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DEPARTMENT OF MECHANICAL ENGINEERING

SRI VENKATESWARA COLLEGE OF ENGINEERING , TIRUPATI

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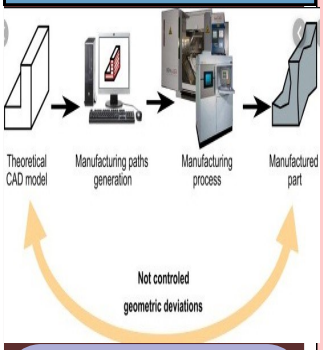


Inside This Issue

Recent Advances in Nano Technology

Nano materials and devices play a major role in the field of pharmaceutical nanotechnology. Nanomaterials exhibit properties remarkably different from the properties of the bulk material due to the large surface area to volume ratio that increases the solubility and rate of absorption. Novel nanostructures will helpful for use as artificial tissue engineering and also help to integrate nanodevices with the nervous system that will restore vision and hearing, and build artificial limbs through the implant of new tissue. Nanotechnology is applied in the pharmaceutical industry in such areas as nano medicine, tissue engineering, nano robots, biosensors, biomarkers, image enhancement devices and implant technology. Investigations are currently being carried out on, among others, liposomes, dendrimers, metallic nanoparticles, polymeric nanoparticles, CNTs, quantum dots and nanofibres. . Distance Lab and Home Lab, are integrated with methodology, curricula and theoretical material as well as web based community support centre for teachers and the learners. The Distance Lab solution for the education and professional use is fully developed and comprises the microcontroller based system access.

Nano Technology in Neuro–drug delivery

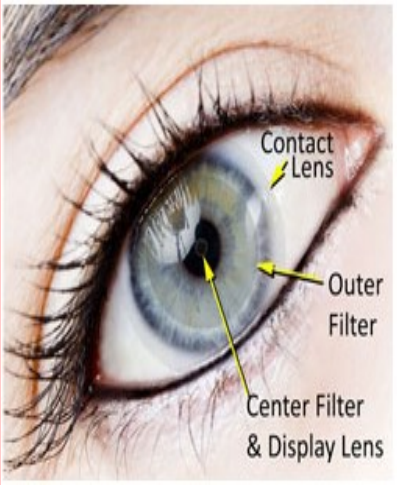
The versatile designs in nanoparticles fabrication made them to be utilized in several applications. Among other employed techniques, nanoparticles can be engineered to move desired molecules or compounds into target locations by using electrostatic forces, bioactive ligand conjugation, or convection enhanced delivery.

A Nanotech Detector for Heart Attacks

Nanosensors that detect heart attacks before they happen could save both lives and money.

That is exactly what Eric Topol, MD, at San Diego-based Scripps Health has been working on with Axel Scherer, PhD, of Caltech. Their technology involves tiny blood stream nanosensor chips that might sense the precursor of a heart attack. A person with such a tiny chip might get a warning on their smartphone or another wireless device that they should immediately see their cardiologist. The latest versions of the chip measure 90 microns--much smaller than a grain of sand. A doctor or nurse might inject the nanosensor into a patient's arm, where it would flow down to the distal tip of the finger and embed itself, screening the blood for endothelial cells that are sloughed off an artery wall in a precursory period preceding a heart attack.

The sensors are now being used for glucose detection in animal studies. Human trials



M.Hari sainadh & K.Shankar

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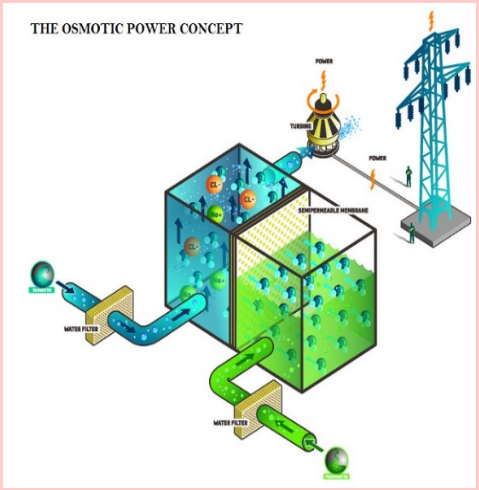
Osmotic Power Generation

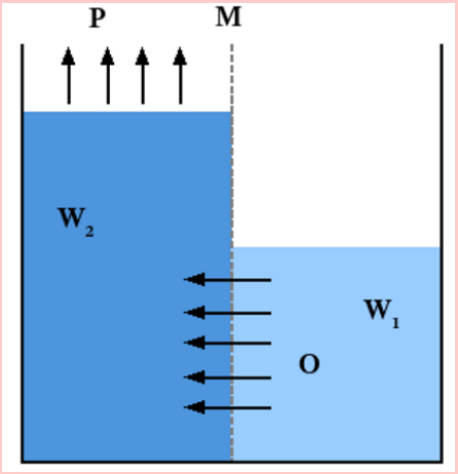
Energy consumption is an important aspect in our day to day life. Energy consumption rate is increasing very rapidly everyday. If this continues as such then the world will one day face shortage of energy. So its time to look for more sources of energy rather than the non-renewable sources of energy and reduce the rate of consumption of non-renewable energy. There are many forms of renewable energy sources in the world. The abundant renewable energies include solar energy, tidal energy, wind energy, Geo thermal energy etc. One of the most recent power generation techniques is osmotic power generation.



Osmotic power or salinity gradient power is the energy available from the difference in the salt concentration between seawater and river water. Salinity gradient power is a specific renewable energy alternative that creates renewable and sustainable power by using naturally occurring processes.

Principle:

The basic principle involved in osmotic power generation is OSMOSIS. Osmosis is the movement of solvent molecules through a selectively permeable membrane into a region of higher solute concentration, aiming to equalize the solute concentrations on the two sides. It may also be used to describe a physical process in which any solvent moves, without input of energy, across a semi permeable membrane (permeable to the solvent, but not the solute) separating two solutions of different concentrations.



Salinity gradient energy is based on using the resources of "osmotic pressure difference between fresh water and sea water."All energy that is proposed to use salinity gradient technology relies on the evaporation to separate water from salt. Osmotic pressure is the "chemical potential of concentrated and dilute solutions of salt". When looking at relations between high osmotic pressure and low, solutions with higher concentrations of salt have higher pressure.

Conclusion:

Osmotic power plants can be constructed anywhere freshwater flows out into the sea, provided that the salt concentration is sufficiently high. Unlike solar power and wind power, osmotic power plants are not affected by fluctuations in the weather and will produce continuous and predictable electricity. Most river outlets around the world represent a potential location for a plant, even though some rivers need more cleaning of the water than others. .

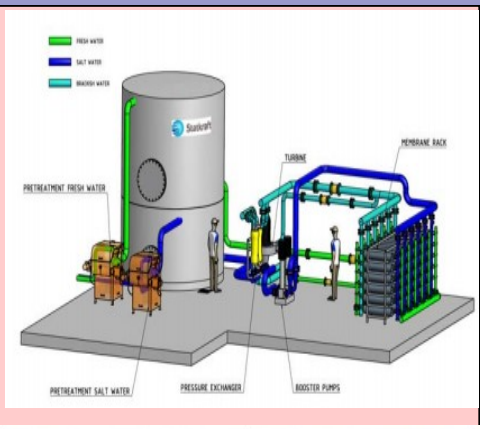


Illustration text: *The prototype at the East coast of Norway*

The global potential is estimated to be 1,600-1,700 TWh – equivalent to 50% of EU's total annual power generation today. In Norway alone, it would be able to generate 12 TWh per year –equivalent to around 10% of our total power consumption. Osmotic power can become an important contributor to the generation of clean, renewable energy.

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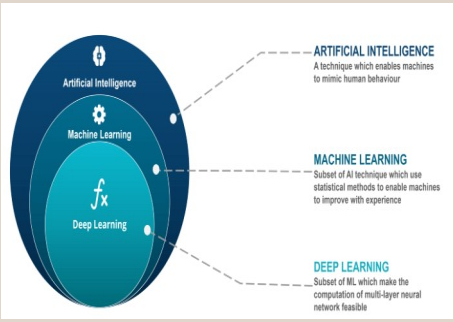
Artificial Intelligence in Mechanical Engineering

Artificial Intelligence and Machine Learning seems to be the current buzzword as everyone seems to be getting into this subject. Artificial Intelligence seems to have a role in all fields of science. According to Britannica , **"Artificial intelligence (AI)**, is broadly defined as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings." By intelligent beings it basically means humans.

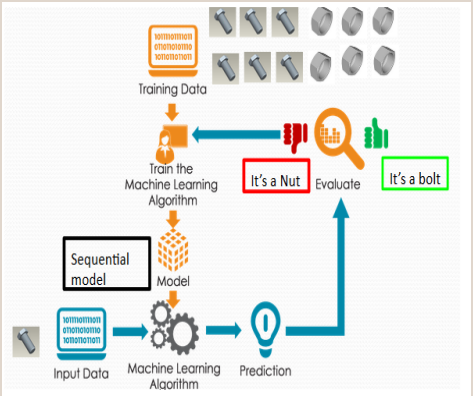


Artificial Intelligence is a broader term which in cooperates Machine Learning. Machine learning uses statistical methods to allow machines to improve with experience. Deep Learning, again, is the subset of Machine Learning which uses multi layer neural networks that mimic the human brain and can learn incredibly difficult tasks with enough data.

We are going to talk about Deep learning methods and its possible role in the field of Mechanical Engineering. Some common examples could be Anomaly Detection (Machine Learning) and Image based Part Classification(Deep Learning). The focus will be on Image based part classifiers and why we need them.

How Does it works:

An algorithm is able to classify images(efficiently) by using a Machine Learning algorithm called Convolutional Neural Networks(CNN) a method used in Deep Learning. We will be using a simple version of this model called Sequential to let our model distinguish the images into four classes Nuts, Bolts, Washers and Locating Pins. The model will learn by "observing" a set of training images. After learning we will see how accurately it can predict what an image (which it has not seen) is.



Methodology:

The process took place in 7 steps. We will get to the details later. The brief summary is

1. **Data Collection** : The data for each class was collected from various standard part libraries on the internet.
2. **Data Preparation :** 8 Isometric view screenshots were taken from each image and reduced to 224 x 224 pixels.
3. **Model Selection :** A Sequential CNN model was selected as it was simple and good for image classification
4. **Train the Model:** The model was trained on our data of 7616 images with 80/20 train-test split.
5. **Evaluate the Model:** The results of the model were evaluated. How well it predicted the classes.
6. **Hyperparameter Tuning:** This process is done to tune the hyperparameters to get better results . We have already tuned our model in this case.
7. **Make Predictions:** Check how well it predicts the real world data

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