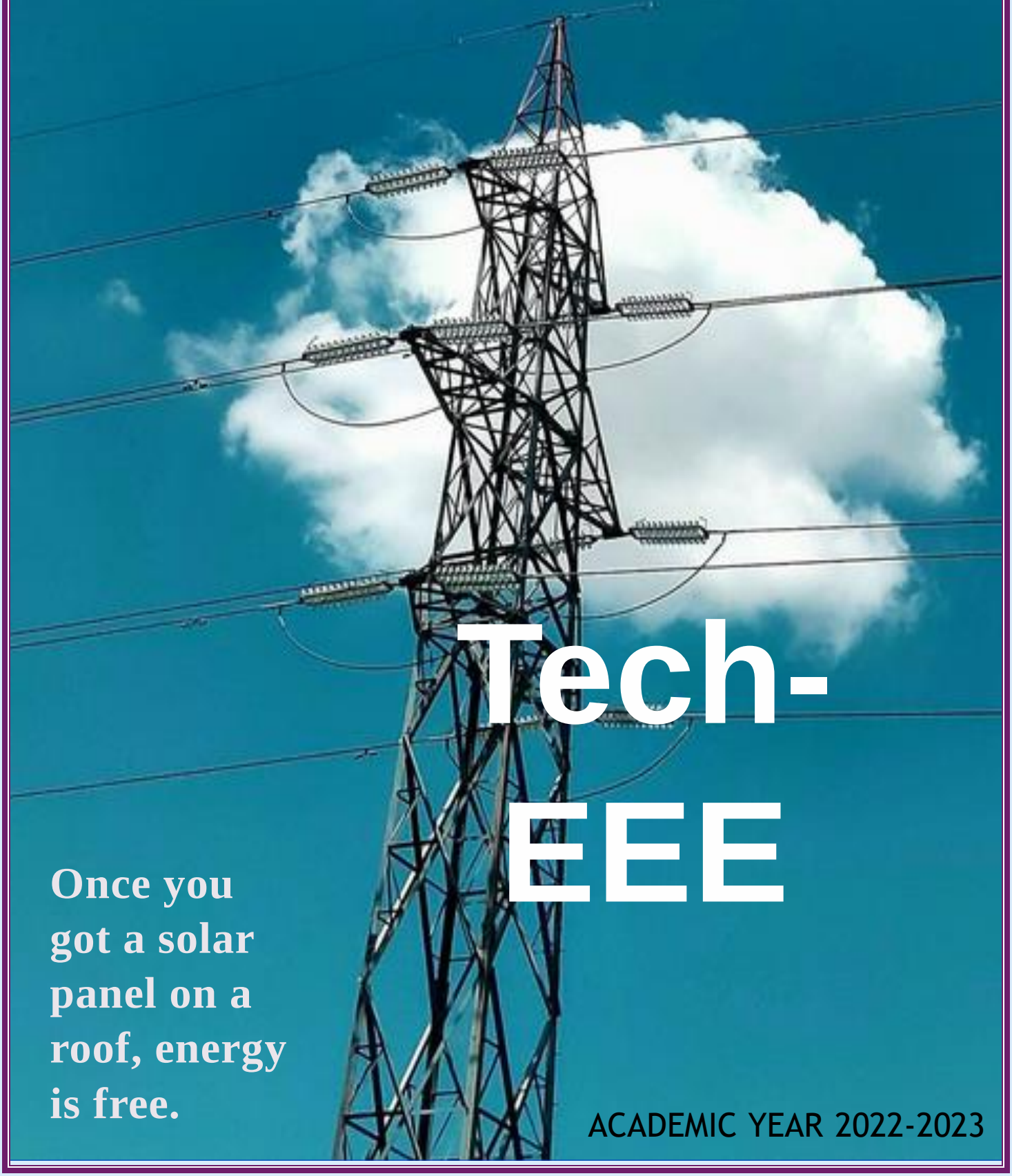
ANAND INSTITUTE OF HIGHER TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING



Tech-EEE

Once you got a solar panel on a roof, energy is free.

ACADEMIC YEAR 2022-2023

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Contents

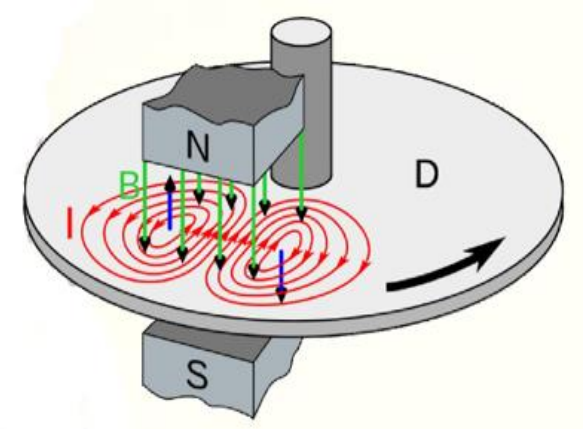
Eddy Current Brake

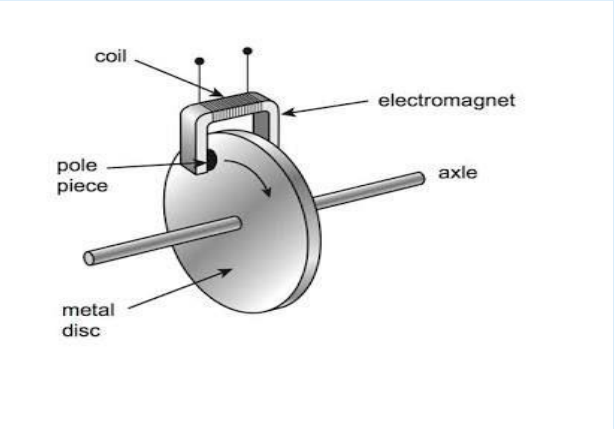
Need For It: -

Many of the ordinary brakes, which are being used now a day's to stop the vehicle by means of mechanical blocking. This causes skidding and wears & tears of the vehicle and if speed of the vehicle is very high, the brake can't provide that much high braking force & it will cause problem .These drawbacks of ordinary brakes can be overcome by "The Eddy current brake".

Principle Of Operations: - (It works according to Faraday's law of electromagnetic induction)

Essentially the Eddy current brake consists of two parts, a stationary magnetic field system and a solid rotating part, which include a metal disc. During braking the metal disc is exposed to a magnetic field from an electromagnet, generating Eddy currents in the disc. The magnet interaction between the applied field and the Eddy currents slow down the rotating disc. Thus the wheels of the vehicle also slow down since the wheels are directly coupled to the disc of the Eddy current brake, thus producing smooth stopping motion.





Types:-

It is of two types

1- Electrically excited eddy current brake

2- Permanent magnetic eddy current brake

Electrically excited eddy current brake:-

Electrically excited eddy current brakes are abruption-free method for braking. In high-speed trains they offer a good alternative to the mechanical rail brakes which are being used now a-days. During braking, the brake comes in contact with the rail, and the magnetic poles of brakes are energized by a winding supplied. Magnetic poles of brakes are energized by a winding supplied with current from the battery. Then the magnetic flux is distributed over the rail. The eddy currents are generated in the rail, producing an electromagnetic braking force. These types of braking need an additional safety power supply when there are breakdowns in the electrical power supply.

The maximum diameter of the Eddy current brake is decided by

1- The spacing of vehicle chassis frame

2- Vehicle floor clearance

In this breaking system kinetic energy of the vehicle is converted to heat and this heat is dissipated

through the rotating disc.

WORKING: -

When the vehicle is moving, the rotor disc of eddy current brake which is coupled to the wheels of the vehicle rotates, in close proximity to stationary magnetic poles. When we want to brake the vehicle, a control switch is put on which is placed on the steering column in a position for easy operation.

When the control switch is operated, current flows from a battery to the field winding, thus energizing the magnet. Then the rotating disc will cut the magnetic field. When the disc cuts the magnetic field, flux changes occur in the disc which

is proportional to the strength of the magnetic field. The current will flow back to the zero field areas of the metal plate and thus create a closed current loop like a whirl or eddy. A flow of current always means there is a magnetic field as well. Due to Lenz's law, the magnetic field produced by the eddy currents works against the movement direction. Thus instead of mechanical friction, a magnetic friction is created. In consequence, the disc will experience a "drag" or the raking effect, and thus the disc stops rotation. The wheels of the vehicle, which is directly coupled to the disc, also stop rotation. Faster the wheels are spinning, stronger the effect, meaning that as the vehicle slows, the braking force is reduced producing a smooth stopping action.

APPLICATION: -

In case of TRAINS, the part in which the current is induced is rail. Brake shoe is enclosed in a coil from an electromagnet, when the magnet is energized, Eddy current are induced in the rail by means of an electromagnetic induction probably producing braking action.

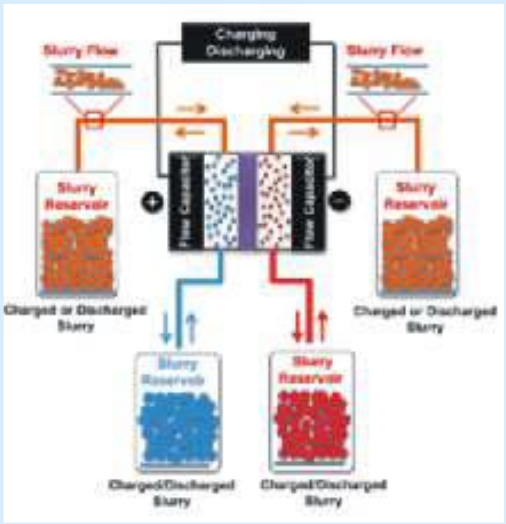
Lightning Protection System

A properly installed lightning protection system is over 98% effective in preventing lightning damage. It is a tried and true method that has been used for over one-hundred years. With the proper lightning protection system you can rest assured that your investments, operations, and personnel will be protected A Lightning Protection Envelope is a complete system of strike termination devices, conductors, grounding electrodes, interconnecting conductors, surge protective devices, and connectors or fittings. The conductors safely conduct the lightning current to ground, and effective low resistance grounding helps to dissipate the lightning current into the earth The practical purpose of a lightning

protection system is the safeguarding of persons and property from hazards arising from the exposure to the dangers of lightning

The universally accepted method of protecting your valuable property from potential damage caused by lightning is a correctly designed and professionally installed lightning protection system. Alltec Corporation designs are application specific to meet your needs. The rolling sphere method is the most used method to determine the protection zone for buildings and other facilities. In this method of determining the likely points of lightning strike attachment, the sphere diameter corresponds to the "last strike" radius of selectable sizes of lightning currents, as established by modern scientific testing and investigation. The areas touched by the sphere are deemed to require protection. On tall structures, this can obviously include the sides of the facility. In addition, all possible placements of the sphere must be considered when determining the zone of protection using the rolling sphere method.

New Technology for Grid Level Electrical Energy Storage



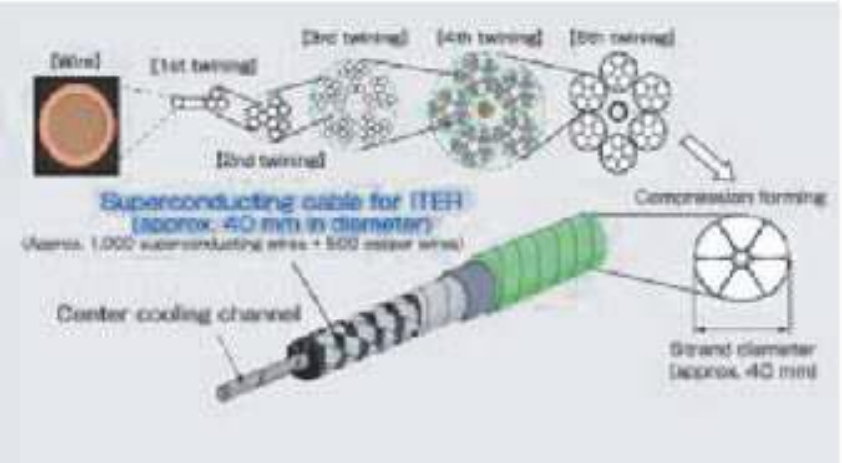
Nowadays, many industrialized nations are shifting to plan towards a sustainable future with efficient use of renewable energy resources. But electrical energy storage is the obstade preventing more widespread use of renewable energy sources such as wind and solar power due to their unpredictable nature. Batteries store a large amount of energy, but are relatively slow in discharging it and they have a limited lifespan, or cycle-life. whereas on other hand conventional super capacitors, similar to lithium-ion batteries, can provide a high power output with minimal degradation in performance and can rapidly store and discharge energy, but only in small amounts compared to the battery. The Drexel's team of researchers is putting forward a plan to integrate into the grid an electrochemical storage system that combines principles behind the flow batteries and super capacitors. The

"electrochemical flow capacitor" (EFC) consists of an electrochemical cell connected to two external electrolyte reservoirs - a design similar to existing redox flow batteries which are used in electrical vehicles.

This technology is unique because it uses small carbon particles suspended in the electrolyte liquid to create slurry of particles that can carry an electric charge. Uncharged slurry is pumped from its tanks through a flow cell, where energy stored in the cell is then transferred to the carbon particles. The charged slurry canbe stored in reservoirs until the energy is needed. When energy is needed then entire process is reversed in order to discharge the EFC.

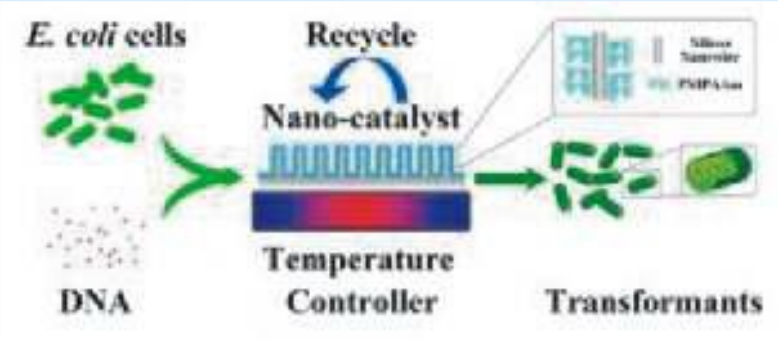
Superconducting Power Cables

Several demonstration projects around the world have been proven technical feasibility of high temperature superconducting power cable systems. These demonstration projects have shown that various cable designs can be implemented to provide reliable service with little maintenance when operated on a continuous basis. High-Temperature Superconducting Cables that utilize the HTS wire can transmit up to 10 times more power than conventional cables or can carry equivalent power at much lower voltages. There are several valuable performance measures for HTS cables that differ from conventional cables and are unique to the superconducting materials, and operating characteristics by critical current and AC loss. Based on this design the manufacture, installation, losses and operating costs of a High-Temperature Superconducting Cable (HTSC) are estimated and compared with conventional cables for a new power link. And it offers the advantages of lower loss, lighter weight and smaller dimensions, as compared to conventional cables. One of the challenging issues in the development of HTS cables



is the AC loss calculation and its reduction, which directly affects the power transmission efficiency.

Nanocatalyst



In electro catalytic performance tests at ANL, the platinum/ nickel nano frames when encapsulated in an ionic liquid exhibited a 36-fold enhancement in Nano-cata lyst mass activity and 22-fold enhancement in specific activity compared with platinum nano particles dispersed on carbon for the oxygen reduction reaction. These nano frame electro catalysts, modified by electrochemically deposited nickel hydroxide, were also tested for the hydrogen evolution Temperature reaction and showed that catalytic activity was enhanced by an order-of DNA Controller Trans magnitude over platinum/carbon catalysts, By greatly reducing the amount of platinum needed for oxygen reduction and hydrogen evolution reactions, our New class Of nano catalysts should lead to the design Of next-generation catalysts with greatly reduced cost but significantly enhanced activities. "Fuel cells and electrolyzes can help meet the ever-increasing demands for electrical power while substantially reducing the emission of carbon and other atmospheric pollutants. These technologies are based on either the oxygen reduction reaction (fuel cells), or the hydrogen evolution reaction (electrolyzes).

some of the major design criteria for advanced nano scale electro catayst, including, high surface-to-volume ratio, 3-D surface molecular accessibility, and significantly reduced precious metal utilization.

Claytronics

Claytronics is a future concept concerning reconfigurable robots known as "claytronic atoms" or atoms designed to form much larger scale machines or

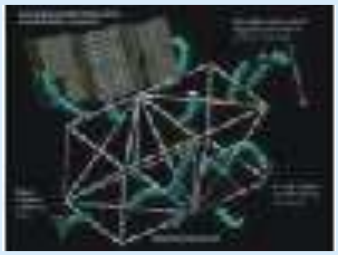
mechanisms. Catoms also known as "programmable matter" are sub millimetre computers that will eventually have the ability to move around, communicate with each other's, change colour and connect to other c atoms to form different shapes. The forms made up of atoms could morph into

tangible 3-D objects that a user can interact with. At Carnegie Mellon, with support from intel the project is known as Claytronics. Current research is exploring the potential of modular reconfigurable robotics and the complex software necessary to control the '"shape changing" robots. Claytronics has the potential to greatly affect many areas of daily life, such as telecommunication, human — computer interfaces and entertainment Using that information they would then form a network in a distributed fashion and organize themselves into a hierarchical structure, both to improve locality and to facilitate the planning and coordination tasks. The goal would then be specified abstractly, perhaps as a series of snap shots or as a collection of virtual deforming forces and then broadcast the catoms. If the source object begins to move, a concise description of the movements would be broadcast allowing the catoms to update their positions moving around each other.

Metamorphic Robots

Metamorphic robots are robots able to change their shape without outside help. The robots are composed of a collection of independently controlled robots that can move around on the other robot store form. The s s image below shows how a module moves. The module labeled S cannot move while another module is moving around it. The moving module wraps itself to another edge of the still module. Then it disconnects from the

edge it started at and wraps itself back to hexagon shape. In our definition, every module has the identical structure, motion constraints, and computing capabilities. The modules also have a regular symmetry, so they can be packed without any gaps between them.



A metamorphic system can dynamically reconfigure by the locomotion of modules over their neighbours. Thus they can

be viewed as a collection of connected modular robots which act together to perform the given task. The planar metamorphic robots described in this paper consist of hexagonal or square modules. What separates metamorphic systems from other reconfigurable robots is that they possess all of the following properties: (1) self-reconfigurability without outside help; (2) a large number of homogeneous modules; and (3) physical constraints ensure contact between modules. the kinematic constraints governing a particular metamorphic robot are addressed.

These robots that can change shape and move without outside intervention are

useful in environments where people cannot go. Examples of such situations are out in space, in mines, deep underwater, and in burning buildings. Having many identical modules makes the system more robust and more cost-efficient. If one module breaks down, the whole system can still continue. The modules can be mass-produced cutting down on manufacturing costs