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Conference and Forum on Engineering Science

Abstract Proceeding

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Conference and Forum on Engineering Science

JSI'2020 is a leading conference and forum on Engineering Science. During this event, conferences relating to the considered areas are presented in the form of plenary sessions and oral communications by researchers, industrials and students. The subject areas include, but are not limited to the following fields:

-Engineering technology and innovation,
-Energy efficiency,
-Renewable energy,
-Sustainable environment,
-Modelling and simulation,
-Experimental testing methods,
-Industry 4.0.

This scientific conference JSI'2020 has been organized in the National School of Engineers of Sfax (ENIS) of the University of Sfax with the support of the Laboratory of Electromechanical Systems, the Association of Engineers from National School of Engineers of Sfax (AIDENIS), the Tunisian Order of Engineers (OIT) and the Club of Mechanics (CM). The goal is to contribute to the welfare of technology exchange and to create a fruitful environment between researchers and industrials to create the closer contacts and sharing experience in various engineering sectors.

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Editorial

On behalf of all members of the Organizing and Scientific Committees of the Conference on Engineering Science (JSI'2020), it is an honor for us to welcome all of you in Sfax, TUNISIA. As you will have the opportunity to see, Sfax is a nice city in board of the Mediterranean Sea.

This scientific conference JSI'2020 has been organized in the National School of Engineers of Sfax (ENIS) of the University of Sfax with the support of the Laboratory of Electromechanical Systems, the Association of Engineers from National School of Engineers of Sfax (AIDENIS), the Tunisian Order of Engineers (OIT) and the Club of Mechanics (CM). The goal is to contribute to the welfare of technology exchange and to create a fruitful environment between researchers and industrials to create the closer contacts and sharing experience in various engineering sectors.

The Conference on Engineering Science (JSI'2020) 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 engineering science. Improvements have been made to this version by adding the Industrial Forum to give more opportunities for technologists and industry to participate in this conference.

The conference will to bring together innovative academics and industrial experts in the fields of engineering science 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 engineering science. 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 75 scientific and technical papers concerning these subjects, made for about 146 authors coming from North Africa as well as from the others continents, will be presented and 9 keynote talks will be held, in parallel sessions. The conference offers an exceptional opportunity to assess the state-of-the-art of engineering science and its potential for future applications with different sessions covering the following topics:

- Engineering technology and innovation,
- Energy efficiency,
- Renewable energy,
- Modelling and simulation
- Experimental testing methods

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 university of Sfax, the National School of Engineers of Sfax, the Electromechanical System Laboratory 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 Sfax and the regional delegation of culture.

At 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 engineering science.

Once again, you are welcome to the conference.

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Keynotes

Vectors of Development and Positioning of Engineering Training in Tunisia's modernity process

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Abstract: We consider here “modernity” as a vector of technological, political, economic and social development. It is also the ability to exploit the alternative potentialities that can be called "skills". These skills are plural, but today, more and more, technical skills are essential, as it is true that the twenty-first century is characterized by mastering human potential. We also consider here that these "skills" were constituted essentially by the engineers, because the latter represents a capacity of " engineering "! In this context, we analyze to what extent these "technical skills" have been considered in the development process of the country. We discuss the measures, if they exist, they play their role, and if they are able to exploit the alternative potentialities that the social system of Tunisia conceals. Indeed, we will discuss the training of engineers in Tunisia that is quite recent. In fact, the training of engineers throughout the colonial period is almost absent. We recall the development policies of Tunisia after independence to try to define the role devolved of engineers in development projects. We discuss also the conditions for the emergence of engineers and their participation in the "modernization" of Tunisia. Then, we ask ourselves to what extent engineers have been and are today the vectors of diffusion of "modernization" in Tunisia. We will make a number of observations and findings on the relationship between engineers and the dynamism of society. We conclude this presentation with several questions on the positioning of engineering training in relation to the new challenges in the 21st century, in particular in relation with new professions, political choices and the positioning of this potential in the process of development.

Keywords: Modernity, Vectors of Development, Engineering Training in Tunisia.

Sliding mode control of robotic systems for rehabilitation

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Abstract. The presentation gives an overview of the robotic applications, more specifically the robotic rehabilitation. Several neurological diseases such as cerebral palsy can cause the walking disability. Hence, many robotic devices used for rehabilitation have been appeared recently. Studies have shown the effectiveness of such devices, thanks to cerebral plasticity which can be developed with the intensive and repetitive movements, willingness during the rehabilitation sessions and the mental effort. In this work, we are interested in lower limbs rehabilitation especially for kids who have between 2 and 13 years old. The talk presents some controllers used to control 2 degrees of freedom exoskeletons at hip and knee joints, aiming to make this robotic orthosis track the desired trajectory. These controllers are based on Sliding mode controllers applied to this complex nonlinear system even in case of parametric variations or external perturbations. Then, considering the case where the system parameters are ill-known, unknown or they vary in time, we propose to implement the adaptive sliding mode control.

Keywords: robotic applications, neurological diseases, walking disability, cerebral plasticity.

Study and developments of the solar air heater systems

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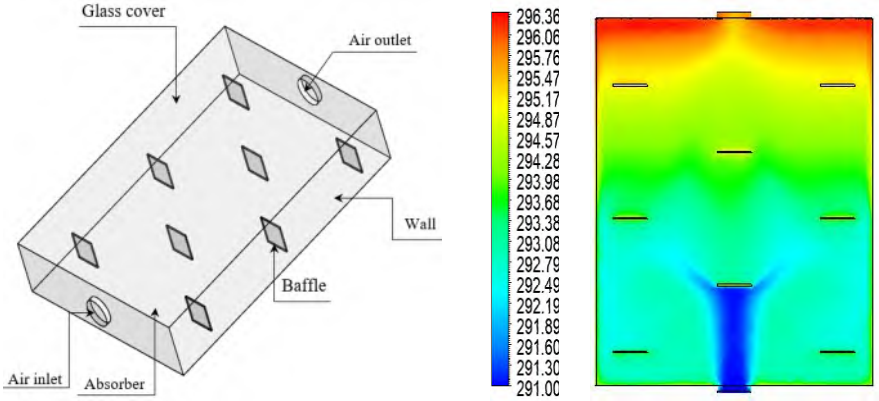
Abstract. Solar air heater is a cheap technology that can be used to insure the comfort of building or in industrial applications such as preheating and heating processes. This technology can substitute the traditional and expensive technologies of heating using fossil fuels like gas and oil. In this context, we are interested in the design and set up of a new test bench in order to make an experimental study for different operational modes. From this study, we confirm that in case of forced convection the inlet delivery mode is the most efficient mode especially in case of high ambient temperature. For the natural convection, we can reach high outlet temperature. Computational study was also developed by using the commercial CFD code ANSYS Fluent 17.0. The analysis was performed using the Navier-Stokes equations coupled with the standard k-ω turbulence model. The computational method and the numerical results were validated based on our experimental results developed in our LASEM laboratory.

Keywords: Solar air heater, forced convection, natural convection, experimental validation, modeling, CFD.



(a) Design model (b) Temperature variation

Graphical abstract

Performance, Modeling, Measurements and Simulation of Energy Efficient for Heat exchanger, Refrigeration and Air Conditioning

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Abstract. Over the years, all parts of a commercial refrigerator, such as the compressor, heat exchangers, refrigerant, and packaging, have been improved considerably due to the extensive research and development efforts carried out by academia and industry. However, the achieved and anticipated improvement in conventional refrigeration technology are incremental since this technology is already nearing its fundamentals limit of energy efficiency is described is 'magnetic refrigeration' which is an evolving cooling technology. The word 'green' designates more than a colour. It is a way of life, one that is becoming more and more common throughout the world. An interesting topic on 'sustainable technologies for a greener world' details about what each technology is and how it achieves green goals. Recently, conventional chillers using absorption technology consume energy for hot water generator but absorption chillers carry no energy saving. With the aim of providing a single point solution for this dual purpose application, a product is launched but can provide simultaneous chilling and heating using its vapour absorption technology with 40% saving in heating energy. Using energy efficiency and managing customer energy use has become an integral and valuable exercise. The reason for this is green technology helps to sustain life on earth. This not only applies to humans but to plants, animals and the rest of the ecosystem. Energy prices and consumption will always be on an upward trajectory. In fact, energy costs have steadily risen over last decade and are expected to carry on doing so as consumption grows.

Keywords: Energy saving, energy efficiency, sustainable technologies, heat exchangers, refrigerant, future prospective.

Graphical abstract

Analysis and modeling of crack propagations in the holed plates using the finite element methods and effect of their priming position around the holes: Application to riveted plates in new technologies

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Abstract. The presence of holes in continuum isotropic and orthotropic plates or even discrete medium have great application in the fields of industry and technology such as in mechanics, aeronautics, space structures, civil engineering or biomechanics taking into account their use for the assembly of different structures by riveting, screwing or bolts. However, the presence of these holes by drilling or modeling reveals damage of a different nature in these structures that can affect their lifespan or even their sudden total destruction. This phenomenon is then translated, at the macroscopic scale, into the creation of a discontinuity surface called cracks that lead to the weakening of the structure during its operation due to stress concentrations at the elasto-plastic areas and the appearance of cracks. As a result, the analysis of the propagation of cracks around the holes in the plates under the effect of different external loads plays an important role to avoid the total destruction of these structures and to increase their rigidity and their duration possible life. Our work consists on the study of the propagation of cracks around the holes in continuum isotropic dimensional plates under the effect of external loads. Different cracking modes with different length and angles of orientation cracks following the plane of the plate with a central hole are analyzed. The theoretical results are obtained based on Griffith's deformation energy theory and compared to numerical models using the quadrangular finite elements method as well as archived experimental results and good results have been found. Also the effect of the total crack priming position on the stresses and the intensity factor coefficients based on cracking length and the propagation angle variation are considered.

Keywords: Holed plates, internal stresses, stress intensity factor, crack propagation, crack orientation, priming and finite element models.

Seismic Behavior of Expansion Joints in Seat-Type Abutments of Bridge Including SSI effects

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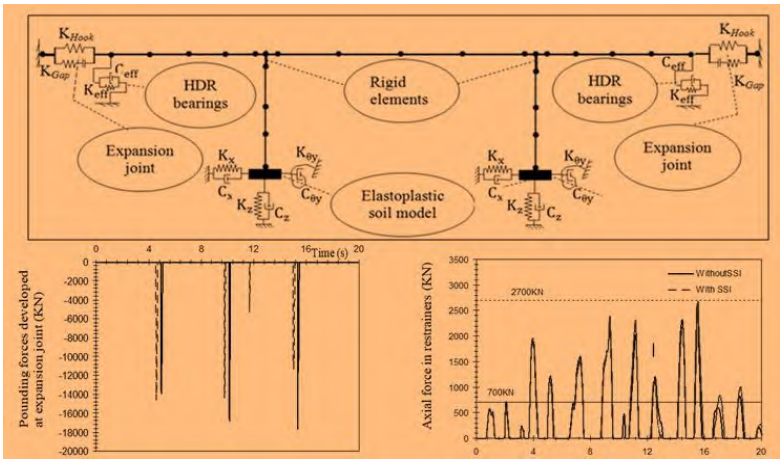
Abstract. This paper addresses the analysis of seismic behavior of expansion joints in seat-type abutments of bridge including Soil Structure Interaction (SSI) effects. A Multi-Span Continuum (MSC) bridge located in North Eastern Algeria is established with a detailed FEM with boundary elements. Nonlinear characteristics of the pounding and restrainer elements at expansion joint and bearing devices at seat-abutments of study bridge are represented by bilinear hysteretic models. The study reveals among others that the SSI should be considered in the analysis of seismic responses of expansion Joints in seat-type Abutments of bridges.

Keywords: Expansion joints, Soil structure interaction, Impact element, restrainer element, Bearing devices, Nonlinear responses



Graphical abstract

Lattice Boltzmann Method and Its Application for Porous Media

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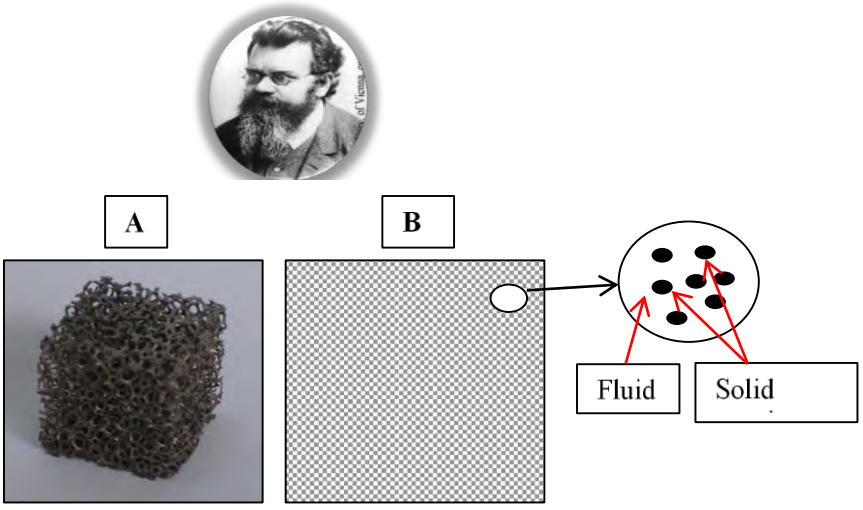
Abstract. Lattice Boltzmann method (LBM) is a class of computational fluid dynamics methods. Unlike traditional numerical methods, which solve the Navier–Stokes equations for macroscopic variables, the discrete Boltzmann equation based on the distribution function of Maxwell-Boltzmann is used to simulate transfer phenomena with approximate collision models such as Bhatnagar–Gross–Krook (BGK). The present plenary session is aimed to show the theory of Lattice Boltzmann method for studying density-driven flows in a porous medium, especially for CO2 migration during greenhouse gas sequestration operation as a study case.

Keywords: CFD, Lattice Boltzmann method, Porous Media, Meso-Scale Method.



Graphical abstract

Prediction of Fire and Smoke Propagation Under a range of External Conditions

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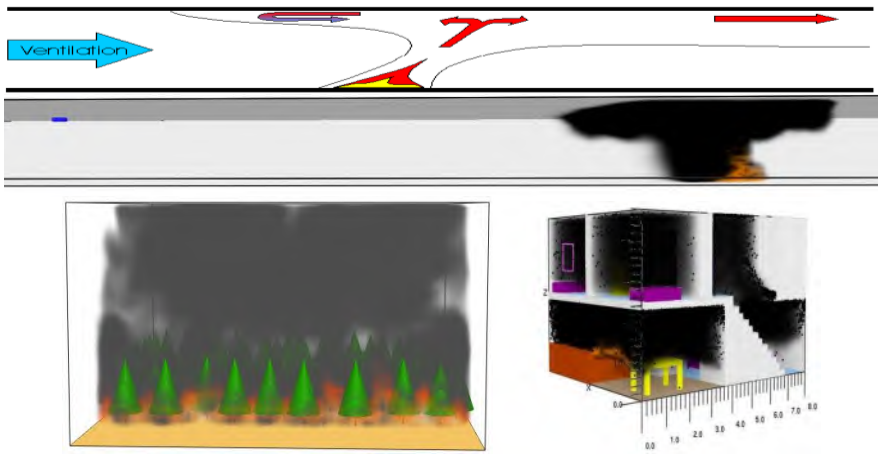
Abstract. The purpose of this paper is to empower the scientific and technological community with the knowledge to identify and define key concepts of fire modeling also to develop the ability to apply the CFD (Computer Fluid Dynamics) tools to fire investigation and prevention using basic mathematical models. Fire processes are a very complicated and complex phenomenon consisting of combustion, thermal radiation, turbulence, fluid dynamics and other physical and chemical processes. The fire behavior using Large Eddy Simulation (LES) codes provides an efficient tool for identifying, describing and analyzing the effects that include flame shape, plume characteristics, combustion product dispersion, and heat effects to adjacent objects. This paper illustrates the strength of the Fire Dynamics Simulator (FDS), an LES code developed by the National Institute of Standards and Technology (NIST), through several small and large-scale case studies under different boundary condition.

Keywords: Modeling; fire scenario; overview; various scales.



Graphical abstract

Long Term Low Emission Development Strategies and Energy Transition Pathways Simulation under EN-ROADS Environment

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Abstract. Under the Paris Agreement, more than 195 countries that reject 97% of global GHG emissions have agreed to strengthen the international response to the threat posed by climate change, including by limiting the rise in average temperature of the planet at a level well below 2°C above pre-industrial levels, and by continuing their efforts to limit the rise in temperatures to 1.5 ° C. Based on analyzes from the fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC), the United Nations Environment Program (UNEP) suggests that reductions in GHG emissions by around 70 to 95% below 2010 levels should be achieved by 2050 in order to stay on a path allowing the chances of limiting the average global temperature increase to 1.5 ° C. Achieving this target temperature is only possible through the adoption of measures that jointly target carbon dioxide and short-lived climate-affecting pollutants (PCDV).
En-ROADS is a fast, powerful simulation tool for understanding how we can achieve our energy transition and climate goals through changes in our energy use, consumption, and policies. En-ROADS stands for "Energy – Rapid Overview and Decision-Support" simulator, and was created by Climate Interactive, Ventana Systems, the ClimateWorks Foundation Research Team, UML Climate Change Initiative, and John Sterman of MIT Sloan. It is customized to address questions such as:How much might technological breakthroughs contribute to addressing climate change? Breakthroughs could include: R&D and scale-up of a new zero-carbon energy supply, Renewable energy, Energy efficiency, Inexpensive natural gas.

Keywords: Low emissions, GHGs, Pathways, Strategies, En-ROADS.

Numerical analysis of laminar mixed convection heat transfer of Fe3O4/water nanofluid in a square channel

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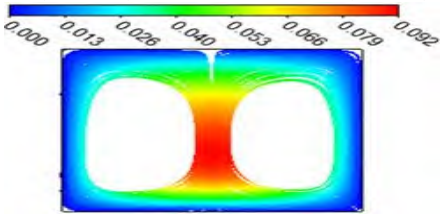
Abstract. The present investigation concerns a numerical study of a nanofluid (Fe3O4/water) flow through a square cross-sectional channel. This channel is heated by a uniform and constant heat flow. The flow studied is three-dimensional and the values chosen for the Reynolds and Richardson numbers allow us to consider it as laminar in mixed convection. The calculations were performed with the monophasic approach and the fluid is assumed to be Newtonian. The different equations which govern the physical phenomenon to be studied were solved using the Ansys-Fluent software based on the finite volume method by introducing the Boussinesq approximation. The study was carried out for Reynolds number values ranging from 500 to 1000 and for two Richardson number values of 0.1 and 0.5 respectively. A dynamic and thermal analysis of the flow structure was performed by determining the variation in temperature, velocity, streamlines, pressure drops and Nusselt number as a function of volume fraction, Reynolds number and modified Richardson. The results showed that the heat transfer is better than that of the base fluid (water) and especially if we increase the concentration of nanoparticles and the value of the Richardson number. The addition of nanoparticles improves heat transfer.

Keywords: Nanofluid, Fe_3O_4, mixed convection, CFD, channel.



Graphical abstract

Study of the effect of laser treatment to reduce contamination of PVC-based packaging

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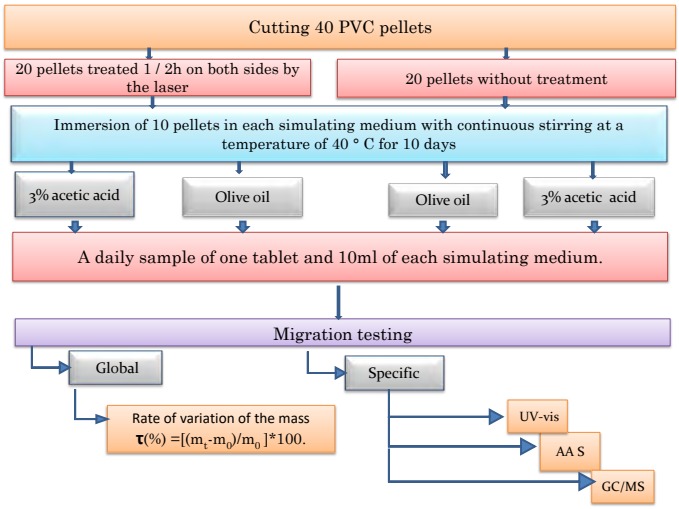
Abstract. In the context of this work, we have sought to reduce this migratory phenomenon by modifying the surface of the polymer by crosslinking using a laser treatment. This method aims to bring the molecular chains of the polymer closer together, increasing its cohesion thus reducing the free volume and creating a three-dimensional network which will play the role of a barrier preventing the additives contained in the packaging from migrating to the food and vice versa, which the food does not penetrate the polymer interior. As part of this work, a formulation is carried out in the presence of 45% plasticizer. Migration tests are performed with agitation in two food simulator media, namely, crude olive oil and 3% acetic acid, with and without laser surface treatment. The migration phenomenon is analyzed based on a preliminary study based on the variation in mass of the PVC pellets in contact with the two simulating media at a temperature of 40 °C as well as using four analysis techniques: Atomic absorption spectrometry (AAS), UV-visible spectroscopy and gas chromatography coupled with mass spectrometry (GC/MS).

Keywords: PVC; migration; DOP; Uv; AAS; GC/MS.



Graphical abstract

Stress Relaxation behavior of Composites with Nano-enhanced Resin after Impact Loads

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Abstract. Carbon fibre composites offer an attractive potential for reducing the weight of high-performance structures as consequence of their high specific strength and stiffness. These materials offer excellent in-plane performance, but they have inferior through-thickness properties, where, in case of impact loads, various types of damages can occur.

In order to improve the impact strength, literature suggests the nanoscale reinforcements as a good strategy, because they, simultaneously, increase the mechanical performance and thermal properties. In terms of impact performance, the reduced damage zone size observed is attributed to the increased stiffness and resistance to damage progression of the nanophased laminates. However, polymer composites are prone to creep and stress relaxation as consequence of the inherent viscoelasticity of the matrix phase, which is a great challenge when they are used in long-term applications.

Therefore, the main goal of this work is to study the stress relaxation behaviour of carbon laminates with an epoxy resin enhanced by carbon nanofibers (CNF). Firstly, different percentages in weight were used to obtain the best flexural strength and impact resistance. It was possible to conclude that, for both properties, the ideal amount was 0.75% by weight. For this value, stress relaxation tests were performed, and the results obtained compared against the laminates with neat resin. In both systems the stress decreases with the time, however, this decrease is more pronounced for laminates with neat resin. The same tendency was observed for laminates subjected to impact, but the existence of impact damages in the composite increases the overall relaxation. Therefore, more relaxation was observed for higher impact energies because of greater damages. Finally, the results were fitted following the Kohlrausch-Williams-Watts equation, evidencing good accuracy of the model for the stress relaxation time.

Keywords: Composites, Low velocity impact, Stress relaxation, Mechanical characterization.

Abstracts

Engineering technology and innovation

Obtaining and characterizing chromium carbide on 100 cr6 steel

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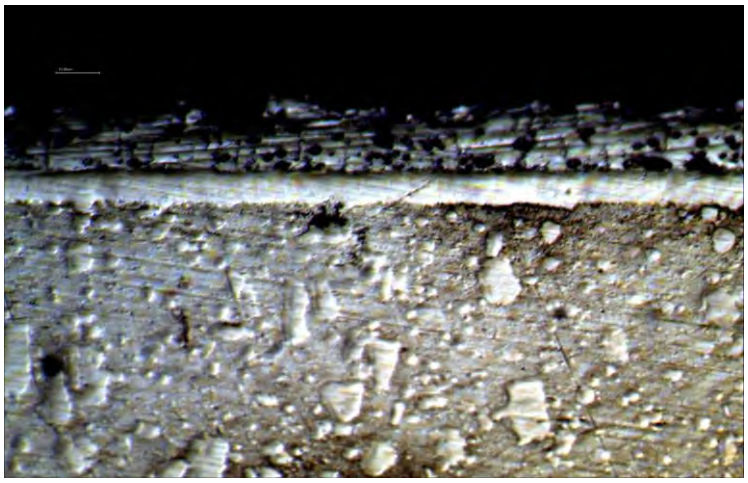
Abstract. This article presents a series of heat treatments on a low-alloy steel 100cr6 previously coated with chromium in an electrolytic bath with a layer of approximately 10 mμ, in order to obtain a layer of chromium carbide with good mechanical and physicochemical properties, a diffusion annealing of 1000 and 1100 ° C while 01 hour and 02 hours capable of offering uniform adherent chromium carbide layers and very high hardness which were confirmed by the characterization means, an optical microscope, a durometer and a diffractometer to determine the nascent phases of this treatment cycle.

Keywords: Annealing, Coating, Chromium carbide, Steel.



Graphical abstract

Three dimensional numerical simulation of the effect of different nanofluids on thermal exchange in mini-channels

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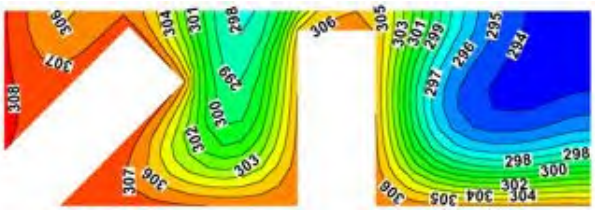
Abstract. The work performed a numerical study of thermal transfers and the influence of the nature of nano-fluid add and Reynolds number variations on thermal transfers in a silicon mini-channel cooler for cooling of electronic components. Three different types of nano-fluids were considered (Cu-water; Ag-water; Diamond-water), using three-dimensional (3D) simulation. In this study, the volumetric fraction of nano-particles was taken to be 5%. The Reynolds number (Re) varied between 200 and 800 and the flow regime was assumed to be stationary. The ANSYS Fluent 15.0 commercial software was used as a calculation tool. The results obtained show that the maximum temperature of the electronic component decreases with the increase in the Reynolds number. The drop in temperature of the electronic component is more noticeable for the Diamond-Water nano-fluid. The best heat transfer fluid among the nano-fluids studied contains the diamond nano-particles because his conductivity.

Keywords: Nano-Fluide, Mini-channels, Thermal transfers, Numerical simulation, CFD, Cooling.



Graphical abstract

CFD simulation of the heat transfer using a Cu-water nano-fluid in different cross-sections of mini-channels

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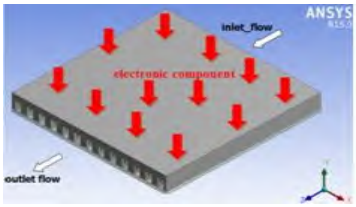
Abstract. In the present work, the objective is to study the heat transfer which is directly related to factors such as Reynolds number, thermal properties of materials, geometric shapes and dimensions. Several works have been carried out in this field. A numerical study of the thermal exchanges between different geometries of cross sections of a cooler with mini channels of dimensions 40 × 52 × 6 mm^3 was carried out. Three different forms have been considered for cooling an electronic component using a nanofluid (CuO-water) as a cooling liquid with 4% volume concentration of nanoparticles. The simulation was carried out using the ANSYS Fluent software. The Reynolds number (Re) is between 100 and 700 and the flow regime was assumed to be stationary. The results obtained for the three forms of mini-channels proposed confirm that the increase in the exchange surface between the walls of the mini-channels and the cooling fluid leads to the increase in the heat transfer coefficient. The improvement of the maximum junction temperature of electronic components has been observed by increasing the value of the Reynolds number.

Keywords: Heat Transfer, Mini-channels, Nano-Fluide, Numerical simulation, CFD, Cooler.



Graphical abstract

Identification of some mechanical and physical parameters of two biological fibers of the date palm “rachis” and “spadix”

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Abstract. In this paper, we expose the essential mechanical properties of the two vegetal fibers of the rachis and spadix of the date palm of the region of Biskra. Those fibers are proposed as reinforcement in a resin matrix of biocomposite material. A variety of mechanical and physical characterizations have been peformed in favor of these fibers such as in their natural state and after their chemical treatment with NaOH at different percentages, visual and SEM observations, the absorption rate calculation, tensile tests and the calculation of conductivity was also a part of the subject of our investigation. SEM images allowed to demonstrate the details of the structural shape of the rachis fibers of the date palm and the physical properties deduced allowed giving the physical details for a probable classification in the library of the studied fiber types.

Keywords: Fiber, biocomposite, mechanical property, physical property.

Graphical abstract

CFD simulations of horizontal ground heat exchangers for cooling irrigation water in the Biskra area

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Abstract. This work is a numerical study aimed at determining the parameters that directly influence the geothermal exchangers. This study focuses on the use of geothermal energy to cool the irrigation water. In particular, horizontal type coil heat exchangers have been studied for different flow rates and materials and number of operating hours, in order to assess the characteristics of these systems in installations and under different working conditions. The calculations were carried out with the CFD Fluent code and the simulations covered the climatic conditions of the summer season in southern Algeria (Biskra). The most important parameter for the heat transfer of this system resulted in the availability of this system. The optimum time was 6 o'clock in the cases analyzed in this work. Another key factor was the choice of fluid velocity inside the tubes. The installation depth of horizontal floor heat exchangers is 3 m according to the literature.

Keywords: Geothermal, Energy, Heat Exchanger, Water, Irrigation, Cooling, CFD Simulation, Biskra.

Graphical abstract

Novel bluish white-emitting $CdBaP_2O_7:Eu^{2+}$ phosphor for near-UV white-emitting diodes

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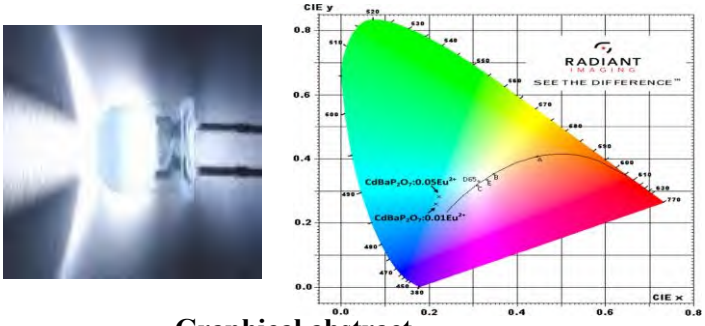
Abstract. A new bluish white-emitting phosphor based on a phosphate host matrix, $CdBaP_2O_7:Eu^{2+}$, was prepared by a conventional solid-state reaction method. The photoluminescence properties were investigated in both ultraviolet (UV) and vacuum ultraviolet (VUV) regions. The band-gaps of Eu-doped $CdBaP_2O_7$ powders can be tuned in the ranges of 2.26 – 2 eV. The Eu^{2+}-doped $CdBaP_2O_7$ phosphor was efficiently excited at wavelengths of 250-400 nm, which is suitable for the blue emission band for near-UV light-emitting-diode (LED) chips (360-400 nm) and red emission peaks up to 700 nm. $CdBaP_2O_7$: Eu^{2+} displays two different luminescence centers, which were suggested to Ba^{2+} and Cd^{2+} sites in the host. The dependence of luminescence intensity on temperatures was measured. The chromaticity coordinates and activation energy for thermal quenching were reported. The phosphor shows a good thermal stability on temperature quenching.

Keywords: Phosphor, Photoluminescence, Eu^{2+}, Light-emitting diodes.



Graphical abstract

Wear behavior of NiTi archwire for biomedical application

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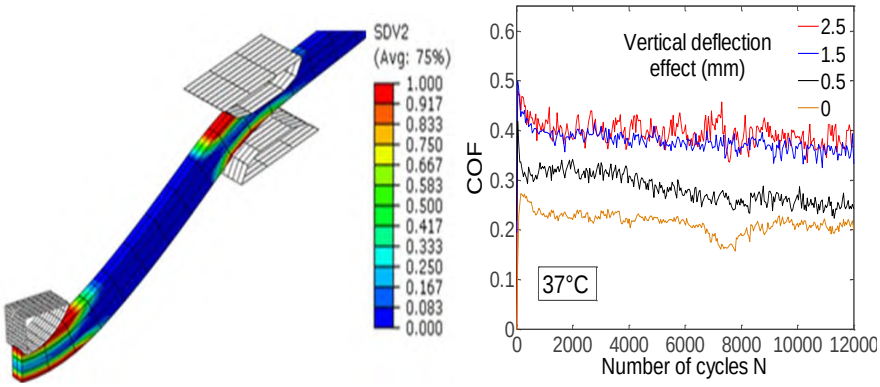
Abstract. The friction and wear behavior of a superelastic NiTi archwire was analyzed at room temperature using an adapted rotational tribometer. This adaptation served to expose the wire during its sliding against a flat, 316 stainless steel plate, to a bending stress of 0 to 2.5 mm. The results showed that in the presence of saliva, the coefficient of friction and wear rate of NiTi alloy decreased significantly compared to tests in dry conditions. The analysis of the obtained wear traces showed that the damage of the NiTi alloy would be attributed to complex mechanisms involving adhesive wear, abrasive wear and delamination wear. The martensitic transformation induced by the deflection of the NiTi archwire would have reduced its tribological properties. This can be explained by the concentration of tensile stresses at the contact zone exacerbating the mechanism of delamination wear.

Keywords: NiTi wires, Friction, Wear, Artificial saliva, Scanning electron microscopy.



Graphical abstract

Electrodeposition and characterization of Zn-Mn coatings for corrosion protection

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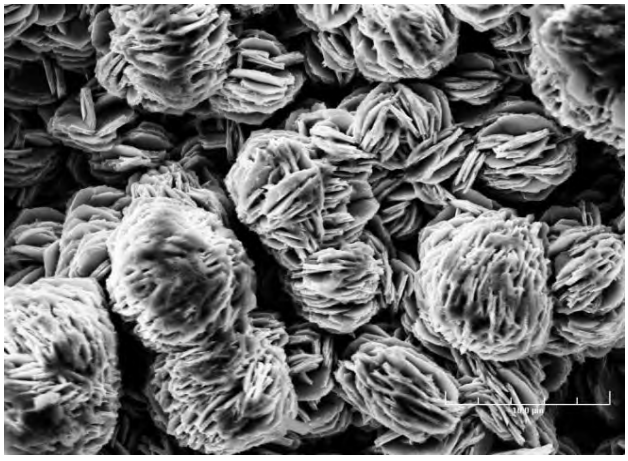
Abstract. A novel additive based on alkylphenol ethoxylate sulphite was investigated in Zn-Mn electrodeposition on steel from chloride bath. Electrochemical data -explored via cyclic voltammetry and chronoamperometry- showed that the tested additive increases Zn deposition overpotential, resulting from a strong adsorption of molecules additive on the cathode surface. Thus, Rich-Mn alloy containing up 16 wt% of Mn content is successfully co-deposited. The morphology and crystallographic structure of co-deposits were analyzed using Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD), respectively. SEM micrographs showed that these co-deposits are compact, well-adherent and bright. XRD analysis exhibited that Zn-Mn are monophasic with a single phase hexagonal close packed ε-Zn-Mn.

Keywords: Electrodeposition, Zn-Mn alloy, Additive, Morphology.



Graphical abstract

Numerical study of the influence of nano-fluid type on thermal improvement in a three-dimensional micro-channel

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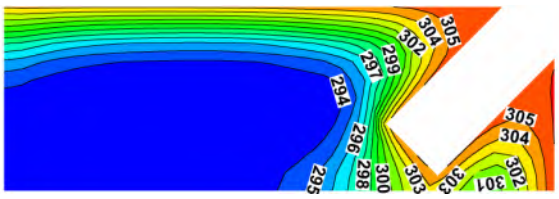
Abstract. The work performed as a numerical study of the effect of different nanofluids on thermal exchange in a silicon mini-channel cooler for cooling electronic components. Using three-dimensional (3D) simulation, three different types of nano-fluids were considered ; TiO_2-H_2O, Ag-H_2O and SWCNT-H_2O. In this study, the volumetric fraction of nano-particles was taken to be 2%, the Reynolds number (Re) varied between 100 and 700 and the flow regime was assumed to be stationary. The ANSYS Fluent 17.1 commercial software was used as a calculation tool. The obtained results confirm that the maximum temperature of the electronic component decreases with the increase of the Reynolds number. The drop in temperature of the electronic component is more noticeable for the TiO_2-water and SWCNT water nano-fluid. The best heat transfer fluid among the studied nano-fluids is the one contains the SWCNT (Single Walled Carbon Nanotubes) nano-particles. So the use of the SWCNT water nanofluid as the fluid for cooling in silicon microchannel is recommended.

Keywords: Thermal transfer, microchannel, nanofluid; numerical simulation, ANSYS.



Graphical abstract

Design and Implementation of a Smart Traffic Light in VANET Protocol

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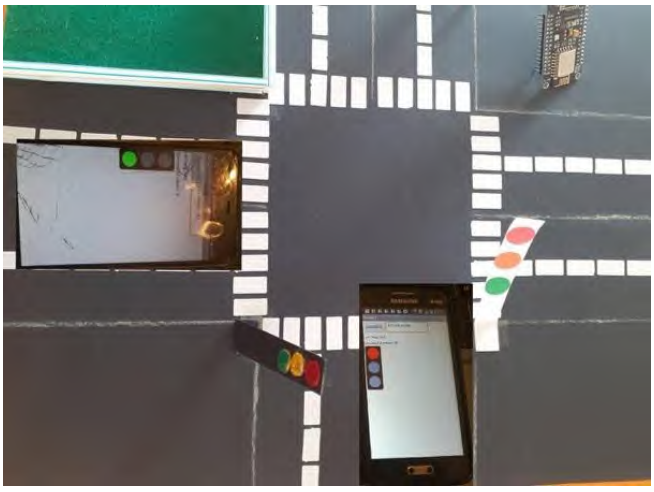
Abstract. Statistics have shown that the majority of accidents are due to human error and that 60% of these accidents could have been avoided if the driver had been alerted at least 0.5 seconds in advance. In this context, ad hoc vehicle networks also called (VANETs) are used to reduce the risk of accidents and improve passenger comfort by allowing the vehicle and the infrastructure to exchange different kinds of data. A smart traffic light is an adaptive real time controller, which receives information from vehicles, such as vehicle position and speed, then uses this information to optimize the traffic light schedule at the intersection. This paper presents a method to implement a real smart traffic light by using smartphones and wireless IEEE802.11 protocol. VANET has two kinds of communication V2V and V2I. the intersection junction adopts the V2I communication which uses the CAM, SPAT and MAP messages.

Keywords: VANET, traffic light, RSU, wireless.



Graphical abstract

Development Of Smart Nano-Materials For Medical Imaging And Therapy

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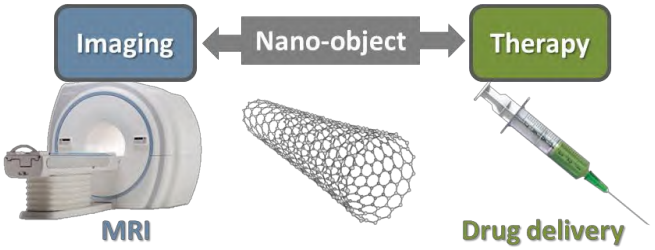
Abstract. In recent years, the development of precisely engineered nano-materials has become one of the hot topics in the biomedical research field owing to their potential to revolutionize diagnostic and therapy of various diseases. Among them, superparamagnetic nano-objects are particularly interesting since they can significantly enhance the contrast of magnetic resonance imaging (MRI) thanks to their high relaxivity. In addition, they can improve the efficacy of the treatment by playing the role of nano-carriers with the capacity of transporting drugs to targeted cells. In our study, we developed a superparamagnetic theranostic nano-object dedicated for cancer imaging and therapy.

Keywords: superparamagnetism, nano-material, theranostics, cancer.



Graphical abstract

Smart Energy Monitoring based on LoraWan technology

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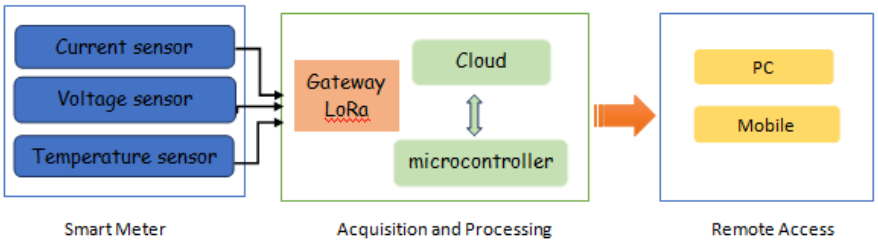
Abstract. With the rise of LPWAN technologies, such as LoRa devices and the open LoRaWAN protocol, new smart metering solutions are proving to be a compelling alternative to other connectivity options for the Internet of Things (IoT) and smart grid applications. This paper presents an IoT architecture of a smart electricity meter monitoring systems based on LoRa technology. We first explored the energy information system and energy monitoring. Second, we propose a system architecture based on the Internet of Things. Information is stored by a device equipped with sensors and a microcontroller, connected to a LoRa module for sending data, which is then processed and stored in the cloud.

Keywords: Smart Metering, Energy Management, IoT, Cloud, UbiDots, LORA, Real Time Monitoring.



Graphical abstract

A Survey of Communication Protocols for IoT

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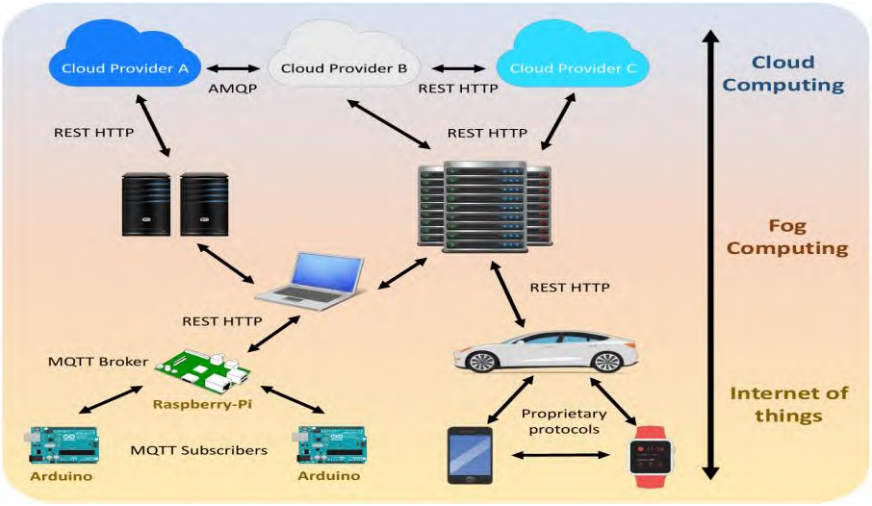
Abstract. The growing number of Internet of Things (IoT) devices is accelerating the search for solutions to make cloud services scalable. In this context, the concepts of fog computing and cloud computing combined are becoming essential to decentralize the cloud and bring it closer to the end system. This paper first examines the application layer communication protocols that meet IoT communication requirements (XMPP, AMQP, DDS, CoAP and REST HTTP) and their potential for implementation in the fog and cloud-based IoT based on their key characteristics, including latency, power consumption and network throughput. Each of these protocols has specific functions and is used specifically to manage certain issues. Next, we take a closer look at the most common IoT protocol, MQTT, its importance in the IoT, its architecture, its areas of use, its issues and future trends.

Keywords: Internet of Things, Fog Computing, Cloud Computing, Communication Protocols, MQTT.



Graphical abstract

Energy efficiency

Influences of four-parameters: Polarization, temperature, Input amplitude and Input Frequency On properties of vertical-cavity surface-emitting lasers and their impact on Optical Communication

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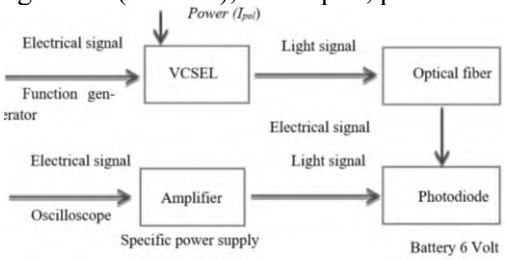
Abstract. In this paper, the influences of four parameters (polarization, temperature, input amplitude and input Frequency) on optical communication systems was been investigated experimentally. Furthermore, the performance of each communication quality evaluated by surveying two factors TDH and SNR. For that purpose, the experimental setup based on transmitter (vertical cavity surface emitting laser), optical fiber (transmission support) and photodiode (as a receiver) at the end of optical communication chain. In addition, the voice signal selected as sample has the frequencies range 20 hertz and 20 khertz. Therefore, our results show that a highest quality of optical signal produced: In polarization I0= 5 we have the best quality SNR=40, 2 dB and TDH=2 % mA. When Input amplitude arrive at Δ v = 1000 mV the SNR reaches a maximum value. Then, Temperature, the signal quality is good when we place in very low temperature. Than more, input frequency, the signal quality is very good when we place in very high frequencies.

Keywords: Total harmonic distortion, signal-to-Noise-Ratio, vertical cavity surface emitting laser (VCSEL), fiber optic, photodiode (PID)



Graphical abstract

Container house: experimental investigation of the wind solar unit

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Abstract. In this paper, the design of a container house is presented first. Secondly, a wind solar unit is detailed. The main components of this unit are a vertical axis wind turbine for water pumping and electricity generation, a solar cooker, a solar refrigerator, PV panels and a biogas digester. Thirdly, experimental investigations were developed under ambient conditions for the main components of the wind solar unit. Regarding the solar cooker, the maximum temperature of the absorber plate was between 81.3 °C and 133.6 °C. In addition, two real cooking process were carried out where 72 min and 107 min were required to fully cook rice and beans respectively. In relation to the vertical axis wind turbine, the main components are two Savonius wind rotors and one Darrieus wind rotor. The study was focused on the evolution of the rotational speed and the torque for each wind turbine rotor. Concerning the solar refrigerator, the novelty consists of concentrating solar radiation using flat polished stainless steel reflectors. In addition, several aspects influencing the performance of the solar adsorption refrigerator were studied such as the mass of the load to be cooled and the initial mass of the refrigerant. The obtained results are very satisfactory when comparing numerical and experimental.

Keywords: Solar cooker, wind turbine, solar refrigerator, container house

Graphical abstract

Experimental investigation of a membrane distillation unit coupled with solar energy

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Abstract. Nowadays, different techniques of purification of water have been created to provide freshwater from the salt water and polluted such as solar distillation method to distill brackish/saline water. This work presents experimental study of solar membrane distillation unit which coupled with direct contact membrane (DCMD) and located at Kairouan University. The system is installed as a part of a cooperation project research and development between Tunisian Electromechanical Systems Laboratory and German Institute for Solar Energy Systems entitled: Solar driven membrane distillation for resource efficient desalination in remote areas. For the heating of the hot feed water stream, a heat exchanger is included and can be operated with any external heat supply between 60 °C and 80 °C. For the cooling of the cold feed water stream, no heat exchanger is included. The cooling can be provided over the intake of cold feed water. The effect of solar irradiation and all temperature on the journal prodectivity of the unit has been presented.

Keywords: Menbrane distillation, desalination, solar energy.

Graphical abstract

Renewable energy

CFD based performance analysis of a solar air heater test bench with unsteady turbulent flow

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Abstract. The solar air heater (SAH) is a widely used thermal application of renewable energy. The unsteady turbulent flow in a new SAH test bench developed in the LASEM laboratory was investigated. The used test bench is composed by two passages separated by an absorber and powered by a fan working in a delivery mode, placed in the inlet side the insulation, for the forced convection mode. Two circular holes, are located in the face of the box prototype. The inlet hole allows the hot air supply. However, the outlet hole allows its escape into the ambient environment. The results predicted by CFD simulation used the Navier-Stokes equations coupled with the standard k-ω turbulence model were resolved. Comparisons with experimental data have been performed and found to be in excellent agreement. This work will promote technique developments of solar air heater.

Keywords: CFD, Solar air heater, Test bench, Two passages, Box prototype.

Graphical abstract

Numerical Study of the Natural Convection Impact into a PCM within Tubular Capsule

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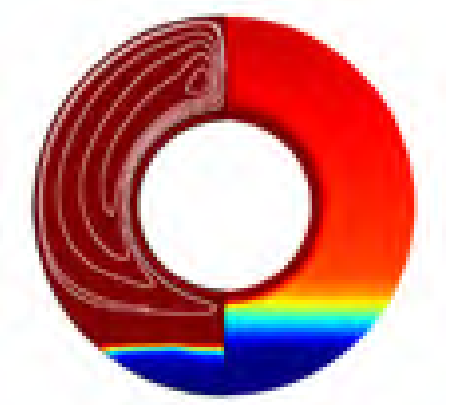
Abstract. The present paper summarizes a numerical study investigating the behaviour of a phase change material PCM filling up a cylindrical container. The PCM is located between two tubes, the inner tube cares the heat transfer fluid HTF and it is posed to produce a heat flux. The investigation focuses mainly in comparing the effect of changing the inner tube position; up, centre and down, on the melting process. Results showed that moving the inner tube downward leads to a decreased melting time and the rate of the thermal energy storage becomes better.

Keywords: PCM, Cylindrical container, Melting, Free convection, Thermal energy storage, mushy zone.



Graphical abstract

Structural Design of a 10 kW H-Darrieus Wind Turbine

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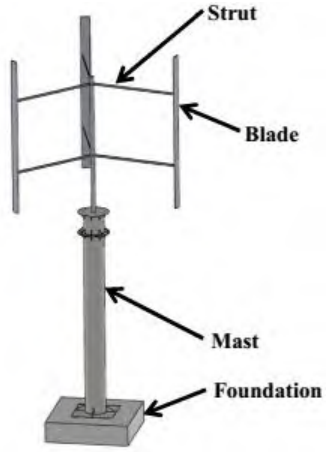
Abstract. The use of wind systems for electricity production is one solution to meet the electricity needs in an isolated site is fairly well windy. In current research on wind energy, vertical axis wind turbines (VAWT) of the Darrieus type are increasingly appreciated, in particular in small installations. In particular, H-shaped turbines can offer attractive spaces for new design solutions, aimed at reducing the visual impact of the rotors, and then improving their degree of integration with several installation contexts. The main purpose of this work is to identify and critically analyze the main design parameters related to a 10 kW H-Darrieus vertical axis wind turbine, which can be considered as a candidate for urban and off-grid rural.

Keywords: H-Darrieus wind turbine, Rotors, Blades, Generator, Mast.



Graphical abstract

Numerical study of the Manzanres prototype of solar chimney power plant

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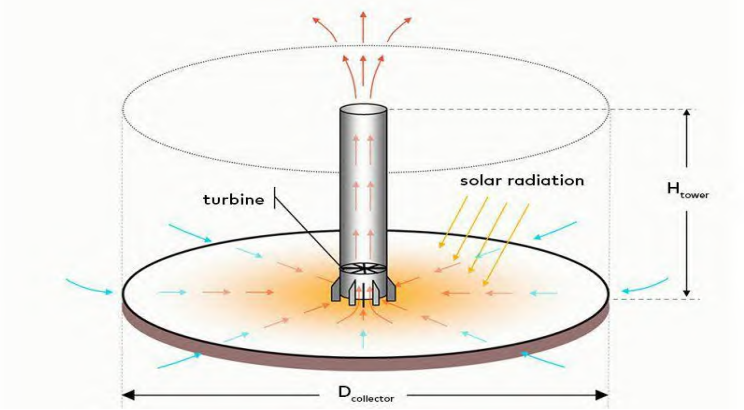
Abstract. Solar chimney power plant is a current project which produces the green energy from the sun. Its principle of working was based on the increase of the internal energy of the ambient air. There are several methods to modeling the SCPP system. By using the CFD software FLUENT16.2 a series of simulations of SCPP were carried out. In this paper, the geometry of Manzanares prototype was taken as a case study. A comparison between 2D and 3D simulations was performed by keeping the same conditions. Three cases are incorporated into the 3D simulation; quarter domain, half domain and full domain. These simulations were performed to predict the distribution of the local characteristics of the fluid flow inside the system. The results of the current work were validated by the experimental data of the Manzanares prototype. A good agreement between the local CFD results and the experimental data was achieved for both 2D and 3D cases.

Keywords: SCPP, CFD modeling, Solar energy, Fluid flow.



Graphical Abstract

Theoretical modeling of heat transfers in conventional collector of solar chimney

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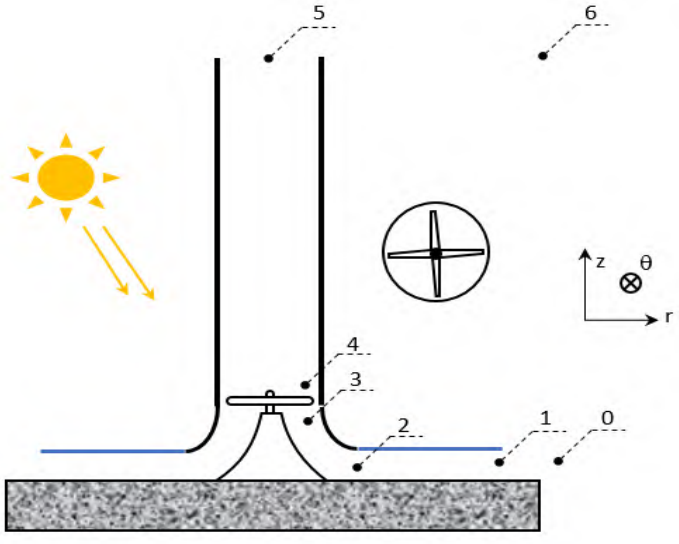
Abstract. Solar chimney (SC) is a renewable energy power plant which is produces electricity from the sun. It consists of three parts; solar collector, tower and wind turbine. The solar collector is the chief part which is based on the conversion of the solar energy into thermal energy by greenhouse effect. In this work, the heat transfer balance in the collector was modeling theatrically. Based on Kutta-range method, simple Navier Stockes equations were solving along the collector to determine the distribution of the air flow characteristics. The present model was validated by the experimental data of the Manzanres prototype. Results show a good agreement between the theoretical model and the experimental data.

Keywords: Theoretical model, Solar chimney, Thermal balance, Airflow.



Graphical abstract

Modeling of an Autonomous Hybrid Microgrid based on Photovoltaic and Flywheel Energy Storage System

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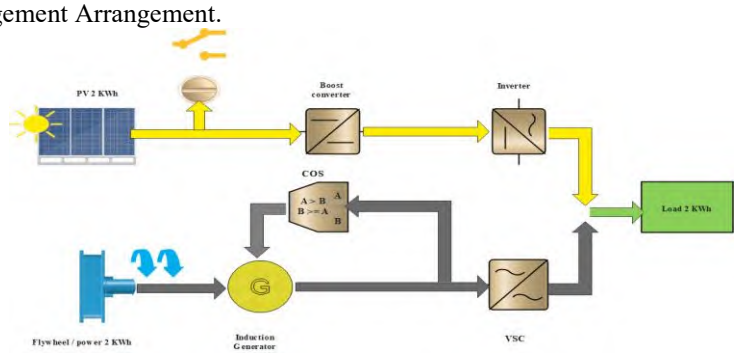
Abstract. The problem of electricity shortage and rising the electrical consumption bill are boosting the researchers to invention another alternative solutions for producing the electricity, therefore the renewable energy methods were the best field for researching. The renewable energy systems are considered as an alternative solution to produce the electricity for residential. The proposed system suggestions a modeling of an autonomous photovoltaic PV and flywheel energy storage system FESS. The advantages of the flywheel are produces clean kinetic energy with high efficiency and long life without maintenance therefore these characteristics motivate the researchers to used it instead of batteries. The offered system is designed to be continuous suppling with 2 KWh independently on the grid, the system is considered as portable supply of 380 AC and 24/48 DC. The flywheel is connected to a Motor Generator M/G which is wired to Voltage Source Converter VSC to reach reliable power. The M/G feeds via two sources to ensure the self-supplying of M/G. the sunset and cloudy days have been considered with Power Management Arrangement PMA, so the system is supported with five operations scenarios between PV and FESS.

Keywords: Flywheel Energy Storage System, Photovoltaic, Modeling, Power Management Arrangement.



Graphical abstract

Performance study of a twisted Savonius water rotor

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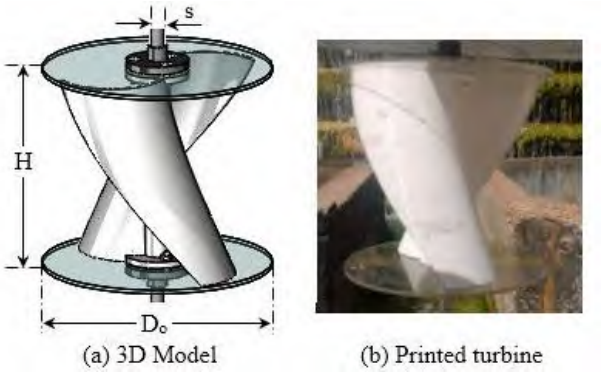
Abstract. Recently, numerous studies were carried out to improve the performance of the twisted Savonius rotor which has not been fully explored. In this paper, an experimental study was carried out to evaluate the performance of a twisted Savonius water rotor. In order to enhance the performance of the studied water rotor, a deflector system was proposed. Different configurations of the proposed deflector system were tested numerically using the commercial software ANSYS FLUENT 17.0. Using the optimal deflector configuration, the peak value of the power coefficient was increased by 20%.

Keywords: Twisted blade, efficiency, validation, deflector.



Graphical abstract

Study of a Banki micro hydro-turbine for discharge regulation and energy recovery

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Abstract. Water Distribution Networks (WDN) is very important infrastructure systems, where failures are expecting. The main goal is to design water distribution systems to deliver potable water in required quantity under sufficient pressure and an acceptable level of quality during different normal and abnormal operational situations. While, for lower pressures, there cannot be a water delivery and for higher pressures, there can be an excessive amount of leakage. In this context, excessive pressure has always been a major problem in water supply systems. In order to contribute to this problem, water utility managers often choose to perform service pressure regulation in WDNs. In this paper, the study of a new simple Banki turbine named power recovery system (PRS) with positive outlet pressure and a mobile regulating flap for hydraulic control of the characteristic curve is carried out using the commercial software ANSYS CFX. The turbine has been designed, constructed and tested in the hydraulic laboratory of the University of Palermo. This study shows that the use of PRS turbine presents an improvement consisting of higher efficiency up to 76% with the capability of performing discharge control and hydropower production.

Keywords: Water Distribution Network, Banki turbine, mobile regulating flap, discharge control, hydropower production.

Graphical abstract

Olive mill wastes as a substitute for silage in biogas plants at laboratory scale

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Abstract. Olive mill wastes represent a serious environmental problem in the Mediterranean regions. However, they can be considered also a valuable and abandon resource for renewable energy production. Moreover, these bio-wastes are widely used in the biogas plants especially they are produced in large quantities during a short period of time. Thus, a proper valorization and reuse strategy to exploit olive oil wastes must be considered. The aim of this work is to estimate the effect of substituting part of silage from energy crops with olive pomace and wastewater in a biogas plant. Biochemical Methane Potential tests were used under mesophilic conditions (35°C) in order to replicate same working conditions of an existing biogas plant. A mixture of corn silage and triticale, olive wastes and liquid swine manure (with the following mass fractions: 66%- 14%- 20%) was used, replicating a possible mixture for a real biogas plant. The maximum methane production rate of 0.500 Nm^3/kg of volatile solids was achieved with fresh pomace at a Hydraulic Retention Time of 70 days. The results showed that using olive mill residue in co-digestion with other substrates enhances methane productivity by balancing nutrient level. The co-digestion process with old olive pomace led to an increase in the methane production of 36%, compared to co-digestion without olive wastes.

Keywords: biogas, olive mill wastes, co-digestion, BMP tests.

Performance improvement of a helical Savonius wind rotor

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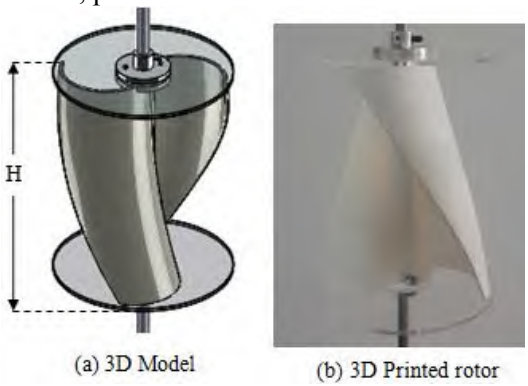
Abstract. Above all vertical axis wind turbines, for their lower cost and independent on wind direction, Savonius rotor takes the advantage to be more suitable for some implementation. This study emphasizes on the effect of the overlap distance and the blade shape on a helical Savonius wind turbine performance. Thus, transient simulations are carried out with the use of ANSYS FUENT 17.0. The numerical model is validated using wind tunnel tests. Results indicate that the non-overlapped helical Savonius rotor highlights higher maximum power coefficient. An improvement of 14.51% is obtained with the novel blade shape.

Keywords: Helical Savonius rotor, overlap distance, blade shape, performance, tip speed ratio, power coefficient.



Graphical abstract

Biomethanization of solid waste at laboratory scale

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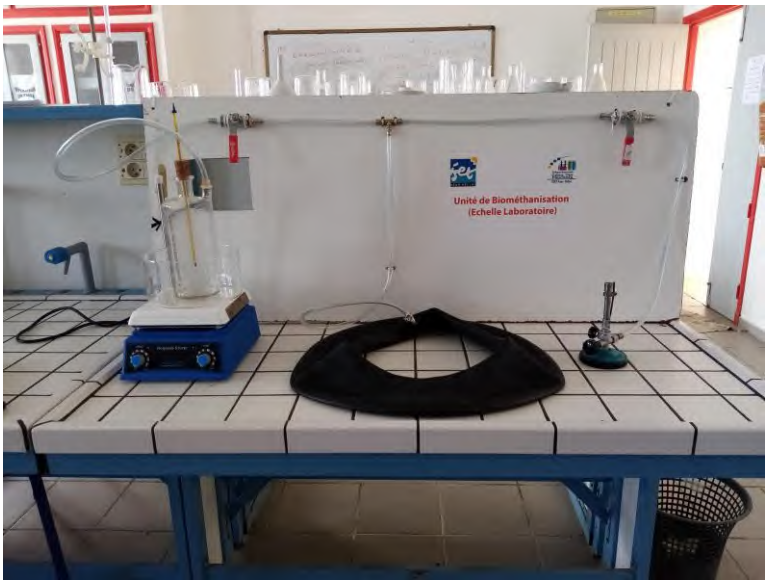
Abstract. This study concerns the design, construction and study of an anaerobic digestion unit for solid organic waste on a laboratory scale. A study of the methanogenic potential of the various solid wastes particularly that of the university restaurant of Ksar Hellal was presented and discussed. The recovery of this solid waste by anaerobic digestion has shown great interest in the good management of solid waste and the investigation of new renewable energy sources.

Keyword: Recovery, solid waste, methane, anaerobic digestion



Graphical abstract

Heat Transfer Enhancement in a Parabolic Trough Solar Receiver using Nanofluids

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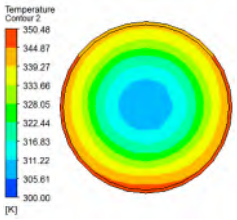
Abstract. The parabolic trough collector (PTC) is the most mature and commercially tested technology. In the concentration process of sunrays, non-uniform heat flux distribution forms outside the absorber tube, which generates a non-uniform temperature gradient on the absorber tube. Moreover, high temperature gradients degrades the thermodynamic performance of the receiver. To override this problem, we have to enhance the heat transfer in the receiver's absorber tube to improve the performance. In this work a three dimensional analysis of the thermal performance of a parabolic trough receiver was investigated through studying the influence of the receiver tube, material type, and nanoparticles. To improve the thermal performance of (PTC), 3 types of materials and water, nanoparticles of $Al2O_3$ with concentration ratio 1%-6 % and mass flow rate 0.005 kg/s were used for the receiver heat transfer enhancement. The results show that Copper and Aluminum give considerably similar values lower than those obtained in the case of steel, which decreases the temperature gradient and induces an improvement in the heat transfer coefficient. Using Al2O3+distilled water, the average of output temperatures was increased by 2%, 6%,10% with the concentration of 1%, 2% and 6% respectively than the water-based.

Keywords: Heat transfer, Nanofluids, Parabolic trough receiver, Temperature gradients, Volume fraction.



Graphical abstract

Modelling and simulation

The effect of viscosity on the transport of crude oil in the OZ2 line connected Haoued El-Hamra to Arzew

Makhlouf Challal, Iboukhoulef Fouad

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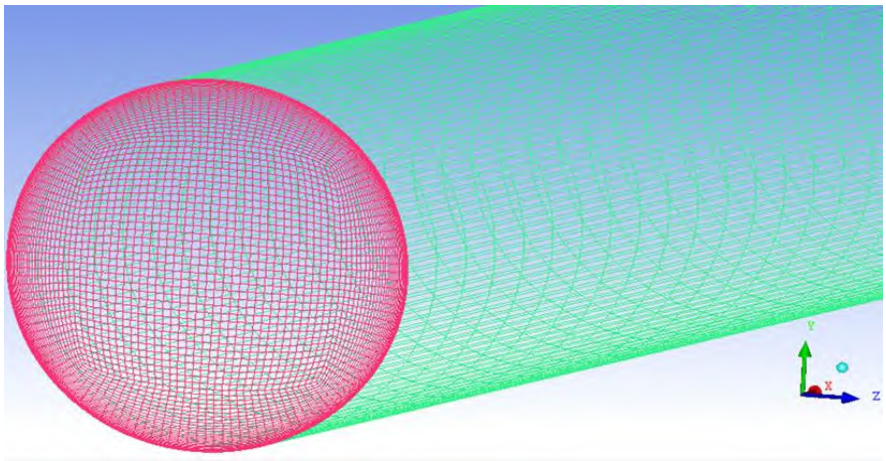
Abstract. The rheological and hydrodynamic characterization of the Algerian crude oil to the passage of a cylindrical pipe was carried out by numerical simulation. The considered geometry is a cylindrical pipe section carrying crude oil connected to the Haoued El-Hamra area to the Arzew refinery. The experimental indicates that the sample of Algerian crude oil has Newtonian behavior, which is strongly influenced by temperature. The induced flow structure was examined: hydrodynamic regime translated by variation in the viscosity of the processed petroleum. This latter factor was injected into the CFX calculation code. The validation of our numerical results with the analytic shows a good agreement.

Keywords: rheological, hydrodynamic, cylindrical pipe, Haoued El-Hamra area.



Graphical abstract

Three-Dimensional Mixed Convection in a Cubical Cavity with Nanofluid

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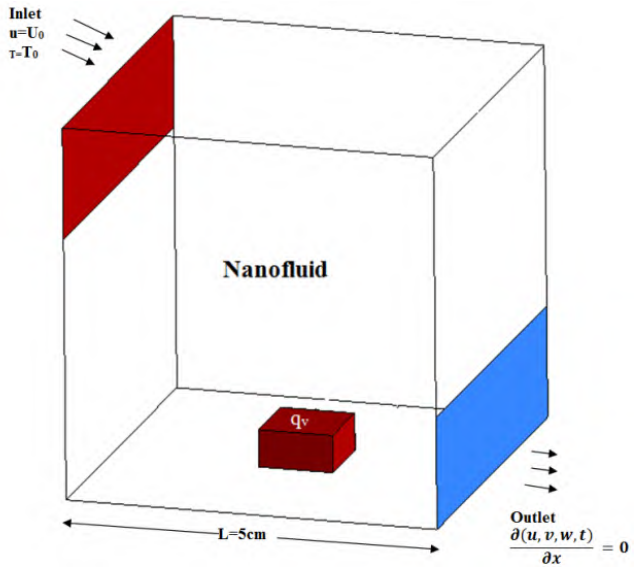
Abstract. The present study reports numerical simulations of three-dimensional laminar mixed convection heat transfer of water-based-Al_2O_3 nanofluid in an open cubic cavity with a heated block. Ansys-Fluent 14.5 was used to simulate 3D flows with heat transfer. Streamlines, isotherms, vertical velocity profile, and local Nusselt numbers are presented for Reynolds numbers in the range $300 < Re < 700$, volume fractions of nanoparticles $0 < \phi < 0.08$ and heat source location 1 cm <d <3 cm. It was found that when adding nanoparticles to the base fluid or increasing the volume fraction of nanoparticles, the Nusselt number increases. Moreover, the heat transfer rate increases when the Reynolds number increases.

Keywords: Cubical cavity, mixed convection, nanofluid.



Graphical abstract

Mesh effects for a rectangular plate resting on the surface of an elastic foundation with distributive properties on the values of its natural frequencies

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Abstract. In this work, a study concerning the effect of the mesh discretization of a rectangular plate resting on the surface of an elastic foundation with distributive properties (Boussinesq's problem) is undertaken. The natural frequencies and convergence were investigated. This paper contributes to this through modifications of the force method. The introduced modification allows the coupling of two essential axes of the design of this problem; the first one is the use of the energetic Ritz's method and the second one is the study of Green's function. The proposed technique leads to a semi-analytical that leads to mathematical simplifications, to get a linear system of equations in matrix form. The roots of the determinant's equation of the obtained matrix represent the values of the Eigen-frequencies of the studied plate. The challenge of this study is the discretization's size of the considered structure (plate resting on the surface of an elastic foundation), where an inverse proportionality (number of elements with error) applies. Precise results done when the mesh becomes finer. Consequently, the execution of the calculation codes elaborated for this study becomes very complex and requires a very long time of running. This challenge is overcome thanks to the use of the university's powerful computing station, which took us a lot of computing time, but allowed us to determine the searched values with increased convergence. Finally, a comparison of the obtained values of the Eigen-frequencies of the studied structure is made with the Winkler model (where the vertical displacements of the elastic foundation's surface are characterized by means of continuous, closely spaced linear springs).

Keywords: Mesh effect, Eigen-frequencies, Rectangular plate, Green's function, Boussinesq's model, Ritz's method.

Investigation of different properties of Full-Heusler alloys Ru_2MnZ (Z=V; Nb)

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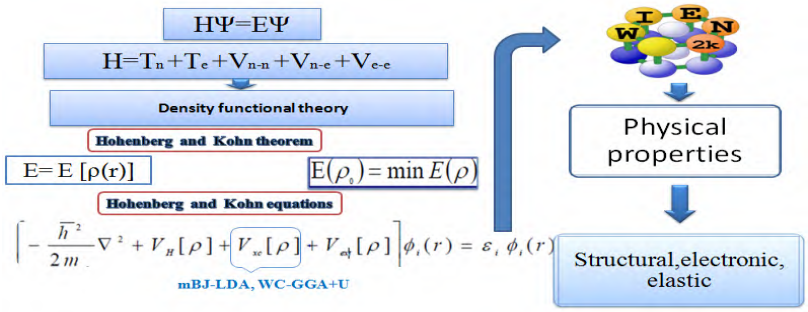
Abstract. In order to predict some desirable compounds for spintronics, we have performed an Ab-initio calculation to investigate different properties of full Heusler alloys Ru_2MnZ (Z=V; Nb) implemented in Wien2k. The calculations are based on full-potential linearized augmented plane wave (FP-LAPW) method using the GGA method of the exchange (XC) and correlation potential with the introduction of Coulomb potential (Hubbard) U to determine the structural, electronic and mechanical properties. Our structural results are, on the one hand, in good agreement with the theoretical results available, and the magnetic results obey the law of Slater-Pauling $M_T = N_V$-24 on the other hand. The band structures reveal that both materials have a metallic behavior, finally. The calculation of the elastic properties indicates the mechanical stability, the rigidity, and the ductility of these compounds.

Keywords: Ab-initio calculation, Heusler alloys, spintronic, Wien2k, GGA+U.



Graphical abstract

Numerical Simulation of impinging double jet with dynamic approaches

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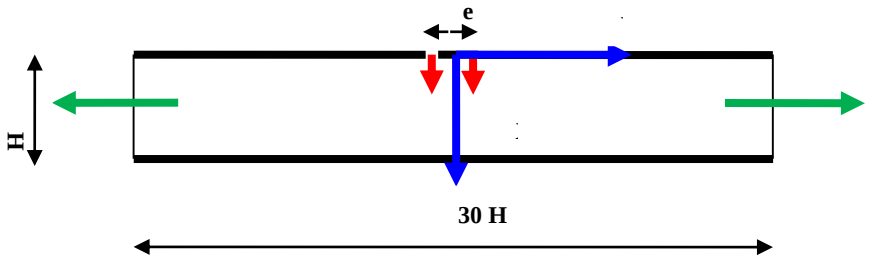
Abstract. The dynamic model is used to predict the evolution of the radial velocity of a double jet. The Reynolds number is 14000 and the decontraction ration is 10. A comparison of our simulation results with those from experimental measurements shows good agreement. The simulation is invested for the six horizontal axes to predict the evolution of the double jet and to give an insight on the behavior of the tatter.

Keywords: Impinging jet, Turbulence, LES, CFD.



Graphical abstract

Numerical simulation of twin jet impingement with LES model

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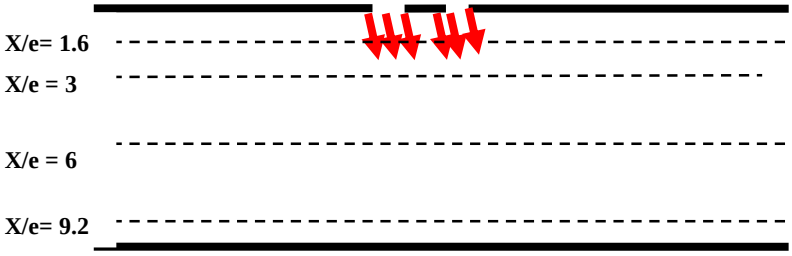
Abstract. The present study is focused on the analysis of the mean quantities of the dynamical field along the central axis of a twin-jets impingement against a flat surface without recirculation. The jet impinging is used to separate different confinement whose have different temperature and different species. The study is achieved using the LES model with dynamic approaches. The jet opening ratio is H/e = 10 and the Reynolds Number R_e= 14000. The investigation is located at six horizontal stations and the mean vertical axe. The results are compared to those of experimental measurements found in the literature. The model exhibits good agreement with the experimental data.

Keywords: Impinging jet, Double jet, Turbulence, LES.



Graphical abstract

Study of the influence of the inlet parameters of the first group compressor (low pressure) - Algerian Hassi messaoud compressor station - to avoid the surge phenomenon

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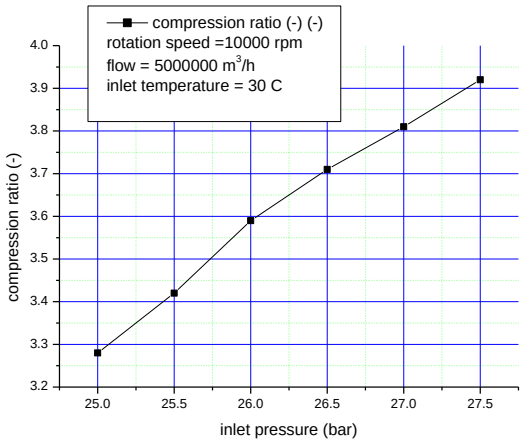
Abstract. Compressor stations are designed to compress the associated gas, in order to reinject it into the injection areas or to be shipped as sales gas, through rotating machinery mainly compressors and gas turbines. For best operation of the units, the compressors must be operated under suitable operating conditions to avoid possible damage. The present study is devoted to define the new operating parameters of the compressor through which a gas flows, undergoing a change in properties, in order to avoid the pumping phenomenon, taking into account the suitable operating conditions. To this end, the feasibility of the theoretical and economic proposal to have a more efficient and less expensive regeneration has been studied.

Keywords: Centrifugal Compressor, Anti-surge, Hysys.



Graphical abstract

Analyse numérique du comportement en rupture des structures réparées par patch en composite

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Résumé. La réparation des structures endommagées par fatigue par l'utilisation du collage de patch en composite est un processus efficace et économique pour préserver les structures et augmenter leur durée de vie. De nombreux travaux se font actuellement pour améliorer cette technique. Dans ce travail une simulation numérique non-linéaire en 3-D par éléments finis a été réalisée pour analyser le comportement du front de fissure et déterminer l'évolution du facteur d'intensité de contraintes pour une plaque en alliage d'aluminium contenant une fissure centrale, réparée asymétriquement avec un patch composite. Selon les observations expérimentales, le front de fissure a été modélisé comme une forme inclinée à partir de l'état initial où le front de fissure est droit et parallèle à la direction de l'épaisseur du côté de patché vers le côté non patché.

Mots-clés : Réparation par patch composite, facteur d'intensité de contraintes, front de fissure, les éléments finis, alliage d'aluminium, fatigue.

Electric Field simulation of the Barrier Effect in Point-Barrier-Plane Air Gaps Using Finite Element Method

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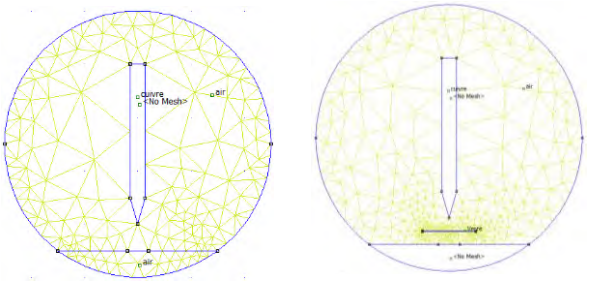
Abstract. Knowledge of the distribution of the electric field inside and around high voltage equipment is a crucial aspect of the design, operation and performance of high voltage insulators. This paper presents the distribution of the electric field in point-barrier-plane air gaps taking into account the presence of insulating barriers. For this, the distribution of the potential and the electric field for the two configurations (with and without barrier) is studied using a numerical method. We used 2D electrostatic simulations using FEMM (Finite Element Method Magnetics) software based on the finite element method. The results are favorable and promising.

Keywords: Electric field and potential, MEF, Point–barrier-plane, Rigidity.



(a) Without barrier (b) With barrier

Graphical abstract

Estimation of Breakdown Voltage of Point-Plane in the Presence of Barrier Using Artificial Neural Network (ANN)

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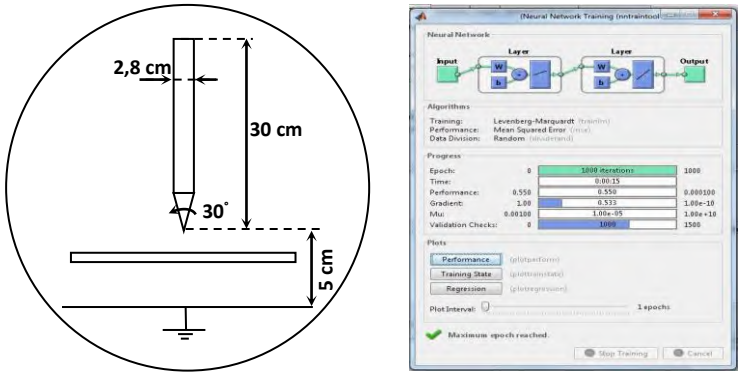
Abstract. The influence of the barrier on the point-plane air gap depends on several parameters. Among these parameters we find the position, dimensions and the pollution of the barrier. The aim of this work is the implementation of the artificial neural network (ANN) for the prediction of the breakdown voltage of an artificially polluted high voltage point-barrier-plane under AC 50Hz applied voltage using MATLAB/Simulink. This technique will have to take into account the variation of the conductivity, the position and dimensions of the barrier. The results obtained show that this method has been successfully applied. There is a good agreement between the calculated results and the experimental results.

Keywords: HV, pollution, artificial neuron network(ANN) , point-barrier-plane, conductivity.



Graphical abstract

Numerical Simulation of the Barrier Effect on the Electric Field Distribution in Point-Plane Air Gaps in AC Voltage using COMSOL Multiphysics

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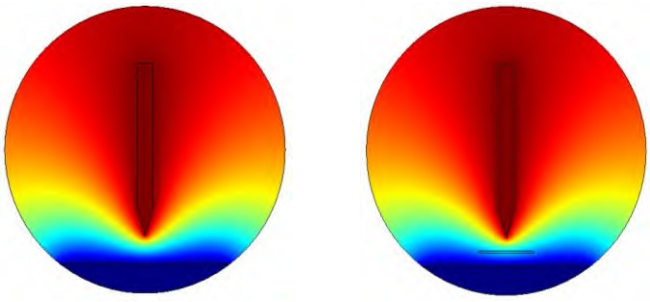
Abstract. The main objective of this work is to characterize numerically a point-barrier-plane electrode configuration. The distribution of the potential and electric field of the precedent configuration was carried out under Comsol. We have modeled the structure studied under COMSOL (multiphysics simulation tools by finite elements). Two modeling cases were treated, one configuration without barrier and the other with polluted barrier. This model has been developed for a point-barrier-plane system with a distance between electrodes equal to five centimeter. The parameters, which influence the field, are numerous. We used 2D electrostatic simulations using Comsol multiphysics software based on the finite element method. The obtained results are in good agreement.

Keywords: Electric field, potential, MEF, Point–barrier-plane, pollution.



(a) Without barrier (b) With barrier

Graphical abstract

Numerical Study of Electrical Field Distribution in Insulation Function of HV Cables Containing Cavities using Comsol Multiphysics

Hani Benguesmia[1,2,*], Hachim Seghiri[2], Abd Rachid Akka[2], Saad Khadar[3], Nassima M'ziou[4]

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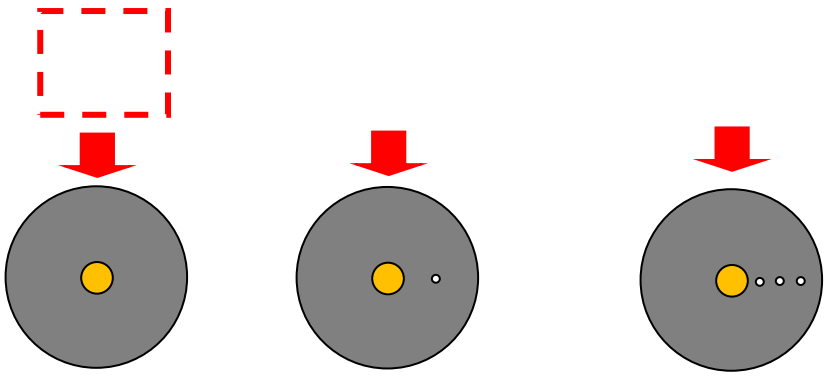
Abstract. This paper studies the electrical constraints within an insulated cable containing micro-cavities. The purpose of this work is to determine by simulation the distortions caused by micro-cavities on the electric field distribution in the insulating layer of cable. According to the obtained results, Partial discharges can be initiated caused by a cavity according to its size and its position. The cavities present a harmful effect on the insulation degradation.

Keywords: Electric field and potential, Insulator, cavities.



Graphical abstract

Study of a Partial Discharge in an HV Cable Using Finite Element Method

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Abstract. The main objective of this work, to try to highlight the effect of the appearance of one or more cavities on the activity of partial discharges. Using Comsol Multiphysics software, we discussed the influence of the cavity, three identical and non-identical cavities, doubled cavities, and the position of the latter. In order to validate some results obtained by simulation, a mathematical model was presented. The results are favorable and promising.

Keywords: Insulator, fault, cavities, electric potential, electric field.

Graphical abstract

Application of Shunt Active Power Filter for Harmonic Compensation in Three-Phase Four-Wire Systems

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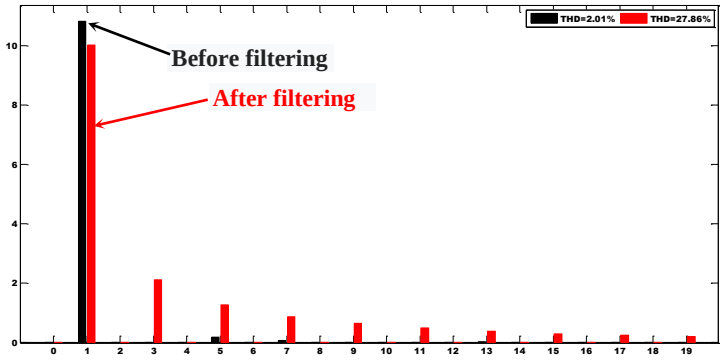
Abstract. In a low-voltage electrical network, harmonics, reactive power, current and voltage imbalances have harmful effects on electrical equipment. In this article, we have approached the structure of a parallel active filter in order to study the compensation of harmonic current disturbances for the improvement of the energy quality of an electrical network. The method of identifying harmonic currents and voltages based on the instantaneous active and reactive power method. All simulations are carried out with MATLAB software. The simulation results obtained showed good performance for the proposed control.

Keywords: *S*hunt active power filter, Hysteris, Regulator (PI), Total Harmonic Distortion (THD).



Graphical abstract

Improving the Electric Power Quality by the Compensation of the Reactive Power in Electrical Networks

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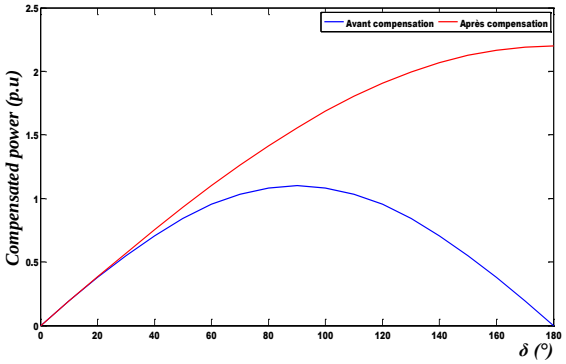
Abstract. The study of reactive energy compensation in electrical networks has become one of the subjects of interest to electrical engineers as well as other researchers. The main objective of electricity distribution grids is to transport electric energy to end users with required standards of efficiency, quality and reliability, which requires minimizing energy losses and improving transport processes. All simulations are carried out with MATLAB software. The simulation results obtained showed good performance.

Keywords: Compensation, Reactive power, Capacitor battery.



Graphical abstract

Finite element investigation of the mechanical behaviour of isotropic porous ceramics

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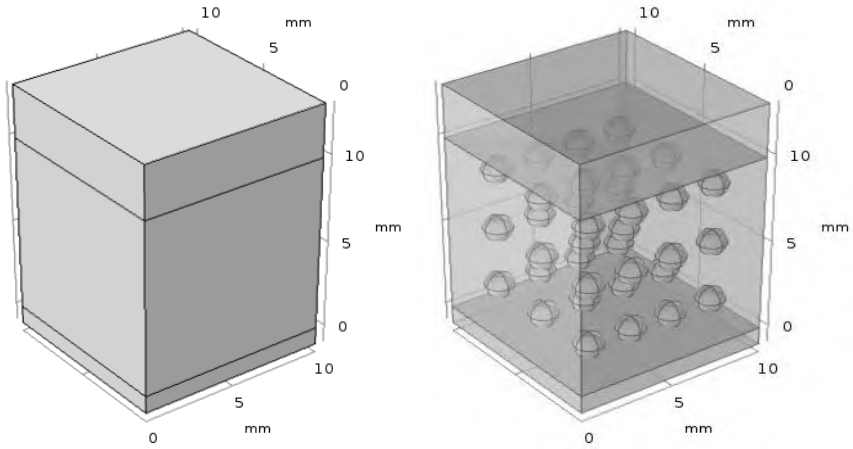
Abstract. Porous ceramic materials are the subject of growing interest in the scientific community due to its multifunctionality. Nevertheless, porosity affects the mechanical properties of these materials. That's why, characterizing of these properties for ensuring the in-service resistance is a necessity, even if the mechanical parameters (modulus of elasticity, strengths) do not present high values. In this paper, a general finite element modeling of an isotropic porous ceramic is performed. Young's modulus and other mechanical parameters are numerically calculated using two approaches. The first is using a simplified homogeneous model and the second is using microstructure with randomly oriented spheroidal pores.

Keywords: Porous ceramic, mechanical properties, modulus of elasticity, finite element modeling.



(a) Homogeneous Model (HM) (b) Microstructure Model (MSM)

Graphical abstract

Numerical simulation to study the multiplication of supply air inlet in a ventilated room

Sondes Ifa[1], Mohammed El Hadi Attia[2], Said Bouabdallah[3], Muslum Arici[4], Zied Driss[1]

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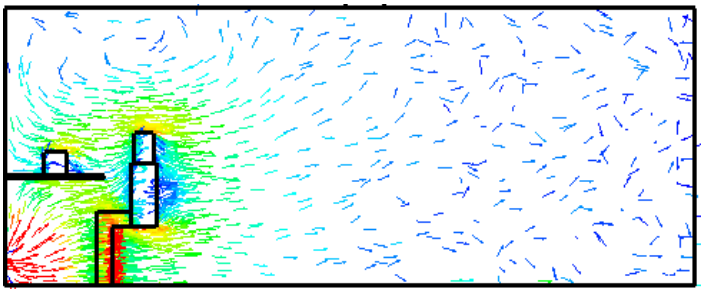
Abstract. The use of the heating, ventilation and the air conditioning HVAC system is well developed. The CFD tool is an important tool to facilitate the study of HVAC systems. Using this numerical tool, this study involves testing the multiplication of the supply air inlet of the ventilation system. The numerical results given by the software ANSYS Fluent 17.0 prove that the multiplication of inlet opening causes a decrease of the indoor temperature hence the room became colder than the room having ventilation with one opening inlet.

Keywords: Ventilation, temperature, inlet opening.



Graphical abstract

Experimental and numerical evaluation of heat flux intensity effect on indoor environment

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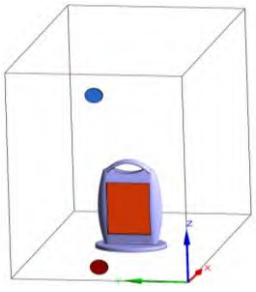
Abstract. Airflow characteristics and thermal comfort in an indoor environment are affected by many factors like the indoor facilities as heating systems and electronic equipment. In this framework, a lot of research has been carried out in order to investigate the impact of these factors. The ultimate goal of this study is to present the heat flux intensity effect on the airflow characteristics and the indoor thermal comfort in a ventilated room prototype. Hence, Computational Fluid Dynamics (CFD) was employed to perform different considered cases. From the obtained results, it can be concluded that the heat flux intensity has a direct effect on the velocity fields, the temperature, the static pressure and the turbulence characteristics.

Keywords: Indoor environment, CFD, room prototype, heat flux intensity, airflow characteristics.



Graphical abstract

Effect of turbulence models on the numerical simulation inside a greenhouse

Hamza Chiboub[1], Hasna Abid[1], Mohammed El Hadi Attia[2], Said Bouabdallah[3], Muslum Arici[4], Saadi Bougoul[5], Zied Driss[1]

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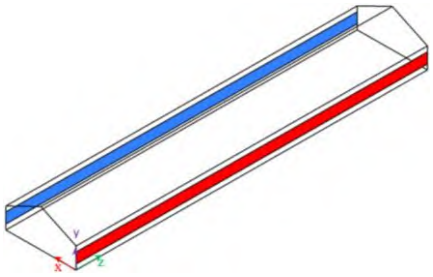
Abstract. The aerodynamic structure inside the greenhouse is modeled using CFD. The software Ansys Fluent 17.0 has been used to present the local characteristics. The numerical model considered is based on the resolution of the Navier-Stokes equations in conjunction with different turbulence model. The numerical model is validated with experimental results.

Keywords: CFD, greenhouse, the aerodynamic structure, turbulence models.



Graphical abstract

Need to CFD simulations for optimization of an industrial combustion process

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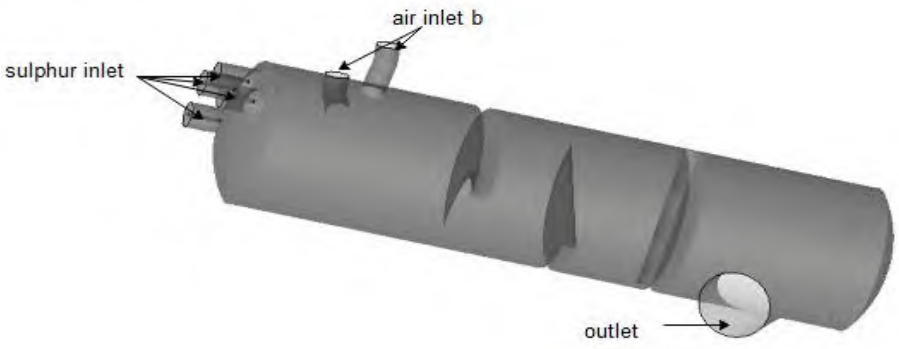
Abstract. The technological development achieved until recent years can help to optimize industrial processes. Using the numerical simulation to study the fluid flow inside combustion processes is a key to solve pollutant emissions. So, a CFD study is presented in order to describe the fluid flow behavior inside an industrial sulfur burner. The simulations are developed using the commercial software Ansys Fluent 16.2. A non-premixed model is investigated. The standard k-ε model is used. The turbulent characteristics are presented.

Keywords: combustion, turbulence, sulfur burner, CFD, optimization.



Graphical abstract

Numerical investigation of turbulent slot jets with various nanoparticles shapes

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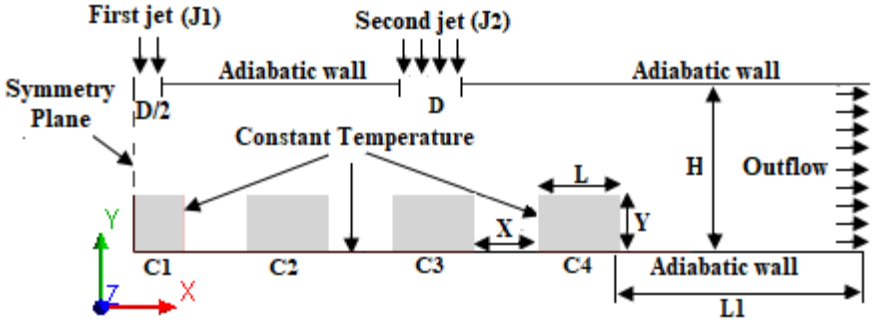
Abstract. In this work, a numerical investigation related to the turbulent forced convection of water-Al_2O_3 nanofluid in slot jets impinging on multiple hot components fixed on the lower wall by using different nanoparticles shapes (spherical, blade, brick, cylindrical and platelet) was carried out. To analyze the fluid flow and heat transfer, the standard k-ε turbulence model with wall enhanced treatment and two-phase mixture model were used. The outcomes revealed that increased the Reynolds number (Re) and volume fraction of nanoparticles (φ) with all nanoparticles shapes enhanced the heat transfer rate, where the platelets nanoparticle shape significantly contribute to increasing the heat transfer rate compare with other shapes. We also found that two-phase mixture model gives higher average Nusselt number ($\overline{Nu}$) values compared to the single phase model, and the maximum values of $\overline{Nu}$ is located around the last block due to the dominance of the second jet (J2) compared of the first jet (J1). Our results were compared with those found in the literature.

Keywords: Slot jets, forced convection, turbulence, nanoparticles shapes.



Graphical abstract

Numerical simulation of the heat ventilation with a solar air heater

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Abstract. Solar air heater is a most popular device in the space heating and building processes applications. However, solar air heater has lower heat-transfer coefficient between the absorber plate and the air stream, which results in a lower thermal efficiency of the heater. The solar air heaters efficiency can be affected by various parameters such as collector length, number of channels, depth of channels, type of absorber plate, number and material of glass covers, air inlet temperature and air velocity. A simple solar air collector consists of an absorber material, sometimes having a selective surface, to capture radiation from the sun and transfers this thermal energy to air via conduction heat transfer. This heated air is then ducted to the building space or to the process area where the heated air is used for space heating or process heating needs. In this paper, we are interested in the study of the heat ventilation in a box prototype.

Keywords: Energy, power, heat, engineering.

Graphical abstract

Numerical parameters choice of a Banki micro hydro-turbine

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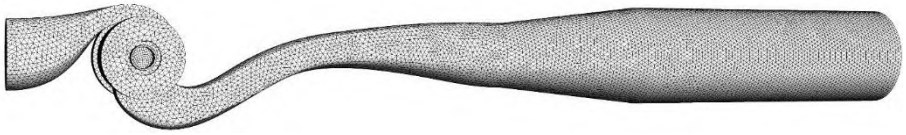
Abstract. A numerical analysis has been implemented to choose the suitable model that allows computing the performance and flow characteristics of Banki-Michell turbine. Several grids have been considered with different rotor-to-stator element size ratio and element numbers for efficiency comparison. The considered element size ratios are 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1 respectively. The considered meshing element numbers are 30874, 50964, 163000, 263375, 368844, 467996 and 563480 respectively. Based on the observation concluded from this comparison, a ratio of 0.5 and a meshing with 467996 elements have been chosen as they show the lowest deviation from experimental data. Comparing the different turbulence models available in the CFX software, it has been observed that the RNG k-ε turbulence model is the most suitable among others models for the numerical simulation of the hydro turbine.

Keywords: CFD analysis, Banki-Michell turbine, RANS model, hydropower production.



Graphical abstract

Numerical assessment of new concept of an aero-voltaic (air PVT) solar collector under Standard Test Conditions

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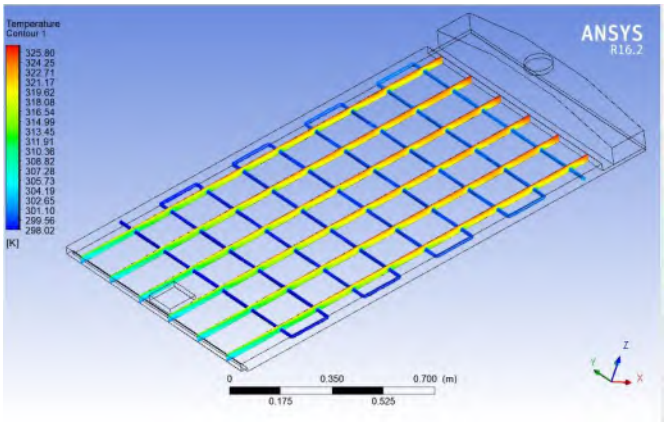
Abstract. Renewable energies have favoured the construction of new buildings and architectural engineering using a natural process. Solar energy is the most widely used source in terms of number of installations over the past decade. This article presents the proposal for a new concept of an aero-voltaic solar collector (air PVT). The new design consists of the simultaneous generation of PV electrical energy and air/water heating energy. The digital procedure, validated from experimental measurements, is carried out under standard test conditions (STC) with the air inlet temperature is equal to 298 K and the solar radiation incident on the surface of the collector is equal to 1000 $W \cdot m^{-2}$.

Keywords: Solar energy, air PVT, aero-voltaic, new concept, numerical.



Graphical abstract

Effects of duct length and connection mode on the efficiency of an aero-voltaic (air PVT) solar collector under Standard Test Conditions

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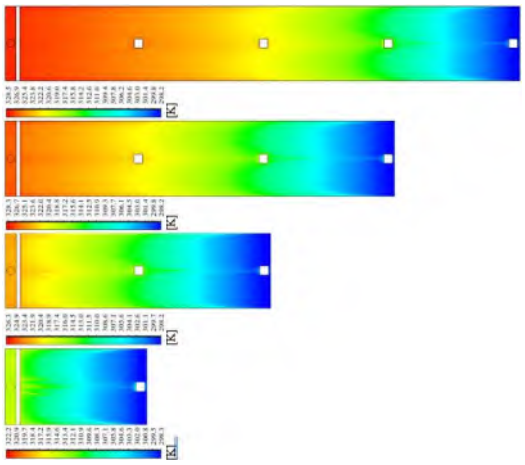
Abstract. Solar energy technologies are largely under development. This paper presents a numerical study of the effect of the length of the air channel as a function of the connection mode on the efficiency of an aero-voltaic solar collector (air PVT). The study presents cases of combination of serial and parallel connections from one to four of the PV module and the air collector. The results show that the series connection mode by increasing the length of the duct improves thermal efficiency. The parallel connection mode of the air collectors and the PV module is the best case of thermal and electrical output.

Keywords: solar energy, air PVT, aero-voltaic, numerical



Graphical abstract

Experimental testing methods

Experimental measurement of the wind speed around a Savonius wind rotor

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Abstract. The Savonius rotor is classified as a vertical axis rotor like the Darrieus, Gyromill or H-rotor. In this paper, we are interested in measuring the wind speed around a Savonius wind rotor. To achieve this, an open wind tunnel has been used and the Savonius rotor was placed in the test vein of the wind tunnel. The distribution of the wind speed was obtained for different longitudinal and transverse planes. This work has been developed at Laboratory of Electro-Mechanic Systems (LASEM) of the National Engineering School of Sfax (ENIS).

Keywords: Savonius rotor, wind tunnel, wind speed, anemometer.

Graphical abstract

Experimental study of the Reynolds number effect on the turbulent flow around a Savonius wind rotor

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Abstract. In this paper, we are interested in studying the effect of the Reynolds number on the aerodynamic characteristics of a Savonius wind rotor. Particularly, different aerodynamic regimes defined by Reynolds numbers were investigated. Four different Reynolds number values equal to Re = 98000, Re = 111000, Re = 124000 and Re = 137000 were considered in this study. To achieve this, an open wind tunnel has been used to determine the global characteristics of the wind turbine. The overall performance evaluation of the rotor has been based on the power, the dynamic and the static torque coefficient evolution. This work has been developed at Laboratory of Electro-Mechanic Systems (LASEM) of the National Engineering School of Sfax (ENIS).

Keywords: Savonius rotor, Reynolds number, wind tunnel.

Graphical abstract

Étude expérimentale du comportement mécanique du béton autoplaçant renforcé par des fibres d'acier et polyamides

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Résumé. La présente étude s'intéresse à l'étude du comportement mécanique des BAP renforce par deux types de fibres (aciers et polyamides) avec différents dosages. Cette étude vise à valoriser le déchet de brique issue du l'usine de Mustapha ben Brahim (Sidi bel Abbes) dans les bétons autoplaçants et voir son effet sur les propriétés physico-mécanique à l'état frais et durci du BAP. Dix formulations ont été étudiées : quatre BAP à base de fibres d'acier et cinq autres à base de fibres de polyamides à des taux différents. Le dixième (10) BAP est un béton témoin sans fibre. Des essais à l'état frai et durci ont été effectués sur ces bétons pour déterminer leurs propriétés physico-mécaniques. Les résultats obtenus montrent que l'emploi de fillers chamotte comme ajout minéral fin dans les BAP permet d'améliorer les propriétés rhéologiques de ce dernier, en plus l'incorporation des fibres métalliques et les fibres polyamides dans le béton auto plaçant améliorent les propriétés mécaniques sans influencer les propriétés rhéologiques s'ils sont employés à des dosages convenables.

Mots-clés : Comportement mécanique, Béton autoplaçant, polyamide, Chamotte, propriétés rhéologiques.

Experimental Study of the Thermomechanical Properties of a Bio-Composite Material

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Abstract. The great demand for energy in buildings is one of many factors that have an impact on our life and our environment. One of the promising alternatives to this problem is the thermal insulation of buildings with the use of bio-compound materials the date palm fibers, sand dunes, and cement in the construction sector. Regardless of the large amounts of date palm waste, its use is still limited to certain traditional construction operations. The incorporation of palm fibers in the cement matrix shows an interesting role. They are available at low prices and are renewable and environmentally friendly raw materials. In this work, palm fibers were added to the sand, and cement mixture to produce mortars with good thermal and mechanical properties, which allows us to use them in structural construction. The objective of our work is to study the effect of adding date palm in different lengths on the mechanical behavior of cement mortar, as well as to measure the absorption and thermal conductivity. The percentage by weight of palm fibers is 1% for different fiber sizes. The results obtained for the cement matrix have shown that the thermal conductivity presents good results for using this material for thermal insulation.

Keywords: date palm fiber, sand dune, mechanical properties, physical properties, mortars.

Graphical abstract

Effect of the varying percentage Diss fiber on mechanical behaviour of the Based Polyester bio-composite

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Abstract. Mechanical and physical properties of the bio-composites materials can be improved by incorporating bio-based fibers such as Jute, Hemp, Kenaf, Ramie, Sisal, Flax, etc. Due to the abundance of Diss plants, its good mechanical strength and low density make it more attractive than other bio-based fibers. Tensile and Brinell hardness tests were conducted using different volume fractions (05% to 20%) of short fibers extracted from the Diss plant. An increase in the short fiber loadings as well as their treatment significantly improves the mechanical properties of the composite materials. These loadings are added to a polyester resin with several volume fractions. This experimental investigation describes the development and characterization of reinforced composite containing different volume fractions of short fibers extracted from the Diss plant.

Keywords: Bio-composite, Diss, Polyester, Mechanical characteristic, Correlation

Effect of the varying percentage Diss fiber on mechanical behaviour of the Based Polyester bio-composite

Touam Lakhemissi[1], Boutrid Abdelaziz[2], Derfouf Semch eddine[1], Belhi Guerira[1], Noureddine Belghar[1]

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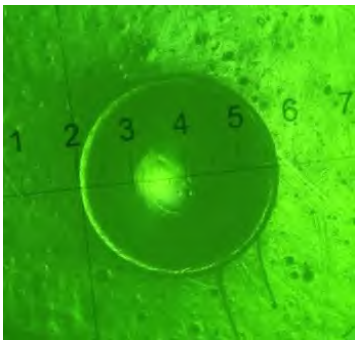
Abstract. Mechanical and physical properties of the bio-composites materials can be improved by incorporating bio-based fibers such as Jute, Hemp, Kenaf, Ramie, Sisal, Flax, etc. Due to the abundance of Diss plants, its good mechanical strength and low density make it more attractive than other bio-based fibers. Tensile and Brinell hardness tests were conducted using different volume fractions (05% to 20%) of short fibers extracted from the Diss plant. An increase in the short fiber loadings as well as their treatment significantly improves the mechanical properties of the composite materials. These loadings are added to a polyester resin with several volume fractions. This experimental investigation describes the development and characterization of reinforced composite containing different vol ume fractions of short fibers extracted from the Diss plant.

Keywords: Bio-composite, Diss, Polyester, Mechanical characteristic, Correlation



Graphical abstract

Experimental Study of a Sweeping Gas Membrane Distillation Unit

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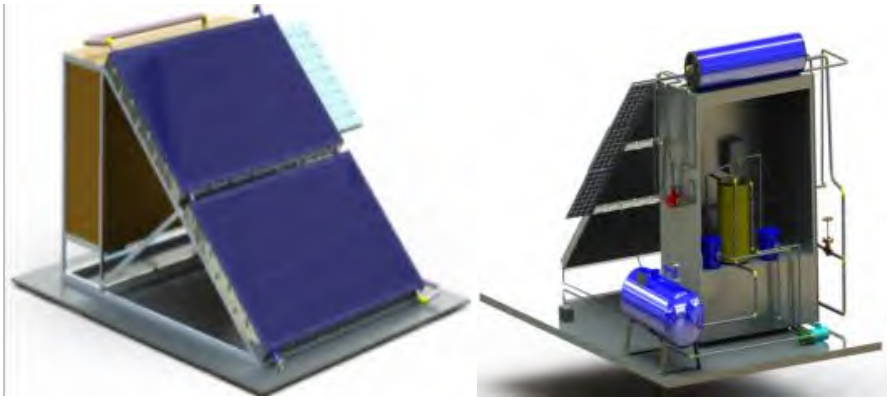
Abstract. This document presents a membrane process for the desalination of brackish water or salt water using sweeping gas membrane distillation (SGMD). First, it is the least used configuration of (MD), and the construction of this system is very expensive. It is used to treat solutions containing nonvolatile compounds, such as salt, which is totally rejected and they have recovered only water of high purity. Vapor transfer is an important phenomenon induced thermally in the membrane (MD) by evaporation and condensation. Our distillation system SGMD was simulated using Matlab programmers on heat transfer and mass transfer aspects. In our research, we found that the heat and mass transfer in the SGMD is determined by the gas evaporation temperature and the sweep rate. The operational parameter (fluid velocity) is influenced by the layer on both sides of the membrane as it is the source of the mass and heat transfer in membrane processes.

Keywords: mass and heat transfer, sweeping gas membrane distillation.



Graphical abstract

Working gas mixture impact on performance hysteresis of turbocharger turbines

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Abstract. The radial turbine, an enabling component of turbochargers, is a seat of highly complex unsteady flow as well as varying gas compositions between diesel and gasoline engines. These flow conditions make it necessary to take into account different physical models when simulating such turbines. Researchers have often considered the turbine working gas as air, which may not lead to an accurate prediction of actual turbine characteristics. In the present work, the effect of the working gas on performance of turbocharger turbines has been investigated through a set of numerical simulations for six wastegate opening degrees from 0% up to 100% and under a wide range of the flow pulse frequency from 33.33 Hz up to 200 Hz. Results showed totally deviated unsteady performance characteristics compared to the turbine working with air. The finding of this research may be useful to put emphasis on the gas composition when modeling such turbines by engineers.

Keywords: ICE, Turbine, Pulsating flow, Hysteresis, Exhaust Gas Mixture, Performance.

Graphical abstract

Performance and exhaust emissions of a compression ignition engine blended by methyl ester

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Abstract. Newly, the use of the biodiesel as alternative fuel to the compression ignition engine is considered as a great solution to undertake the significant growth of fossil fuels word's demand and global warming caused by greenhouse gas emissions. Thus, the search objective is the investigation of the physical-chemical analysis and effect of the methyl ester produced from waste fraying oil on the performance and exhaust emissions of the compression ignition engine. The methyl ester was prepared by the transesterification reaction of the waste fraying oil with the methanol in presence of the hydroxide potassium (KOH) as catalyst. The physico-chemical characterization of the produced methyl ester is improved and will be similar to those of diesel fuel. Experimental tests were carried out on a single-cylinder diesel engine 15 LD 315 fueled by the WFOME and its formulated blends in order to investigate the WFOME addition effect on the compression ignition engine performances and emissions. As results, this investigation shows globally that the WFOME and its blend provide energy and emission performances comparable to those of Diesel. In these conditions, a lesser improvement is noted in the variation of thermal and volumetric efficiency when using WFOME20 and WFOME50 mixtures. In addition a significant reduction of the smoke opacity values is obtained during the combustion of WFOME100.

Keywords: Methyl ester, WFO, physico-chemical characterization, compression ignition engine, performance, emissions.

Effect of operating parameters on Zn-Mn alloys properties

Nouha Loukil, Mongi Feki

Laboratory of Material Engineering and Environment, ENIS-Tunisia, University of Sfax, Tunisia, P. B. 1173-3038

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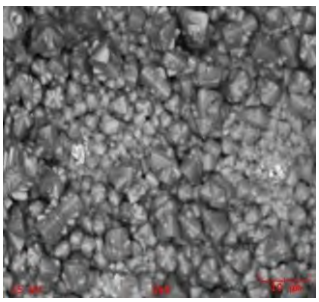
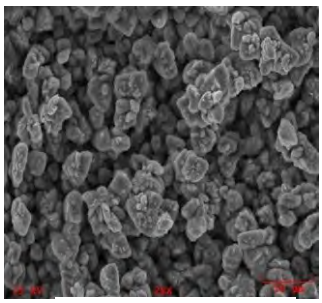
Abstract. Zn-Mn alloy electrodeposition on steel electrode from additive-free chloride bath was investigated. Several parameters such as Mn^{2+} ions concentration, current density and stirring were explored with regard to the Mn content into the final Zn-Mn coatings. The Mn content varies with the applied current density from zero to a maximum of 12 wt.%. Scanning Electron Microscopy (SEM) data reveal that the morphology of Zn-Mn alloys varies from fine to coarse grains as the current density increases. X-ray diffraction analysis Zn-Mn alloys deposited at low current density are tri-phasic and consisting of η-Zn, ζ-$MnZn_{13}$ and hexagonal close packed ε-Zn-Mn. Whereas, an increase in current density up to 140 mA/cm² leads to a transition from crystalline to amorphous structure, arising from the hydroxide inclusions in the Zn–Mn coating at high current density.

Keywords: Electrodeposition, Zn-Mn alloy, Morphology, structure.



60 mA/cm²



140 mA/cm²

Graphical abstract

Publication

Book Publication

The abstract proceeding will be published in this Book:

"Advances in Engineering Science"

The extension of the presented and selected papers will be published in this Book:

Mechanical Engineering Technologies and Applications

or others proposed Books...

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Journal Publication

The presented and selected papers will be published in one of these International Journals:

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• Polymer matrix composites
• Solid – fluid interactions
• Static, quasi-static and dynamic behavior
• Steady, and transient response behavior of engineering materials and structures
• Structural and multidisciplinary optimization
• Surface and interfacial science
• Transport structure relations in fast ion and mixed conductors

Web site: http://www.sapub.org/journal/aimsandscope.aspx?journalid=1108

American Journal of Mechanical Engineering

American Journal of Mechanical Engineering is a peer-reviewed, open access journal that publishes originalresearch articles and review articles in all areas of Mechanical Engineering. The aim of the journal is to provideacademicians, researchers and professionals a platform to share cutting-edge development in the field ofMechanical Engineering

Web site: http://www.sciepub.com/journal/AJME

American Journal of Energy Research

American Journal of Energy Research is a peer-reviewed, open access journal that publishes original research articles and review articles in all areas of energy research. The goal of this journal is to provide a platform for scientists and academicians all over the world to promote, share, and discuss various new issues and developments in different areas of energy research.

Web site: http://www.sciepub.com/journal/AJER

Sustainable Energy

Sustainable Energy is a peer-reviewed, open access journal that provides rapid publication of articles in all areas of renewable and sustainable energy. The goal of this journal is to provide a platform for scientists and academicians all over the world to promote, share, and discuss various new issues and developments in different areas of renewable and sustainable energy.

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Web site: http://www.sciepub.com/journal/RSE

International Journal of Energetica

The Journal of Energetica is dedicated to research and application of several renewable energy technology, energy management and environment & climatic.

Web site: http://www.sciepub.com/journal/RSE

International Journal of Fluid Mechanics & Thermal Sciences

International Journal of Fluid Mechanics & Thermal Sciences (IJFMTS) will be a forum for the publication of high-quality peer-reviewed papers on fluid mechanics and thermal sciences. This journal also publishes contributions that employ existing experimental techniques to gain an understanding of the underlying discipline. In fact, fluid mechanics and thermal sciences applications are ubiquitous in nature. Many aspects in industrial operations and daily life are closely related to fluid flow and heat transfer processes. Along with the development of computer industry and the advancement of numerical methods, solid foundation in both hardware and software has been established to study the processes by using numerical simulation methods, which play important roles in the ways of extending research topics, reducing research costs, discovering new phenomena, and developing new technologies. Methods for solving ancillary equations such as transport and diffusion are also quite relevant. The expressed intention of this journal is the dissemination of information relating to the development refinement and application of numerical and experimental techniques for solving problems in fluid mechanics and thermal sciences.

Web site: http://www.sciencepublishinggroup.com/journal/index?journalid=315

Program

WELCOME TO JSI'2020

Registration opening

Forum installation

15H00-17H00

Chairmans: M. Maher Yangui and M. Lotfi Abid

Poster session

17H00-18H00

Chairmans: Dr. Ahmed Ketata and Dr. Olfa Moussa

Saturday / September 26, 2020

Opening ceremony and Honoration of Ex-Directors of ENIS and Enisien-Industrials

08H30-09H00

Chairmans: Prof. Slim Abdelkafi, Prof. Khaled Eleuch and Prof. Mohamed Masmoudi

Oral session 1

09H00-10H30

Chairmans: Prof. Zied Driss and Prof. Hafedh Trabelsi

1. **Vectors of Development and Positioning of Engineering Training in Tunisia's modernity process (JSI'2020-72)**
   Keynote 1: Mr. Mohammed Abid
2. **Sliding mode control of robotic systems for rehabilitation (JSI'2020-74)**
   Keynote 2: Pr. Nabil Derbel
3. **Working gas mixture impact on performance hysteresis of turbocharger turbines (JSI'2020-63)**
   Dr. Ahmed Ketata
4. **Container house: experimental investigation of the wind solar unit (JSI'2020-40)**
   Dr. Zied Guidara
5. **Experimental measurement of the wind speed around a Savonius wind rotor (JSI'2020-3)**
   Dr. Sobhi Frikha
6. **Performance study of a twisted Savonius water rotor (JSI'2020-45)**
   Dr. Mosabahi Mabrouk

COFFEE BREAK

10H30-11H00

Oral session 2

11H00-13H00

Chairmans: Prof. Hatem Ksibi and Prof. Mohamed Abid

1. **Performance improvement of a helical Savonius wind rotor (JSI'2020-51)**
   Dr. Mariem Lajnef

2. **Performance and exhaust emissions of a compression ignition engine blended by methyl ester (JSI'2020-65)**
   Dr. Olfa Moussa

3. **Experimental and numerical evaluation of heat flux intensity effect on indoor environment (JSI'2020-41)**
   Dr. Hasna Abid

4. **Theoretical modeling of heat transfers in conventional collector of solar chimney (JSI'2020-37)**
   Dr. Haythem Nasraoui

5. **Heat Transfer Enhancement in a Parabolic Trough Solar Receiver using Nanofluids (JSI'2020-66)**
   Djemaa Guerraiche

6. **Effects of duct length and connection mode on the efficiency of an aero-voltaic (air PVT) solar collector under Standard Test Conditions (JSI'2020-71)**
   Ismail Baklouti

7. **A Survey of Communication Protocols for IoT (JSI'2020-70)**

   Mohamed Oweiss HARIGA

LUNCH TIME

13H00-14H30

Oral session 3

14H30-17H00

Chairmans: Prof. Nader Haddar and Prof. Mohamed Salah Abid

1. **Study and developments of the solar air heater systems (JSI'2020-35)**
   Keynote 3: Pr. Zied Driss

2. **Experimental study of the Reynolds number effect on the turbulent flow around a Savonius wind rotor (JSI'2020-4)**
   Dr. Sobhi Frikha

3. **Numerical study of the Manzanres prototype of solar chimney power plant (JSI'2020-34)**
   Ines Amamri

4. **Need to CFD simulations for optimization of an industrial combustion process (JSI'2020-46)**
   Souhir Echi

5. **Modeling of an Autonomous Hybrid Microgrid based on Photovoltaic and Flywheel Energy Storage System (JSI'2020-44)**
   Atiyah A. Altayf

6. **Effect of turbulence models on the numerical simulation inside a greenhouse (JSI'2020-42)**
   Hamza Chiboub

7. **Smart Energy Monitoring based on LoraWan technology (JSI'2020-69)**
   Radhouane Zaabi

Oral session 4

08H30-10H15

Chairmans: Prof. Riadh Eleuch and Prof. Moncef Zairi

1. **Performance, Modeling, Measurements and Simulation of Energy Efficient for Heat exchanger, Refrigeration and Air Conditioning (JSI'2020-1)**
   Keynote 4: Pr. Abdeen Omer
   University of Nottingham, UK

2. **Analysis and modeling of crack propagations in the holed plates using the finite element methods and effect of their priming position around the holes: Application to riveted plates in new technologies (JSI'2020-2)**
   Keynote 5: Pr. Brahim Necib
   University of Constantine, Algeria

3. **Seismic Behavior of Expansion Joints in Seat-Type Abutments of Bridge Including SSI effects (JSI'2020-6)**
   Keynote 6: Pr. Ouanani Mouloud
   University of Djelfa, Algeria

4. **Lattice Boltzmann Method and Its Application for Porous Media (JSI'2020-7)**
   Keynote 7: Pr. Abdelmalek Atia
   University of El Oued, Algeria

5. **The effect of viscosity on the transport of crude oil in the OZ2 line connected Haoued El-Hamra to Arzew (JSI'2020-5)**
   CHALLAL Makhlouf

6. **Influences of four-parameters: Polarization, temperature, Input amplitude and Input Frequency On properties of vertical-cavity surface-emitting lasers and their impact on Optical Communication (JSI'2020-29)**
   Bendehiba Dahmane

7. **Numerical Study of the Natural Convection Impact into a PCM within Tubular Capsule (JSI'2020-13)**
   Tarek BOUZENNADA

8. **Investigation of different properties of Full-Heusler alloys Ru2MnZ (Z=V; Nb) (JSI'2020-14)**
   Sabrina Nia

9. **Analyse numérique du comportement en rupture des structures réparées par patch en composite (JSI'2020-18)**

Abdelghani Baltach

10. **Design and Implementation of a Smart Traffic Light in VANET Protocol (JSI'2020-61)**

Mohamed Hedi GMIDEN

COFFEE BREAK

10H15-10H45

Oral session 5

10H45-12H30

Chairmans: Prof. Fakhreddine Dammak and Prof. Jamel Bouaziz

1. **Prediction of Fire and Smoke Propagation Under a range of External Conditions (JSI'2020-9)**

Keynote 8: Pr. Miloua Hadj
University of Djillali Liabes Sidi Bel Abbes, Algeria

2. **Long Term Low Emission Development Strategies and Energy Transition Pathways Simulation under EN-ROADS Environment (JSI'2020-28)**

Keynote 9: Pr. Kamal MOHAMMEDI
University of M Bougara Boumerdes, Algeria

3. **Numerical analysis of laminar mixed convection heat transfer of Fe3O4/water nanofluid in a square channel (JSI'2020-32)**

Keynote 10: Pr. Saadi BOUGOUL
University of Batna, Algeria

4. **Study of the effect of laser treatment to reduce contamination of PVC-based packaging (JSI'2020-36)**

Keynote 11: Pr. BOUSSOUM Iddir
University of Ibn Khaldoun Tiaret, Algeria

5. **Stress Relaxation behavior of Composites with Nano-enhanced Resin after Impact Loads (JSI'2020-73)**

Keynote 12: Pr. P.N.B. Reis
University of Beira Interior, Covilhã, Portugal

6. **Numerical simulation to study the Multiplication of supply air inlet indoor a ventilated room (JSI'2020-33)**

   Sondes Ifa

7. **Finite element investigation of the mechanical behaviour of porous ceramics (JSI'2020-30)**

   Wiem Nasri

8. **The Effect of the Length of Treated Date Palm Fibers on the Thermomechanical Properties of a Bio-Composite (JSI'2020-31)**

   Samir Benaniba

9. **Identification of some mechanical and physical parameters of two biological fibers of the date palm "rachis" and "spadix" (JSI'2020-43)**

   Abdelkader Boudjemline

10. **Study of a Banki micro hydro-turbine for discharge regulation and energy recovery (JSI'2020-49)**

    Marwa Hannachi

11. **Effect of the varying percentage Diss fiber on mechanical behaviour of the Based Polyester bio-composite (JSI'2020-47)**

    Touam Lakhemissi

CLOSING CEREMONY

12H30-13H00

LUNCH TIME

13H00-14H30

SOCIAL PROGRAM

Poster session

Chairmans: Dr. Ahmed Ketata and Dr. Olfa Moussa

Engineering technology and innovation

JSI'2020-11

Obtaining and characterizing chromium carbide on 100 cr6 steel

Belhocine Abdelghani, Omar Allaoui, Mourad Maazouz, HaouesGhouss

JSI'2020-38

CFD simulation of the heat transfer using a Cu-water nano-fluid in different cross-sections of mini-channels

Kamel chadi, Aymen Mohamed Kethiri, Nourredine Belghar, Belhi Guerira, Zied Driss

JSI'2020-39

Three dimensional numerical simulation of the effect of different nanofluids on thermal exchange in mini-channels

Kamel chadi, Aymen Mohamed Kethiri, Nourredine Belghar, Belhi Guerira, Zied Driss

JSI'2020-52

CFD simulations of horizontal ground heat exchangers for cooling irrigation water in the Biskra area

Yacine Kessai, Kamel Aoues, Mohamed Aymen Kethiri, Khaled Chebah

JSI'2020-55

Novel blue -emitting CdSrP2O7 : Eu2+ phosphor for near-UV white-emitting diodes

Mouna Derbel, Aïcha Mbarek

JSI'2020-57

Effects of saliva addition on the wear resistance of deflected NiTi archwire for biomedical application

Ines Ben Naceur, khaled Elleucha

JSI'2020-58

Electrodeposition and characterization of Zn-Mn coatings for corrosion protection

Nouha Loukil, Mongi Feki

JSI'2020-59

Numerical study of the influence of nano-fluid type on thermal improvement in a three-dimensional microchannel

Kamel chadi, Nora Boultif, Nourredine Belghar, Aymen Mohamed Kethiri, Zied Driss, Belhi Guerira

JSI'2020-62

Experimental investigation of a membrane distillation unit coupled with solar energy

Mokhless Boukhriss, Mohamed Ali Maatoug, Mahdi Timoumi

JSI'2020-08

CFD Based Performance Analysis of a Solar Air Heater Test Bench With Unsteady Turbulent Flow

Badis bakri, Hani Benguesmia, Ahmed Ketata, Slah Driss, Zied Driss

JSI'2020-20

Structural Design of a 10 KW H-Darrieus Wind Turbine

Soumia Benbouta, Fateh Ferroudji, Toufik Outtas

JSI'2020-50

Olive mill wastes as a substitute for silage in biogas plants at laboratory scale

Mawaheb Mouftahi, Pietro Bartocci, Nawel Tlili, Nejib Hidouri, Francesco Fantozzi

JSI'2020-54

Biomethanization of solid waste at laboratory scale

Nizar Loussif, Chedlia Mhedhbi

JSI'2020-10

Three-Dimensional Mixed Convection in a Cubical Cavity with Nanofluid

Saliha Bellout, Rachid Bessaih

JSI'2020-12

Mesh effects for a rectangular plate resting on the surface of an elastic foundation with distributive properties on the values of its natural frequencies

H. Gherdaoui , S. Guenfoud, S.V. Bosakov, A. Rezaiguia, D.F. Laefer

JSI'2020-15

Numerical Simulation of impinging double jet with dynamic approaches

Rachid Bouregba, Abdelhak Benaoum

JSI'2020-16

Numerical simulation of twin jet impingement with LES model

Abdelhak Benaoum, Rachid Bouregba

JSI'2020-17

Study of the influence of the inlet parameters of the first group compressor (low pressure) - Algerian Hassi messaoud compressor station - to avoid the surge phenomenon

Goucem Mahdi, Alaeddine Mekahlia

JSI'2020-21

Electric Field simulation of the Barrier Effect in Point-Barrier-Plane Air Gaps Using Finite Element Method

Hani Benguesmia, Badis Bakri, Fayssal Ouagueni, Saad Khadar, Nassima M'ziou

JSI'2020-22

Estimation of Breakdown Voltage of Point-Plane in the Presence of Barrier Using Artificial Neural Network (ANN)

Hani Benguesmia, Youssouf Kharchi, Moustapha Daoudi, Saad Khadar, Nassima M'ziou

JSI'2020-23

Numerical Simulation of the Barrier Effect on the Electric Field Distribution in Point-Plane Air Gaps in AC Voltage using COMSOL Multiphysics

Hani Benguesmia, Moustapha Daoudi, Youssouf Kharchi, Fayssal Ouagueni, Nassima M'ziou

JSI'2020-24

Numerical Study of Electrical Field Distribution in Insulation Function of HV Cables Containing Cavities using Comsol Multiphysics

Hani Benguesmia, Hachim Seghiri, Abd Rachid Akka, Saad Khadar, Nassima M'ziou

JSI'2020-25

Study of a Partial Discharge in an HV Cable Using Finite Element Method

Hani Benguesmia, Abd Rachid Akka, Hachim Seghiri, Saad Khadar, Nassima M'ziou

JSI'2020-26

Application of Shunt Active Power Filter for Harmonic Compensation in Three-Phase Four-Wire Systems

Hani Benguesmia, Manel Terk , Imane Saadallah, Saad Khadar, Nassima M'ziou

JSI'2020-27

Improving the Electric Power Quality by the Compensation of the Reactive Power in Electrical Networks

Hani Benguesmia, Imane Saadallah, Manel Terk, Saad Khadar, Nassima M'ziou

JSI'2020-48

Numerical investigation of turbulent slot jets with various nanoparticles shapes

Boudraa Bouziane, Bessaïh Rachid

JSI'2020-60

Numerical simulation of the heat ventilation

Slah Driss, Mohamed Salah Abid, Imen Kallel Kamoun

JSI'2020-64

Study and design of a Banki-Mitchell turbine

Fida Harabi, Marwa Hannachi, Ahmed Ketata, Marco Sinagra, Tullio Tucciareli, Zied Driss

Experimental testing methods

JSI'2020-19

Étude expérimentale du comportement mécanique du béton autoplaçant renforcé par des fibres d'acier et polyamides

Abbache Ali, Youzera Hadj, Boulefrakh Laid, Meftah Sid Ahmed

JSI'2020-47

Effet de la variation du pourcentage en fibre de Diss sur le comportement mécanique du bio-composite à base de Polyester

Touam Lakhemissi, Boutrid Abdelaziz, Derfouf Semch eddine

JSI'2020-56

Experimental Study of a Sweeping Gas Membrane Distillation Unit

Mokhless Boukhriss, Mohamed Ali Maatoug

JSI'2020-67

Development of smart nanomaterials for medical imaging and therapy

Fahmi Smaoui, Dorra Driss, Mouna Messaoud, Sami Aifa

JSI'2020-68

Numerical assessment of new concept of an aero-voltaic (air PVT) solar collector under Standard Test Conditions

Ismail Baklouti, Zied Driss

JSI'2020-75

Effect of operating parameters on Zn-Mn alloys properties

Nouha Loukil, Mongi Feki

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