Modelisation and simulation of physico-thermodynamic properties: genetic algorithm and artificial neural networks methods

Département de Génie des Procédés, LSPN, Université 8 Mai 1945 de Guelma, B.P. 401, Guelma, Algeria

Speaker: Pr. Yasmina Lahiouel **Algeria**

Keynote 3
09H30-10H00

Computer Program of Structural Analysis by FEM

Laboratory of Mechanics, Engineering and Innovation (LMEI), Higher School of Technology, Department of Mechanical Engineering, University Hassan II - Casablanca, Morocco

Speaker: Pr. EL Hassan Boudaia **Morocco**

ORAL SESSION N° 3

10H00-11H30

SS _ Renewable energy

Chair: Pr. Wissem Zghal & Pr. Zied Driss
(Room 1)

1. **ICME-2022-004:** Computational Study of coupled Natural Convection and radiation in Vertical Cylindrical Annular Cavity filled with Cu-Water Nanofluid Under Magnetic Fields
   Mohamed A. MEDEBBER, BelKacem OULD SAID ; Noureddine Retiel
2. **ICME-2022-033:** Repowering of a wind farm in Sidi-Daoued -Tunisia
   Hassen Ayed Chraiga , Zakaria Twaila Zaher Khantouch , Othman jeddi
3. **ICME-2022-034:** Parametric study of a vertical air-to-ground heat exchanger
   Idir Kecili, Rezki Nebbali
4. **ICME-2022-005:** Effect of the Atmospheric Boundary Layer on a Wind Turbine
   Said Zergane, Abdelkader Djerad, Seyfeddine Guesmia
5. **ICME-2022-053:** An experimental performance of a solar air heater integrated with an internal heat storage tank made of finned phase-change material PCM
   Hussam S. Dheyab, Manar S.M. Al-Jethelah, Sirine Chtourou, Mounir Baccar
6. **ICME-2022-111:** 2-way fluid-structure interaction simulation of a wind H-Darrieus turbine with a flexible blade
   Tarek Elbeji, Wael Ben Amira, Khaled Souaissa, Moncef Ghiss , Hatem Bentaher and Nabil Ben Fredj
7. **ICME-2022-054:** Effect of water layer thickness on the performance of triangular solar still with concave absorber
   Ridha Boudhiaf , Sameh Kessentini, Elhachmi Elhassene, Zied Driss, Mohamed Salah Abid, Abderrahmane Aissa, Mohammed El Hadi Attia

8. **ICME-2022-098:** Numerical studies on the influence of Y-shaped fin arrangement on the melting performance of a vertical PCM enclosure
   Belazreg Abdeldjalil , Abderrahmane Aissa , Sahnoun Mohammed, Zied Driss, Mohamed Salah Abid
9. **ICME-2022-050:** Calcium sulfate fouling on two different heat exchanging surfaces
   Rania Jradi , Christophe Marvillet , Mohamed Razak Jeday

SS _ Mechanical and physical systems optimization

Chair: Pr Hamdi Hentati & Pr. Jamel Mars
(Room 2)

1. **ICME-2022-043:** The influence of nitrogen and thermal annealing on the properties of titanium nitride thin films
   Selma Baali, Younes Benarioua
2. **ICME-2022-044:** Effect of Time and Temperature of Carburizing Treatment on the Structure and the Hardness of Steel 16NC6
   Selma Baali, Younes Benarioua
3. **ICME-2022-077:** Stress-frequency effect on fatigue behavior of Polyethylene
   A. Djebli, M. Bendouba, A. Baltach, A. Talha
4. **ICME-2022-180:** Strain-hardening and damage of metal matrix composites under simple shear: experimental analysis and numerical features
   M. Dammak, M. Gaspérini, P.Franciosi
5. **ICME-2022-115:** Comparative Study between Fuzzy Controller and Sliding Mode Control for Quadruple Tank System
   Akka Ali, Moussa Oussama, Bouzidi Ali, Benguesmia Hani
6. **ICME-2022-031:** Perturbation method applied to interfacial three dimensional waves in the presence of a parallel current
   Soraya Salmi, Nabil Allalou, Mohamed Debiane
7. **ICME-2022-070:** Choice of mother wavelet by the wavelet entropy
   Kenza. Zaibak, Nora. Nait Bouda and Fawzia. Mekideche- Chafa
8. **ICME-2022-045:** Experimental study and modeling of spinel biomarkers for biomedical applications as fluorescent probes
   I.Elhamdi, H. Souissi, S. Kammoun, E. Dhahri, B. F.O. Costa
9. **ICME-2022-047:** Prediction of solar irradiation using response surface methodology
   Badis Bakri,Hani Benguesmia, Zied Driss

SS _ Energy systems innovations

Chair: Pr. Mohamed Kaffel & Pr. Sarhan Karray
(Room 3)

1. **ICME-2022-038:** Linear Fresnel Concentrator Receiver: Sensitivity Analysis based on Thermal Resistance Model
   Filali Baba Yousra, AL Mers Ahmed, Abdessamad Faik
2. **ICME-2022-040:** Experimental Evaluation of the Thermal Performances of no vacuum Compound Parabolic collector Receiver
   AL Mers Ahmed , Filali Baba Yousra
3. **ICME-2022-042:** EFFETC OF PCM MASS ON THE PERFORMANCES OF LaNi5-METAL HYDRIDE PUMP
   Amel MILED, Faouzi ASKRI
4. **ICME-2022-064:** Numerical study of parameter's effect on the performance of a parabolic dish system
   Hiba Cherif, Marwa Ezzine, Jalila Sghaier, Hatem Mhiri

5. **ICME-2022-116:** Fuzzy Logic Controller Optimized by ACO for Decentralized Source Based on a SOFC
   Akka Ali, Bouzidi Ali,Moussa Oussama, Benguesmia Hani
6. **ICME-2022-121:** Fuzzy Logic Power Control of a doubly fed induction generator based on WECS
   Oussama Moussa, Lallouani Hellali , Aboubaker Essadiq Mazouz, Ali Akka
7. **ICME-2022-154:** Numerical Investigation of Solar Chimney with storage tank
   Ines Amamri , Haythem Nasraoui , Abdallah Bouabidi , Zied Driss
8. **ICME-2022-173:** Model tests on a fixed OWC wave energy converter with focus on the oscillating chamber shape effect
   Mohamed Amine Samet, Mohamed Ali Jemni, Mariem Ammar, Mohamed Salah Abid
9. **ICME-2022-168:** A study of air-swirl design features for GT air-compressor gas turbine through CFD optimization
   Mohamed Ali Jemni, Mohamed Salah Abid

COFFEE BREAK

11H30-12H00

CLOSURE CEREMONY / BEST PAPERS AWARDS / CERTIFICATES DISTRUBITION

12H00-12H30

Poster Session

(This session is taking place on **Wednesday & Thursday / December 21 & 22, 2022** with the coffee break)

1. **ICME2022-001 :**Fluid structure interaction of the turbulent flow aroundan obstacle
   Sarhan Karray, Wissem Zghal, Mohamed Salah Abid
2. **ICME2022-006 :** Tribological characterization of nano-sized silicon nitride on beta phase
   Amine Charfi, Mohamed Kharrat, Mohd Farooq Wani, Maher Dammak
3. **ICME2022-007 :** Resistance to crack propagation of a glass fibercomposite (mats) - Polyester
   Abdelkader Djerad, Lamia Benhamadouche1, Nassima Moussaoui.
4. **ICME2022-008 :** Elaboration and characterization of a composite polyester / recycled jute fabric.
   Lamia Benhamadouche, Nassima Moussaoui, Abdelkader Djerad
5. **ICME2022-014 :** Mechanical Behavior Of Unstable Embankments Reinforced With Discrete Elements (Geosynthetics)
   Messaouda Boutahir Born Bencheikh , Assia Aidoud, Salima Boukour, Fatima zohra Benamara and Lazhar Belabed
6. **ICME2022-015 :**A Design Of Experiment Study Of Plasma-Sprayed Alumina-Titania Coatings Using Taguchi's Technique
   Mokhtar DJENDEL, Rabah BOUBAAYA, Samir BENANIBA,Omar ALLAOUI,Maazouz Mourad
7. **ICME2022-021 :**The effect of adding different types of natural fibers on the mechanical properties of mortars
   Samir BENANIBA, Mokhtar DJENDEL, Rabah BOUBAAYA, Kessal Oussama, Zied Driss
8. **ICME2022-022 :** Thermal characterization of bio sourced materials reinforced with date palm fibers
   Samir BENANIBA, Rabah BOUBAAYA, Mokhtar DJENDEL, Kessal Oussama, Zied Driss
9. **ICME2022-023 :** Contribution to the study of a surface conversion treatment of a borided or cemented steel and coated with chromium films
   Rabah BOUBAAYA, Mokhtar DJENDEL,Omar ALLAOUI,Samir BENANIBA, Sami ZIEDELMEL
10. **ICME2022-024 :** Characteristics of mortars reinforced with date palm fibers
    Samir BENANIBA, Mokhtar DJENDEL, Kessal Oussama, Rabah BOUBAAYA, Zied Driss
11. **ICME2022-025 :** Effect of Aggressive Media on a Sawdust-Lightened Mortar (Physico-Mechanical Properties).
    Assia Aidoud, Messaouda Boutahir Born Bencheikh, Salima Boukour, Nacera Khaldi, Meriem Dorbani
12. **ICME2022-026 :** Cooling of an agricultural greenhouse, comparative study
    Djemoui Lalmi , Abdelouahab Benseddik, Hocine Bensaha, Abdelmadjid Adouad And Billal Arriallah
13. **ICME2022-049 :** Numerical investigation of the flow in a 2D Supersonic Ejector
    Moundir Dandani, Philippe Desevaux, Abderrahmane Ghezal, Valérie Lepiller
14. **ICME2022-058 :** Corrosion Resistance of HSLA Steel After Combined SurfaceTreatment in Simulated Seawater
    ArwaToumi , Chokri Boubahri , JalelBriki
15. **ICME2022-059 :** Modelling the full scale reverse osmosis system using new computational modelling technique
    LAIDI Maamar, HANINI Salah
16. **ICME2022-068 :** Numerical study of dust grains behavior in multi-component plasma sheath
    D. Benlemdjaldi, A. Tahraoui, and N. Fouial
17. **ICME2022-076 :** Detection of Fouling in Cross-Flow Heat Exchanger in Phosphoric Acid Concentration Plant using Artificial Neural Networks
    Rania Jradi , Christophe Marvillet b, Mohamed Razak Jeday
18. **ICME2022-083 :** Heat transfer coefficient estimation and performance evaluation of cross flow heat exchanger using normal distribution analysis
    Rania Jradi , Christophe Marvillet , Mohamed Razak Jeday
19. **ICME2022-084 :** Optimization of cutting parameters during machining of titanium alloy Ti-6Al-4V using the combination of Taguchi S/N method, GRA and genetic algorithms based on artificial neural network modeling
    Nabil Kribes, Younes Belbellaa, Lekmine Habiba, Abbed Khaoula, Mohamed Athmane Yalles, Boutabba Ismail
20. **ICME2022-092 :** Backstepping control of a doubly fed induction generator based on WECS
    Oussama Moussa, Lallouani Hellali , Aboubaker Essadiq Mazouz

21. **ICME2022-093 :** Effects of chemical treatments of Ampelodesmos mauritanicus fibres on their physico-chemical characteristics
    Abdessamed Atoui, Abderrezak Bezazi, Salah Guenfoud, Abilo Silva, Gilberto Garcia del Pino, P.N. B. Reis, Fabrizio Scarpa and Zied Driss
22. **ICME2022-094 :** Thermal Transfer on a wall corrugated
    Rabia ferhat, Ahmed.Z.Dellil, Kamel Hamidou, Khadidja Boualem
23. **ICME2022-100 :** Comparative study between electrocoagulation used separately and coupled with adsorption for dairy wastewater treatment using response surface methodology design
    Mouna Cherifi, Salah Guenfoud, Sabir Hazourli, Debra F. Laefer
24. **ICME2022-101 :** Numerical investigation on effect of fins orientation on melting performance of NEPCM in an annulus enclosure
    Abed Mourad , Abderrahmane Aissa , Sahnoun Mohammed, Zied Driss, Mohamed Salah Abid
25. **ICME2022-104 :** Development of composite materials from glass fibre waste and study of their machinability
    Habiba Lekmine, Nabil Kribes, Abderrezak Bezazi, Smail Boutabba, Younes Belbellaa
26. **ICME2022-105 :** Reinforcement Of Poor Soils By Ballast Columns
    Messaouda Boutahir Born Bencheikh, Assia Aidoud, Salima Boukour, Fatima zohra Benamara and Lazhar Belabed
27. **ICME2022-106 :** Multi-Objective Optimization in Machining of Polyamide Composite Using NSGA-II coupled with TOPSIS/AHP
    Septi Boucherit, Sabrina Haoues, Mohamed Athmane Yallese, Salim Belhadi, Mounia Kaddeche
28. **ICME2022-107 :** The Method of Characteristics and its application to the solution of hyperbolic differential equations
    A. Haddad
29. **ICME2022-109 :** Vibration study of a helicopter blade in vertical flapping using the MYKLESTAD method
    Abdelkader kirad , M.Fateh , Z.Loukmane
30. **ICME2022-117 :** Reinforcement of unstable slopes with recycled plastic pins RPP
    Fatima Zohra Benamara, Chiraz Kechkar, Ghania Nigri, Messaouda Bencheikh, Mohamed Salah Nouaouria
12. **ICME2022-118 :** Numerical simulation study of the outlet temperature in an air/buried ground heat exchanger coupled with a humidifier
    Soufounizia Boultif , Noureddine Belghar, Abdelhafid Moummi , Sadam Houcine Sellam, Foued Chabane
31. **ICME2022-119 :** Effect of surface roughness of steel on structural and mechanical properties of galvanization coatings
    Younès Benarioua
32. **ICME2022-125 :** Numerical analysis of the fluid-structure interaction in the environment of gas turbine flame tubes
    Sidali Bensedira, Ishak Ouzeri
33. **ICME2022-131 :** Elaboration and Mechanical Characterization Composite Materials Based on Particles of Fibrous Wood of Date Palm Tree.
    Tarek Djoudi, Toufik Ameur, Mabrouk Hecini.
34. **ICME2022-132 :** Fault analysis of induction motor drive fed by PMW voltage source inverter
    Lallouani Hellali , Oussama Moussa, Aboubaker Essadiq Mazouz
35. **ICME2022-134 :** Digital analytical study of the piston deformation of a 1.7 DCI turbo diesel engine consisting of different composite materials in four strokes
    Hassen MERZOUK, Samir HABIBI, Amar ABBOUB
36. **ICME2022-135 :**
    Considering photocatalytic activity of Bi-doped TiO2 thin films in degradation of rhodamine B under sunlight irradiation
    Elhachmi Guettaf Temam, Hachemi Ben Temam, Tarek Djoudi, Mostefa Mohamed Touba, Abdelkrim Merzougui
37. **ICME2022-136 :** Dynamic Balancing of a Rigid Rotor
    Abdelouahab Rezaiguia, Salah Guenfoud, Debra F. Laefer
38. **ICME2022-137 :** Effect of radiation on the performance of a simple-passe solar air heater
    Yassmin Touhami, Ridha Boudhiaf, Slah Driss, Abederrahmane Aissa, Zied Driss, Mohamed Salah Abid
39. **ICME2022-140 :** Prediction of the thermal conductivity of cellulose fiber reinforced aerogel composite using periodic conditions

Wiem Nasri, Kyu-Yeon Lee, Hyung-Ho Park, Paulo Reis, Abderazak Bezazi, Zied Driss

40. **ICME2022-142 :** Air out-flow in the ventilation channels of a disc brake
    Mohamed Kaffel, Mounir Baccar
41. **ICME2022-146 :** Interface model effect on Banki micro hydro-turbine
    Marwa Hannachi, Ahmed Ketata, Marco Sinagra, Tullio Tucciarelli, Zied Driss
42. **ICME2022-150 :** Prediction of Solar Radiation Using Artificial Neural Network
    Badis Bakri, Hani Benguesmia, Zied Driss
43. **ICME2022-151 :** Meshing Effect for the numerical study of A Darrieus Wind Turbine
    Dorra Ghodhbani, Sihem Kahalaf, Mariem Lajnef , Mabrouk Mosbahi, Costansa Aricò , Tullio Tucciarelli Zied Drissa
44. **ICME2022-152 :** 2D approach for the Turbulence modeling choice of a zephyr vertical axis wind turbine
    Madiha Khlifi,Omar Hammami,Zied Driss, Hedi Kchaou
45. **ICME-2022-153:** Impact of the windows opening in the indoor air quality
    Sondes Ifa, Zied Driss
46. **ICME2022-155 :** Modeling of DFIG with converter control used in wind energy conversion system
    Oussama Moussa, Lallouani Hellali , Aboubaker Essadiq Mazouz
47. **ICME2022-159 :** Control of Double Stator Induction Motor by Field Oriented Control based on Interval type-2 fuzzy logic
    Lallouani Hellali, Oussama Moussa, Aboubaker Essadiq Mazouz, Saad Belhamdi
48. **ICME2022-160 :** Study for Control of Dual Star Induction machine based on Direct Torque Control
    Lallouani Hellali, Oussama Moussa, Aboubaker Essadiq Mazouz, Saad Belhamdi
49. **ICME2022-166 :** Optimization of Cutting Parameters for Removal Rate of Medium Carbon Steel C-45 in CNC Turning Machining by Using Taguchi Method
    Khaled Aljaly , Salah Iddin Ali Salem Issa, Akram Aleiah, Faouzi Masmoudi
50. **ICME2022-167 :** Numerical analysis of metal cutting operation
    Alia Khanfir
51. **ICME2022-169 :** Application of desirability function to optimizing cutting parameters when turning Ft-25 gray cast iron by GC1690 tool
    Bouchelaghem Hadjira, Yallese M. Athmane, Chihaoui Salim.
52. **ICME2022-170 :** A Comparative Study on Inhibition Corrosion of X52 and X70 steels in sodium chloride (NaCl) solution saturated with CO_2 gas
    Zidelmel Sami, Dakmoussi Maamar, Allaoui Omar
53. **ICME2022-175 :** The Effect of Porosity on elastic buckling behavior of shell structures made of Porous Functionally Graded Materials
    Jamel MARS, Hanen JRAD, Mondher WALI, Fakhreddine DAMMAK
54. **ICME2022-181 :** Characterization of the mechanical behavior of a duplex stainless steel in relation to the phenomenon of hydrogen embrittlement
    Amar Abboub , Ahmed Aboura, Hassen Merzouk
55. **ICME2022-182 :** Experimental analysis flow of a combined three bladed Darrieus and Savonius Water Rotor
    Ibrahim Mabrouki, Abdelkader djerad, Zied Driss, Mohamed Salah Abid

ICME Organizing Committee

ICME' 2022 Conference Program

Time	Wednesday/ December 21, 2022	Thursday / December 22, 2022	Friday / December 23, 2022
08:00	Welcome and registration		
08:30		Keynote 4 / Keynote 5 / Keynote 6	Keynote 9 / Keynote 10 / Keynote 11
10:00		Coffee break / Poster session	Oral session 3
10:30		Oral session 2	
11:30			Coffee break
12:00			Closing Ceremony / Attestation Distribution
12:30	Lunch	Lunch	
14:00	Official Opening Ceremony	Keynote 7 / Keynote 8	
14:30	Keynote 1 / Keynote 2 / Keynote 3		
15:00		Social visit	
16:00	Coffee break / Poster session		
16:30	Oral session 1		
19:00	Dinner	Dinner	

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ICME'2023, December 18-20, 2023
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