Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

PRESENTS

VULCAN

(2020-2021)

"Vulcan is the Roman and Greek god of fire and the forge, and mythical inventor of smithing and metal working"

IN ASSOCIATION WITH

MESA
MECHANICAL ENGINEERING STUDENTS ASSOCIATION

Department of Mechanical Engineering

Vision

To be a Centre of Excellence for education and research in the field of Mechanical Engineering to meet the national as well as global challenges.

Mission

M1: To educate and enrich effective and responsible engineers for national as well as global requirements by providing quality education.
M2: To maintain vital State-of-the-Art Research facilities to provide its students and faculty with opportunities to create, interpret, apply and disseminate knowledge.
M3: To develop linkages with world-class organizations and educational institutions in India and abroad for excellence in teaching, industry and research.
M4: To cultivate and promote entrepreneurship using the industry and R&D facilities of the institution.

Program Educational Objectives (PEOs)

PEO1: Apply modern analytical, computational, simulation tools and techniques on engineering materials, thermal sciences, applied mechanics and manufacturing methods to address the global challenges faced in mechanical and allied engineering streams.
PEO2: Adapt new and recent techniques of engineering science and their applications to conceive, organize and develop the design of engineering systems.
PEO3: Work as an individual and in teams on multidisciplinary assignments in industries, research organizations and academic institutions both at national and global levels through collaboration.
PEO4: Demonstrate techno-commercial skills such as research interest and entrepreneurial ability in students to cater the societal problems.

Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

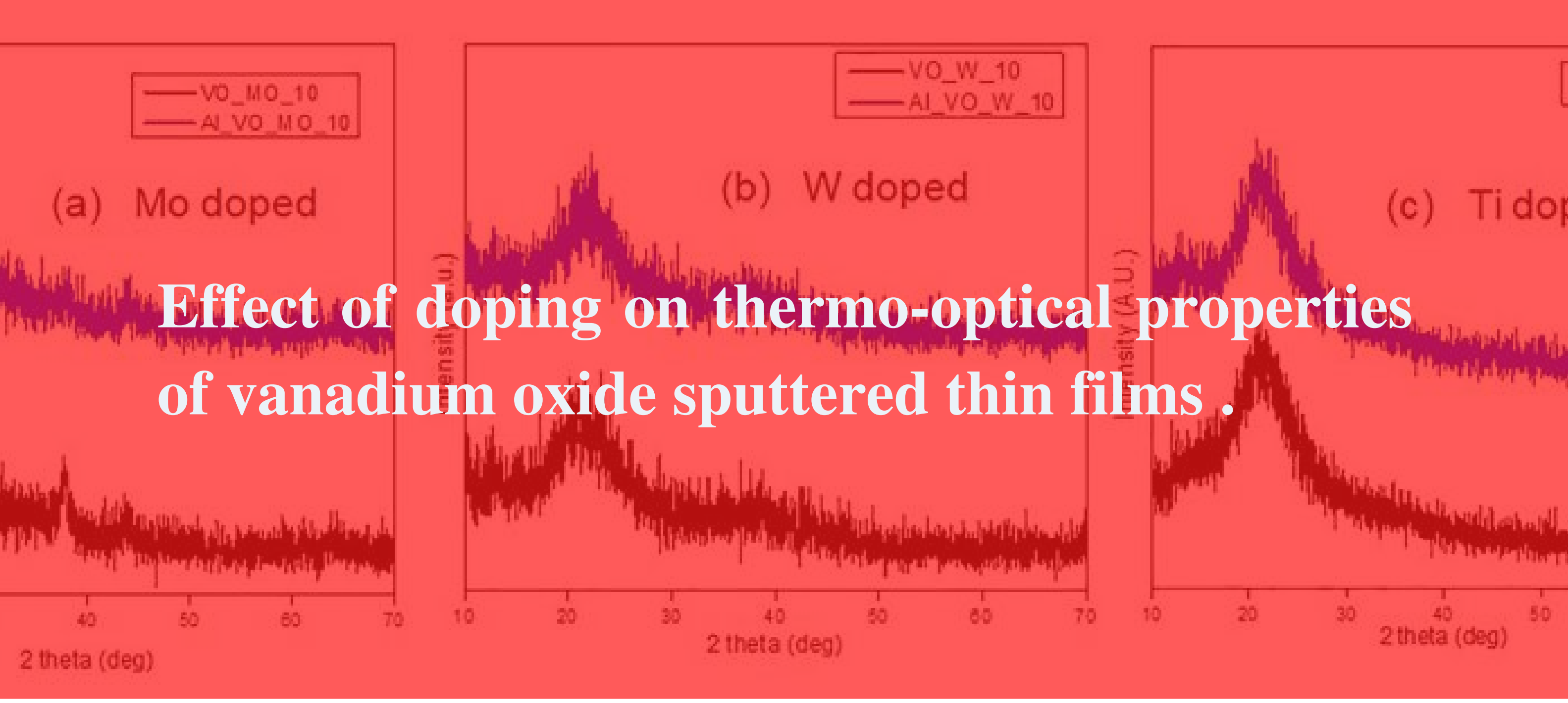
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (POs)

PSO1: Apply their knowledge in the domains of design, manufacturing and thermal sciences to solve engineering problems using advanced technology.

PSO2: Engage professionally in industries or as entrepreneurs by applying innovative ideas in design and manufacturing using modern CAD/CAE/CAM tools.



Effect of doping on thermo-optical properties of vanadium oxide sputtered thin films .

In this development work an attempt has been made to investigate the effect of doping elements i.e. tungsten, molybdenum and titanium in vanadium oxide thin films. Various thin films have been developed by co-sputtering process. The phase and elemental analysis were studied by X-ray diffraction (XRD) and energy dispersive X-ray spectroscopy (EDX), respectively. The thermo-optical properties i.e. absorptance (as), solar reflectance (qs), solar transmittance (ss) and IR emittance (eir) were investigated and correlated the doping elements effect in vanadium oxide thin films.

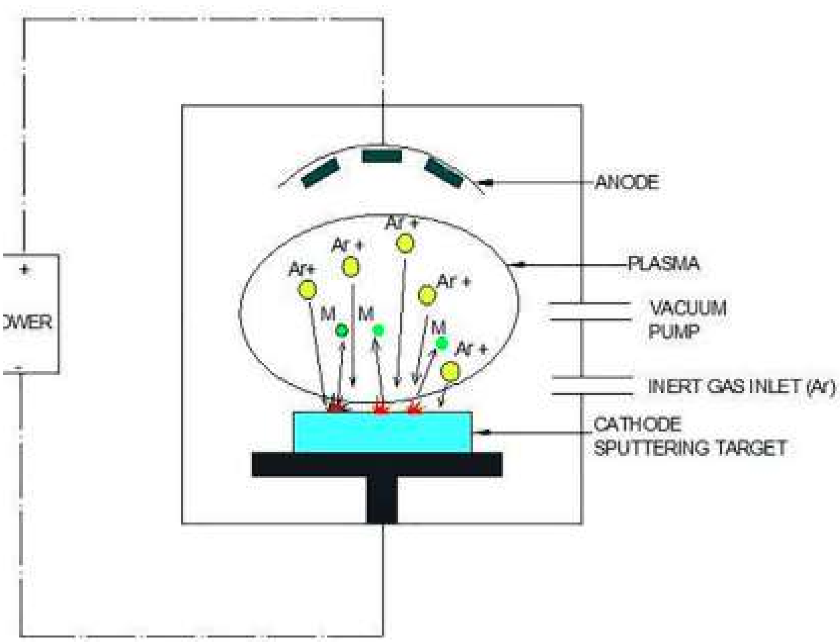


Fig. 1. Schematic diagram showing the principle of sputtering technique.

Dr Ankur Bansod
Mechanical Department

Investigations on different hardfacing processes for High temperature applications of Ni-Cr-B-Si alloy hardfaced on austenitic stainless steel components

Ni-Cr-B-Si alloy is used for hardfacing of 316 L N Stainless Steel components in Sodiumcooled Fast Reactors (SFRs) to enhance wear resistance and also to prevent self-welding. Since the shear force is acting between the substrate and the deposit due to dissimilar thermal expansion during high temperature operating conditions, it is necessary to focus on the hardfacing process which provides good bonding shear strength between them. Though low substrate dilution is advisable to attain high microhardness of the deposit, the deposit should not get de-bonded due to shear. To seek solution to this problem, three major hardfacing processes, viz., Plasma Transferred Arc, Gas Tungsten Arc and Laser processes were considered. Hardfaed shear specimens were prepared using each process and tested as per the ASTM A264. Faster cooling rate leads to finer grains and higher microhardness. The influence of dilution on the microhardness was studied. Scanning Electron Mircographs and Energy Dispersive Spectroscopic studies at the fractured surfaces were done to ascertain the reason for strength. Finally, the laser hardfacing process which provides a combination of good shear strength, high microhardness as well as low dilution is recommended for hardfacing of the components of the SFRs for their reliable operations

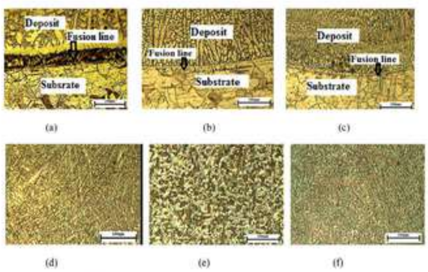
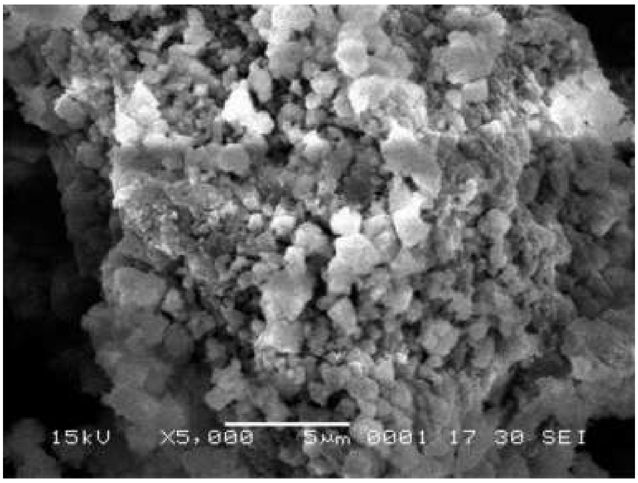


Fig. 9 – Microstructures of (a) PTA (b) GTA and (c) Laser hardfaced specimens near the interface & microstructures of (d) PTA (e) GTA and (f) Laser hardfaced specimens at 700 μm from the interface.

Abid, M
Mechanical Department

Experimental study on Al2O3 /H2O nanofluid with conical sectional insert in concentric tube heat exchanger

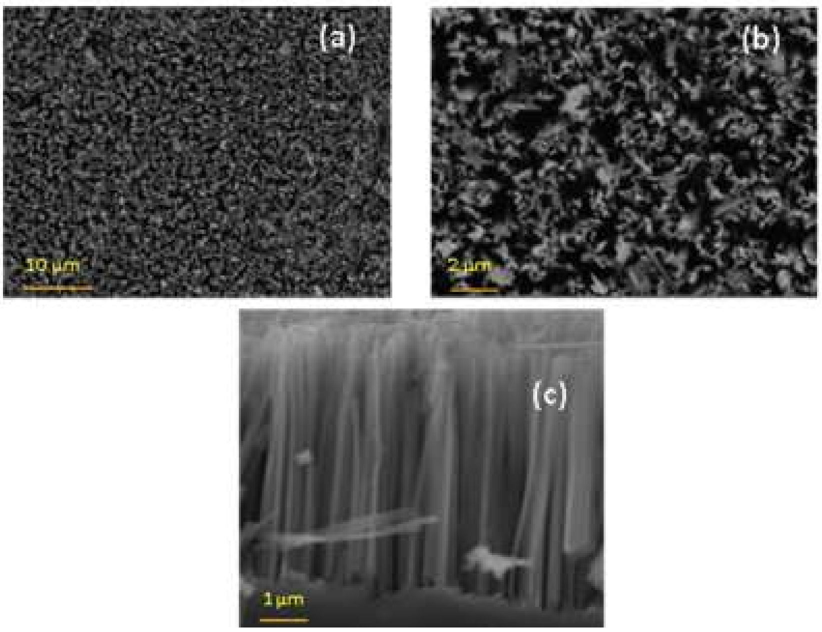
A parallel flow heat exchanger containing conical sectional inserts with three different pitch ratio (i.e., 1, 2, and 3) in a different orientation to the flow direction of the working fluid had been fabricated. Al2O3 with different volume concentration, i.e., 0%, 2%, and 4% nanoparticles (90 nm size) were added to De-ionized water as the working fluid. The combined effect of the Nanofluid and the inserts in different orientations was studied. It was concluded that the insert, flow direction, and Nanofluid volume concentration provided most augmented heat transfer and enhanced the thermal properties.



Arulprakasajothi M., Dilip Raja N
Mechanical Department

Mechanical, Structural and Optical Properties of the Silicon Nanowire Arrays

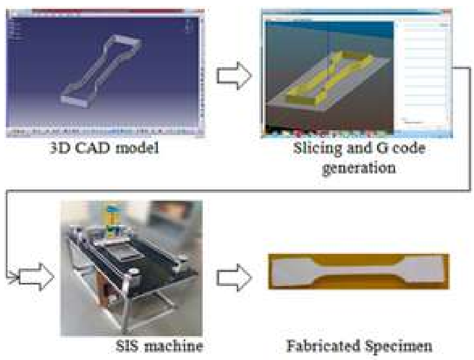
The present work discusses the systematic study of mechanical properties of the silicon nanostructures formed by metal assisted chemical etching (MACE). Silver electrolyte solution, along with hydrogen fluoride, was utilized in formation of silicon nanostructures. An optimized condition of etching time and silver electrolyte concentration were utilized to obtain high aspect ratio, defect-free and high density nanowire arrays on Si wafers. The as-prepared silicon nanostructures (SiNS) were investigated by Scanning electron microscopy (SEM) and nano indentation technique to bring out the morphological and mechanical properties. Further, the variation in optical properties of the bulk silicon and Si nanowire arrays were also investigated to determine the formation of nanostructures.



Dr.Jayavelu s
Mechanical Department

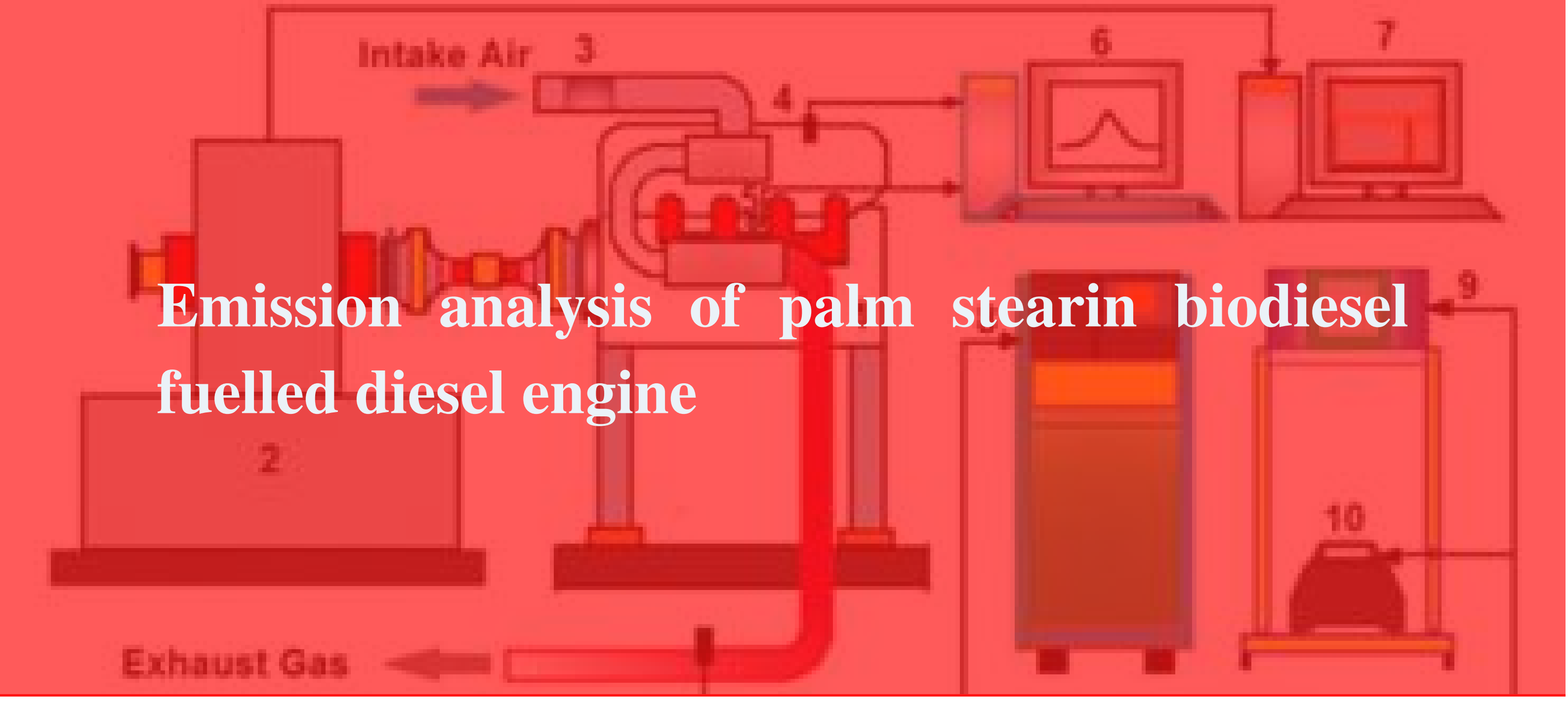
Optimization of fatigue strength of selective inhibition sintered polyamide 12 parts using RSM

Selective inhibition sintering (SIS) is a powder based that fabricate functional parts through fusion of powder bed on a layer by layer basis. Being a new fabrication method, the correlation between process variables and part properties are not fully comprehended. Polyamide 12 (nylon 12) is one of the widely used materials in powder based AM processes including SIS. Therefore, in this work, the effect of critical SIS process parameters on the fatigue behavior of polyamide 12 parts was experimentally investigated, and the parameter settings were optimized to maximize fatigue strength. The number of experimental runs was determined based on BoxBehnken design, and specimens were fabricated as per ASTM D7791. Specimens were tested by subjected them to fluctuating loading at a frequency of 3 Hz. The test results were analyzed using Minitab statistical analysis software. From the ANOVA result, it was identified that the fatigue life of SIS parts is significantly influenced by layer thickness, heater temperature, and heater feed rate. Optimization of process variables settings was performed using the Minitab response optimizer and maximum fatigue strength of 17.43 MPa was obtained. The verification experiment resulted in 17.93 MPa fatigue strength which is comparable to the predicted value and with the result from the literatures.

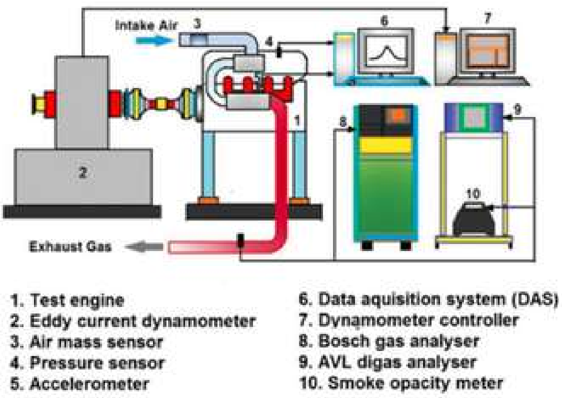


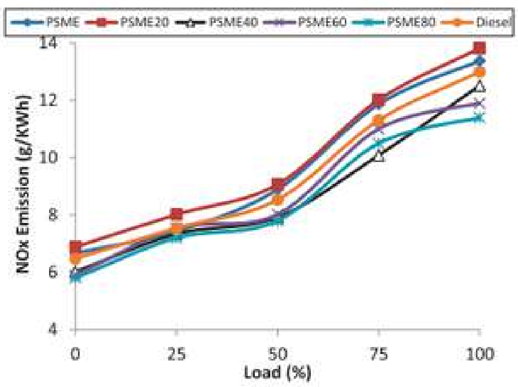
Esakki Balasubramanian
Mechanical Department

Emission analysis of palm stearin biodiesel fuelled diesel engine



This work presents the practicability of using palm stearin oil(PSME) as an alternate on diesel blendedfuel to evaluate the emission characteristics. Six blends of fuels namely, neat diesel, biodiesel (palm stearin methyl ester), a blend of diesel–biodiesel (20%, 40%, 60%, and 80%) are prepared and tested in a diesel engine. The experimental results were revealed that the replacement of diesel by PSME has shown a significant reduction of unburned hydrocarbon, Smoke, CO, and NOx emissions.





Ganesh R., Manikandan K., Chandran J
Mechanical Department

New tools in the fight against pandemics

In addition to the excellent news that arrived at the end of 2020 with the announcement of several effective vaccines against the coronavirus, we witnessed the development of new technologies that will help us face the future's viral challenges. Thus, we talked about innovative algorithms that allow us to identify patterns in the voice associated with ailments. Or the many applications of blockchain technology that also helped to manage pandemic data more reliably. The versatility of 3D printing, which had already shown potential in prosthetics, also played a role in the manufacture of ventilators and other medical components. Of course, smartphone tracking apps proliferated that optimized the tracking of infections.

Ganesh R., Manikandan K., Chandran J
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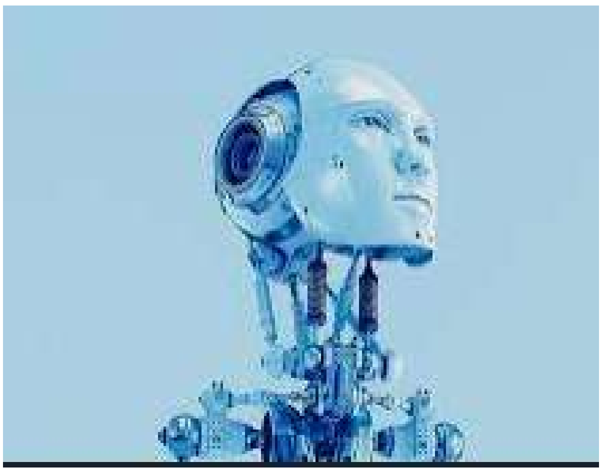
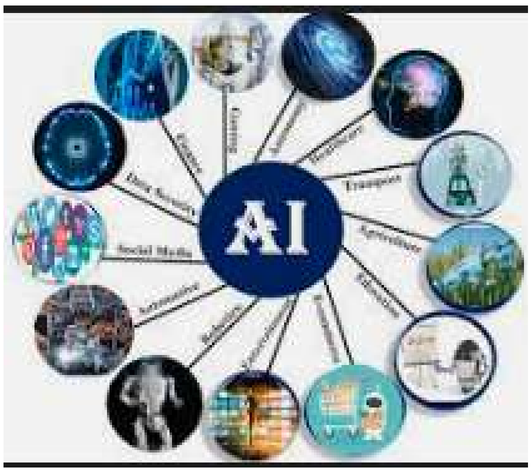
Artificial intelligence multiplied its applications

AI and big data have long been at the heart of technological development. However, this year we saw a real explosion in their applications. On the one hand, they drove the development of new self-piloted ships and mining machinery, but they also were behind archaeological and historical findings. Through analyzing manuscripts of the Archive of the Indies, AI confirmed that the Spaniards discovered Australia. New geoglyphs were also identified in the Nazca Desert. Both discoveries confirmed that AI could help us face the future and better understand our past.





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Robotics handled recycling

However, robotics did not only stick to the design of autonomous vehicles but also opened up new recycling possibilities. A robotic arm capable of selecting and classifying waste was one of the significant advances. Which is the greatest thing now and we can use AI to recycle with the robotic Arm.

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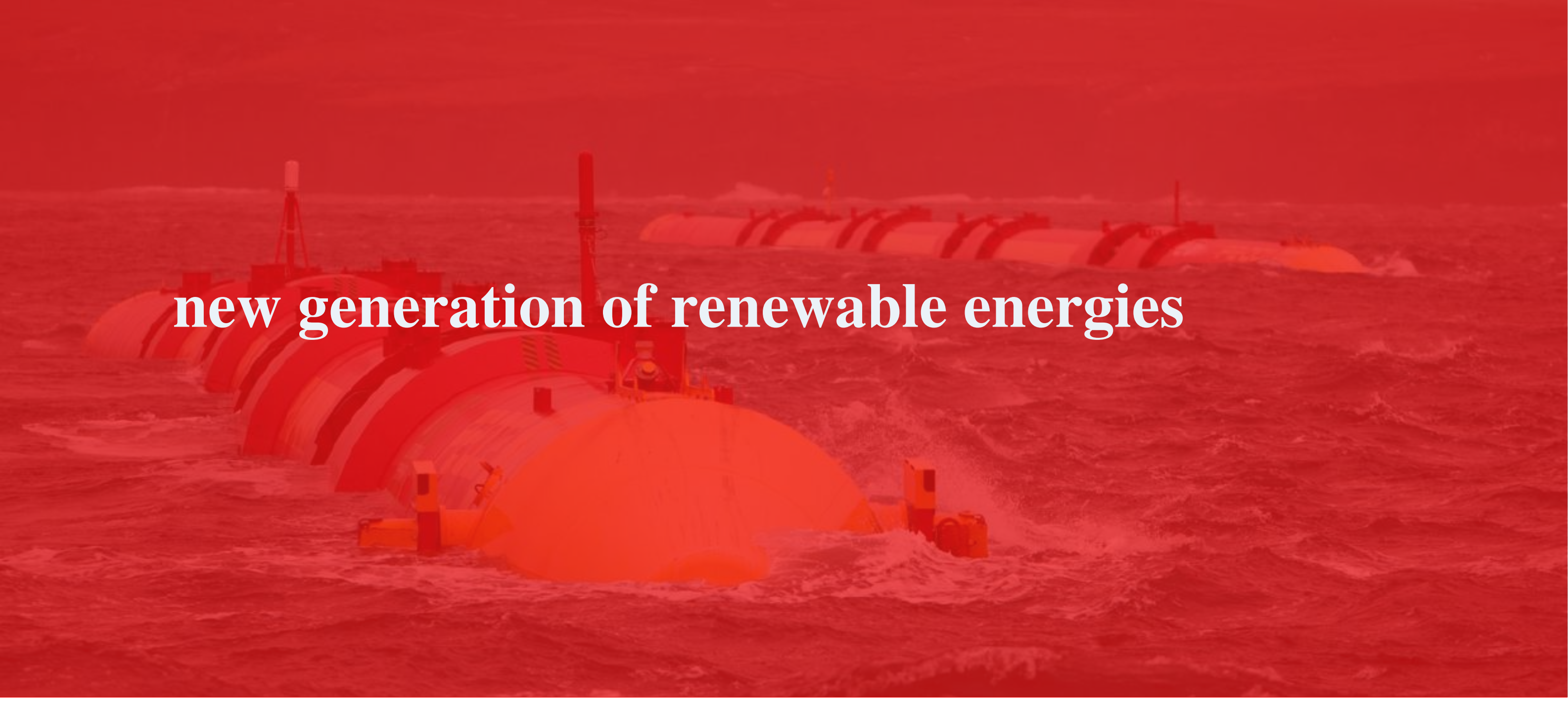
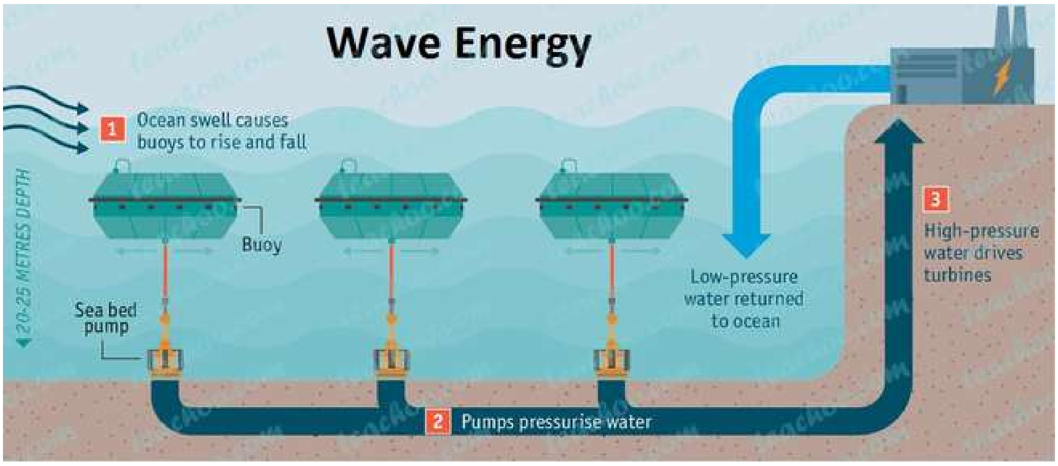
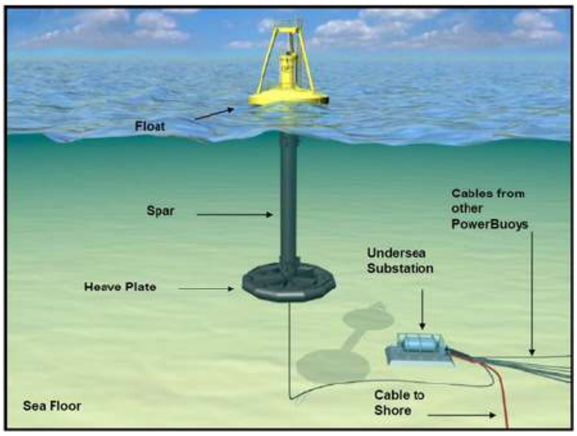


new generation of renewable energies

Along with the consolidation of traditional renewable energies such as wind or photovoltaic, we are also witnessing the advent of a new generation of renewable energies. Some of them, such as wave energy, will take advantage of the seas' energy potential. Others will make it possible to obtain electricity from the ubiquitous Wi-Fi signals. Or even by resorting to the so-called shadow effect. We also address the use of triboelectricity in applications as diverse as wildfire prevention.





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