# INSPIREEEE

INSPIRATIONAL SCRIPTS, PERSONALITIES AND INNOVATIVE RESEARCHES OF EEE

VOLUME 2 - ISSUE 1 - JULY 2013

## LEARN HOW TO DO A POWERPOINT PRESENTATION

## THE RIGHT WAY

**TOP NOTCH PRESENTATIONS FOR REFERENCE**


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## MESSAGE FROM THE HEAD OF THE DEPARTMENT

**Dr. S.M. Kannan**

**HOD/EEE,**

**K.L.N College of Engineering**

## MESSAGE

This issue is meant for the publication of materials presented by B.E-EEE Final Year students (2010 - 2014) batch, during their Presentation Skills and Technical Seminar Laboratory (PSTS Lab) in the previous semester of 2012 - 2013. Dr.S.Venkatesan [Professor/EEE] and Mr.S.Parthasarathy [Associate Professor 1/EEE], being the coordinator of the course, motivated the students to present their bests.

Their feedback about the performance of the students, induced me to attend their final presentation during April 2013.

Students really prepared well and presented neatly. This is what I expected from the students. If properly motivated, all students will concentrate in their subjects and update themselves.

Good wishes to all

**(Dr. S.M. Kannan)**

**Head of Department**

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# TIPS FOR A GOOD PRESENTATION

## Before Slide Design:

Learn about the topic and completely analyze the topic and contents to deliver before starting to prepare the slides for the presentation. Also be conscious about the given time and slide count limit.

**During Slide Design:**

1) Make your slides look calm, pleasing and legible. Do not overload your slides with contents (texts, images, tables or graphs) if you are not planning on explaining them.
2) Form a synopsis at the beginning if your slide count is large (20+ slides), giving a heads up to the audience at the beginning about the topics you're about to cover.
3) Have a pen and a sheet of paper near you while preparing the slides (or keep a Notepad open in your PC). Write down (or type in case of a notepad) about what you're going to say in the current slide. After forming the idea, type the content in the form of hints in the presentation. If you type everything in the presentation, you're of no use to the audience.
Say for example you need to explain about the 'Thirsty crow story' in a slide. This is what you'll put in the slide.

-> Hot Summer day - Draught everywhere - No water
-> Crow - Thirsty - Searched everywhere
-> Found Water at last
-> Problem: Water - Deep down - Not reachable
-> Thought for a while
-> Solution: Pebble stones - Dropped inside pot
-> Thirst quenched - Crow - Happy

So, form contents in such a way that the audience can get the basic overview about the slide but are in need of you to explain them about the stuffs
4) Design the flow of your presentation. Your presentation should have an easily understandable and coveting introduction, a body and a good futuristic conclusion.
5) Use pictures as much as possible instead of texts. Remember, a picture is worth a thousand words.

**After Slide Design:**

1) Be familiar with the slides. Know the ins and outs of the slides, i.e.: what comes next and before each slide. Even if there's a technical issue with the projector, you'll be able to proceed with one or two slides.
2) For most of us, a presentation is a learning process and definitely not something we do on a daily, weekly or even monthly basis. Therefore, it is important to know your strengths and weakness to boost your confidence level.
3) PRACTICE, PRACTICE and PRACTICE. Even Steve Jobs, one of the greatest Orator, would rehearse the presentation at least 10 or 15 times before presenting it. So, it’s best if you Practice and Rehearse. Present before a friend or Present before a mirror. You can even Record your presentation and review it on your own to rectify yourself.

**During the Presentation:**

1) Wear Formals for your presentation. It gives you a professional look. And trust me only that makes the people who're listening to you to believe in what your deliver. Stay calm and present naturally. Prepare your mind before 10 minutes and don't try to review anything. Else, your adrenaline rush is going to make you nervous, giving you a shake ruining your presentation.
2) Make sure you're audible to the one at the back seat but seriously, try not to scream!
3) Make your audience feel engaged in your presentation (especially if you're addressing a medium to large crowd). For example: Ask rhetorical questions when needed or just give short pauses like when you are changing the slides or moving on to another topic (caution: don't do the latter if you're racing against the clock)
4) Non-verbal communication plays a major role in a good presentation. Take good care of your hand movements because they seem to get in the way when we are giving presentations.
One way to feel more confident with your hand movements is to hold a pen in your hands (but make sure you do not break them!)
5) Make eye contact with your audience frequently. Reach the hall across all the four corners with your eyes. Look into the audiences' eyes and give a gentle nod when you stress on key facts.

# GESTURE GLOVE CONTROLLER

PRESENTED BY,

S.RAGHU NANDHAN

[105904121055]

•1

## A MAJOR PROBLEM IN CONVENTIONAL CONTROL SYSTEMS

CONTROL PANELS ARE STATIONARY

•3

## WHAT IS GESTURE GLOVE?

A BREAKAWAY FROM THE CONVENTIONAL DEVICES

A SUPER GLOVE THAT CAN CONTROL ALMOST ALL DEVICES

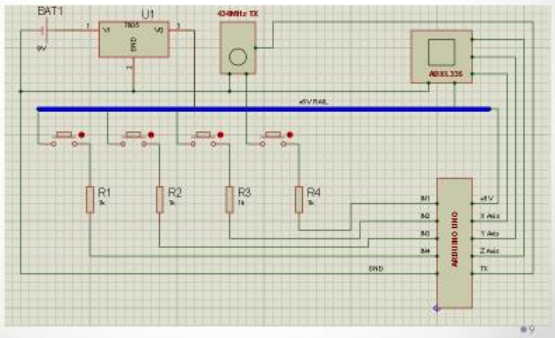
•5

## INSIDE THE GLOVE

- Miniature buttons / Pressure sensors
- Accelerometer
- Micro-controller
- RF module

•7

## WORKING




•9

## RF MODULE

FREQUENCY & ENERGY

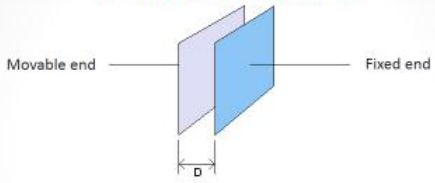
$f=c/\lambda$

$e=hf$

WAVELENGTH & PENETRATION POWER

•11

## HAND ORIENTATION PROCESSING





13

## ABOUT THE MICRO-CONTROLLER

- ATMEGA 328 –> ON ARDUINO IDE


15

## ADVANTAGES

- Simple hand gestures with high accuracy level
- Natural interaction with the environment
- Live wires in control panels
- Ultra-Low power consumption
- Complete isolation from the working environment
- Mobility

17

GESTURE GLOVE – INNOVATING FUTURE

## THANKS FOR YOUR PATIENCE ☺


**REFERENCE:**

ADXL335 DATASHEET:
www.sparkfun.com/datasheets/Components/SMD/**adxl335**.pdf
ARDUINO UNO DATASHEET:
**www.arduino**.cc/en/uploads/Main/**arduino-uno**-schematic.pdf
RF TRANSCEIVERS:
http://www.glacialwanderer.com/hobbyrobotics/?p=291

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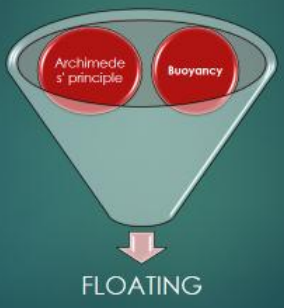
1

# MAN-MADE SEA HORSE

# [SHIP]

PRESENTED BY,
M.SHANMUGA VEL RAJAN
[105904121071]

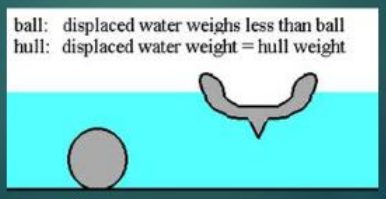
## PRINCIPLE OF FLOATATION




FLOATING

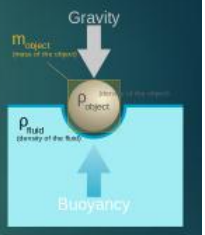
## ARCHIMEDES' PRINCIPLE

- Any object, wholly or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object.



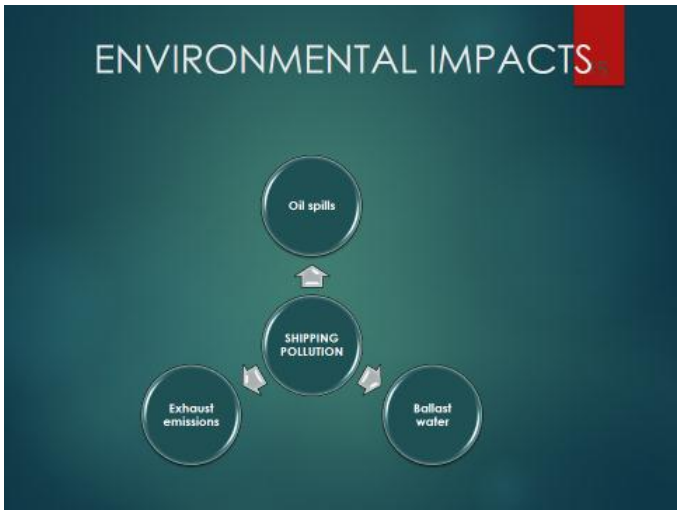

## BUOYANCY

- An upward force exerted by a fluid
- Opposes the weight of an immersed object.




## ARCHITECTURE OF A SHIP


TYPES OF SHIP
Fishing Vessel
Naval Vessel
Commercial Vessel


ENVIRONMENTAL IMPACTS
Oil spills
SHIPPING POLLUTION
Exhaust emissions
Ballast water


IMPACT OF CYCLONE
17
Oil Tanker Stuck At Chennai Beach


21
THANK YOU!

# TIDAL ENERGY

PRESENTED BY,
K.RAJA MATHANGI
105904121056

1

## NEED FOR ALTERNATE ENERGY SOURCES

- Decreasing our dependency on non renewable energy sources
- Reducing carbon footprint
- Reducing overall environmental impact

3

## WHY TIDAL ENERGY?

- Inexhaustible
- Environment friendly
- 71% of earth covered by water-scope of production HIGH
- Doesn't require fuel
- Easy to predict rise and fall of tides(cyclic manner)

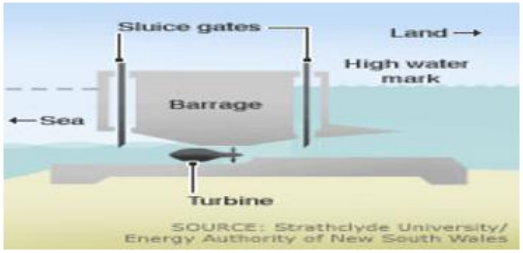
5

WORKING

Construction of dams or barrage

7

## SLUICE GATES



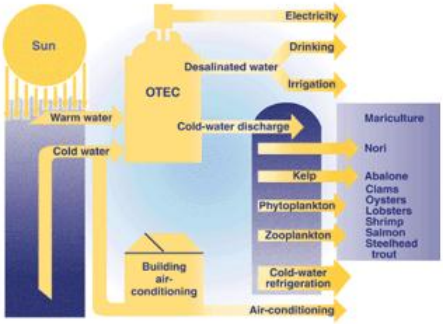

9

## OCEAN THERMAL ENERGY CONVERSION(OTEC)

- Temperature difference between surface warm water and deep cold water
- Seawater as working fluid

11

## Working of otec




13

## APPLICATIONS OF OTEC

- Air conditioning
- Refrigeration
- Mari culture
- Fresh water

15

- Reference:
- Wikipedia.com
- Howstuffswork.com

17

## THANK YOU

Reference:

en.wikipedia.org/wiki/**Tidal_power**

inventors.about.com/od/tstartinventions/a/**tidal_power**.htm

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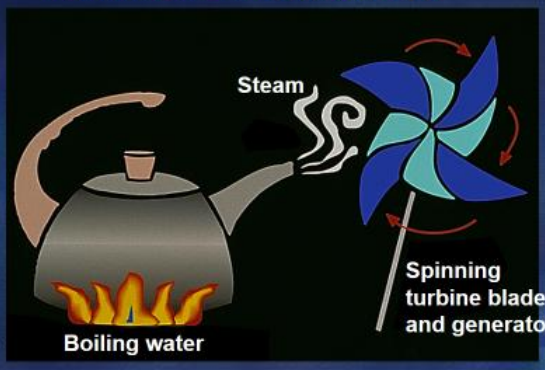
# Nuclear Power Plants

By Prabhakaran

1

## Nuclear Power Plant Turbine and Generator




2

## Nuclear Energy Powers 1 in 5 U.S. Homes and Businesses

3

## Uranium Ore ▶ Uranium hexafluoride ▶ Gas ▶ Solid

4

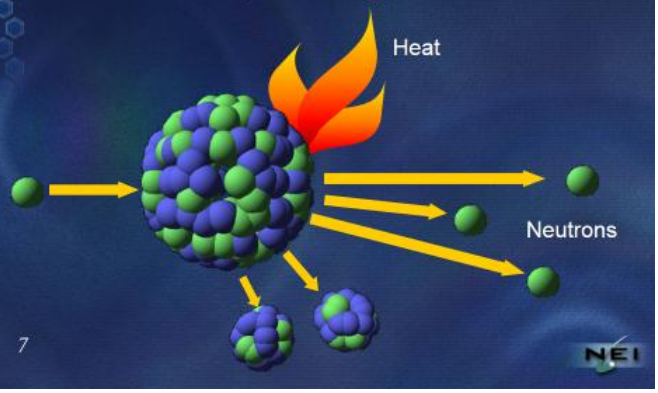
## Fuel Rods Filled With Pellets Are Grouped Into Fuel Assemblies

5

## Nuclear Energy Comes From Fission


6

## Splitting Atoms Releases Neutrons, Making Heat

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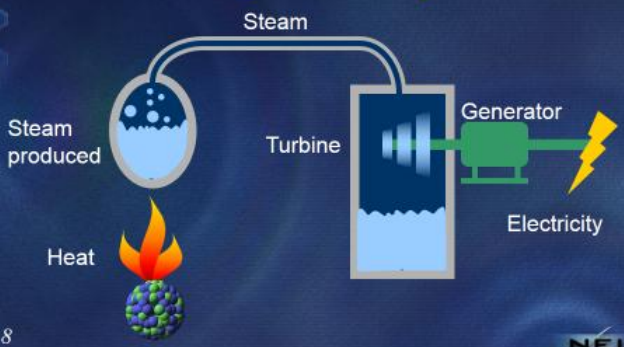
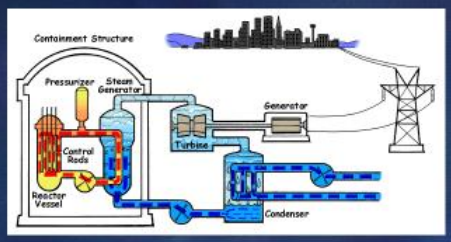
## Heat Produces Steam, Generating Electricity



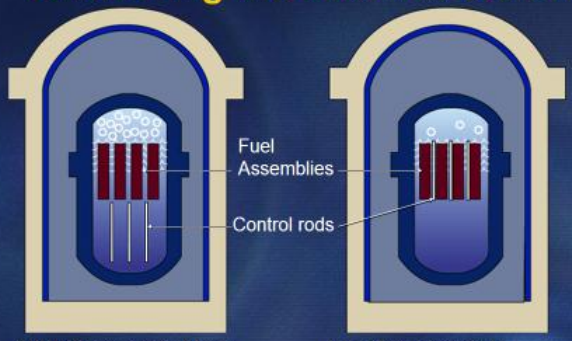

8

## Simplified layout of Nuclear power plant




9

## Controlling the Chain Reaction




Withdraw control rods, reaction increases

Insert control rods, reaction decreases

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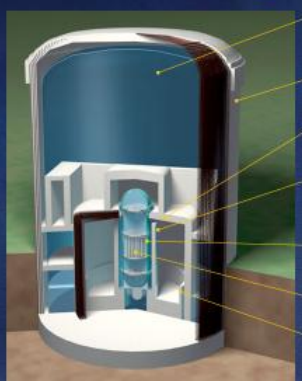
## Safety Is Engineered Into Reactor Designs



Containment Vessel
1.5-inch thick steel

Shield Building Wall
3 foot thick reinforced concrete

Dry Well Wall
5 foot thick reinforced concrete

Bio Shield
4 foot thick leaded concrete with 1.5-inch thick steel lining inside and out

Reactor Vessel
4 to 8 inches thick steel

Reactor Fuel

Weir Wall
1.5 foot thick concrete

11

## Comparing Uranium to Coal

1 kg of uranium-235 will generate as much energy as 3,000 tons of coal without $CO_2$ emissions

12

## ADVANTAGES

➢Nuclear power generation does emit relatively low amounts of carbon dioxide ($CO_2$). The emissions of green house gases and therefore the contribution of nuclear power plants to global warming is therefore relatively little.

13

## Advantages

- This technology is readily available, it does not have to be developed first.
- It is possible to generate a high amount of electrical energy in one single plant.

14

## Disadvantages

- Uranium is ultimately a nonrenewable resource.
- Nuclear power plants are extremely costly to build.
- The slight possibility that nuclear power plants can have catastrophic failures.
- Large environmental impact during the mining and processing stages of uranium are numerous.
- Nuclear waste (Spent nuclear fuel) is extremely hazardous and must be stored safely for thousands of years.

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# EYEBALL MOVEMENT CONTROLLED WHEELCHAIR CONTROL SYSTEM

Presented by,
R.M.Sanjana
[105904121062]

## Let's think about the disabled!

A very few inventions help the 'lame'
-Persons who can't walk!
WE'LL ADD OUR INVENTION TO THAT LIST AS WELL

3

## ABOUT OUR SYSTEM

- A Scouter
- A Wheelchair
- Micro-camera
- 2 Micro-controllers
- A Light sensor and an LED
- RF Transmitter and receiver
- Relays and H-Bridge
- DC Gear Motors
- 2 Push Buttons

5

## Principle of Operation

- Determining the Orientation of the eyeball
- Controlling the wheel chair based on the acquired data

7

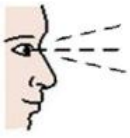
## WORKING

- User wears the Scouter & sits on wheelchair
- Micro-camera samples user's eyeball
- User side µC processes that image data
- Sends processed signal through Tx
- Rx receives the data & sends to wheelchair side µC
- µC processes that data and controls the wheelchair

9

## EYEBALL MECHANISM

- See up/down/left/right to move in that particular direction
- Pixel analysis and approximation technique



11

## Receiver side Implementation

- Differential Drive mechanism


13

## 'The Two Buttons'

- Brakes attached with Servo motors
- First button – Emergency stop
- Second button – Power button

15

## DRAWBACKS

- Visually impaired cannot use this device
- Immobile while charging the battery

17

## CONCLUSION

- A mobility-aided device
  - For persons with moderate/severe physical disabilities
  - For persons with chronic diseases
  - Elderly people
- Immobility shouldn't be a hindrance to mental abilities
- One step closer in making the disabled people Independent

Reference:
wise2.ipac.caltech.edu/staff/fmasci/Ref.vsActivePix.pdf

www.arduino.cc/

19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# CORONA

Presented by
105904121047

1

## Corona

- Corona is an electric discharge brought on by an ionization of a fluid surrounding a conductor that is electrically energized
- This phenomenon can be identified by a faint violet glow and a hissing noise around the conductor

3

## FORMATION OF CORONA

- When potential gradient is less than 30kV/cm, there is no corona formation
- When the potential gradient is greater than 30kV/cm, ions attain a sufficiently high velocity & strike each other, dislodge one or more electrons resulting in complete elecric breakdown

5

## Corona formed in a conductor

7

## corona

9

## Corona power loss

- Formation of corona is always accompanied by energy loss which is dissipated in the form of light, heat, sound and chemical action
- This will affect the efficiency of the transmission line

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## Factors affecting corona

- Atmospheric factors-pressure, temperature, dust & dirt, rain, snow, & fog
- Electrical factors- supply voltage, frequency
- Other factors like diameter of conductor, shape of conductor, conductor spacing, number of conductor per phase

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## ADVANTAGES

- It reduces the magnitude of high voltage steep fronted waves
- The air surrounding the conductor is minimized
- Several applications like van-de-craff generator, electrostatic precipitator, ionization counting etc

15

## DISADVANTAGES

- During foul weather conduction, the power loss is more
- Ozone gas is formed by corona corrosion
- Reduces efficiency of the line
- Triple frequency corona currents & voltages interfere with communication circuits

17

## METHODS OF REDUCING CORONA

- Increasing the diameter of the conductors
- Increasing conductor spacing
- Using hollow conductors
- Using bundled conductors

19

## METHODS OF REDUCING CORONA

21

# THANK YOU

Reference:

en.wikipedia.org/wiki/**Corona**
www.atoptics.co.uk/droplets/**corona**.htm

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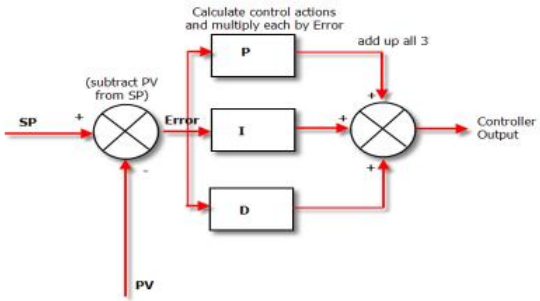
# PID CONTROLLERS

BY
JOHN BAPTISTA.M

## INTRODUCTION

- Definition of PID Controllers
- Function
- Also called " three term control"- P,I, D
- PID controllers – placed close to the sensor – monitored centrally using a SCADA system.




PID CONTROLLERS are process controllers with following characteristics

- Continuous process control analog input (process variable/ PV)
- Analog output
- Set point (SP)
- Proportional, derivative and integral constants

## Proportional Band(P) – Gain

- Error- multiplied by proportional constant (Kp)
- controller's output is proportional to the error of the system
- provide a stable process temperature
- error exists between the required setpoint and the actual process temperature.

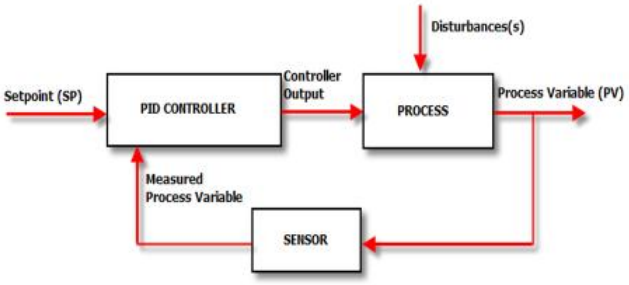
## Integral Band – Reset

- Error-integrated over a period of time, and multiplied by a constant (Ki)
- remove setpoint / measured value errors
- Good stability can be achieved

## Derivative Band – Rate

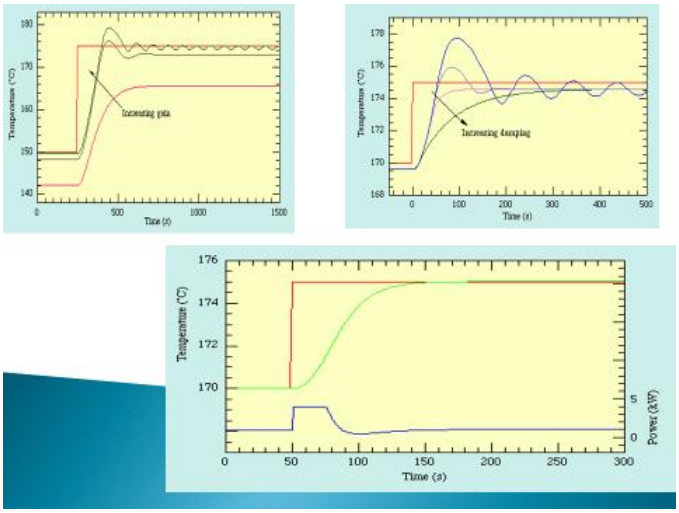
- rate of change of the error with respect to time – multiplied by derivative constant (Kd)
- to determine a controller's response to a change or disturbance of the process temperature
- larger the derivative term, the more rapidly the controller will respond

## BLOCK DIAGRAM




## PURPOSE OF THREE CONSTANTS

- Proportional Kp x Verror ,Kp reduces a large part of the overall error.
- Integral Ki x ∫ Verror dt Reduces the final error in a system.
- Derivative Kd x d (Verror) / dt Counter acts the Kp and Ki terms when the output changes quickly.




## LIMITATIONS

- The fundamental difficulty is a feed*back* system, with *constant* parameters, and no direct knowledge of the process.
- Not suited to non linear applications such as HVAC Systems
- Derivative term will produce small amount of noise– large change in output

## ADVANTAGES

- smaller maximum overshoot due to the 'faster' D action
- no steady state error due to the action integral band.
- Most reliable controllers

## DESIGNING A PID CONTROLLER

**SPECIFICATIONS**

- Zero steady state error
- Settling time within 5 seconds
- Rise time within 2 seconds
- Only some overshoot permitt

## Allen Bradley 1771-TCM

- Uses PID controller
- 8 independent control loops
  - Heating or cooling control
- Auto-Tuning software
  - Speeds up design
  - Accurate gains
- Analog or digital control
- Standard PLC-5 rack mount

## CONCLUSION

- common instrument used in industrial control applications.
- can be used for regulation of speed, temperature, flow, pressure and other process variables.

# A DSP BASED ON-LINE UPS

BY

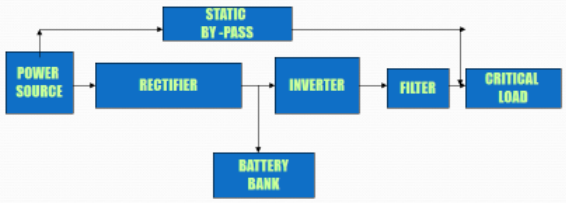
KALAI VANI.A

## INTRODUCTION

- Uninterrupted Power Supply
- Online UPS
- DSP Based Online UPS

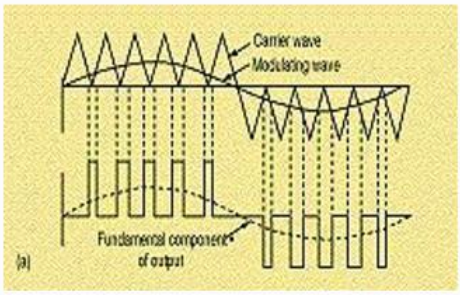
## TYPICAL ON-LINE UPS

Block diagram:




## PULSE WIDTH MODULATION

Mechanism of PWM:

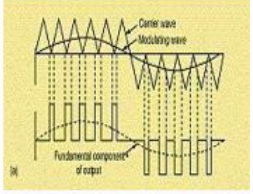



## GENERAL PWM techniques

- Analog devices
- Using Micro-processors.
- With Digital Signal Processor chips.

## ANALOG DEVICES

- Uses natural sampling technique
- Compares the sine wave and triangular wave
- Triangular wave- generated by time base generator



## USING MICRO PROCESSOR

- Digital PWM signal generator is interfaced
- Calculates Pulse width at every sampling instant

**DISADVANTAGES**

- Lack speed for high frequency inverter control
- Harmonics are not eliminated effectively

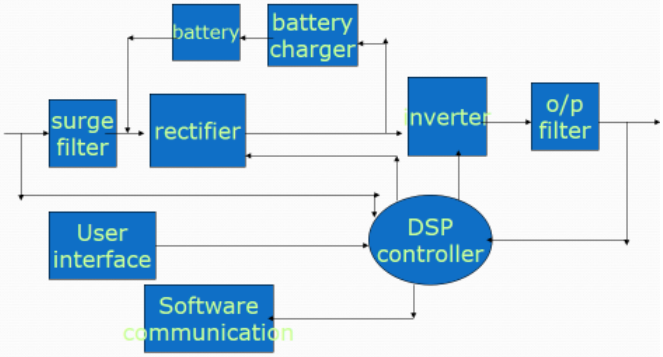
## USING DSP

Significance

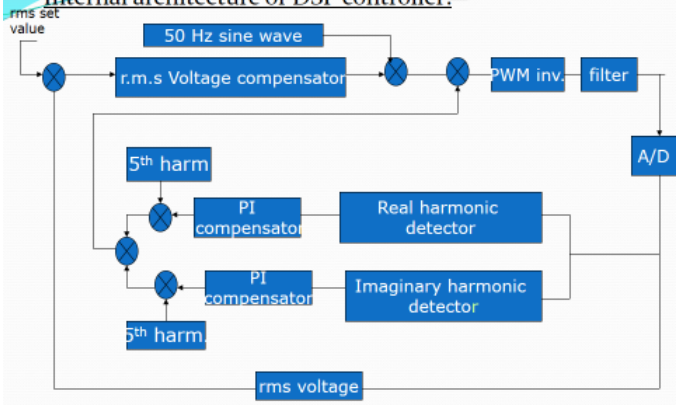
- Sophisticated switching algorithm.
- Flexibility in configuration.
- No analog circuitry.
- Chance for up gradation.

## DSP control of UPS systems.

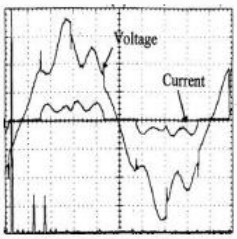
Basic block diagram:



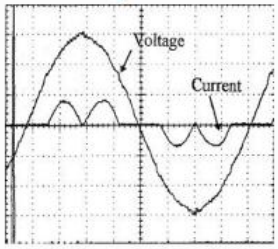

## Internal architecture of DSP controller:



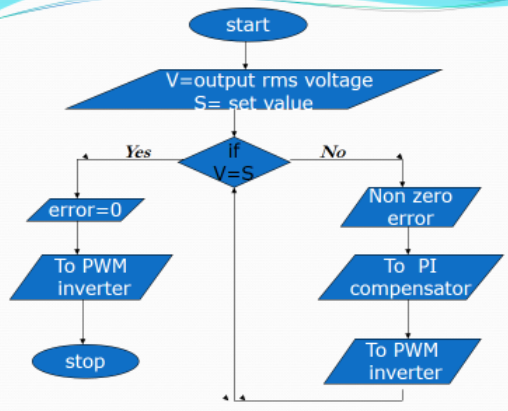

**UPS without DSP Controller**




**With all harmonic conditioner enabled in inverter output**




## Flow chart for voltage control:



## Advantages of using DSP in UPSs:

- High Reliability.
- Low dimensions.
- Precision.
- Interactive communication.
- Software controllable
- High execution speed(30MIPS)

## Closing thoughts:

- To include more intelligent systems in it's architecture.
- Cutting the cost by making its use extensive.
- Increasing the efficiency of electronic components.

*Questions????*

**THANK YOU!!**

# GROUNDING

G.EZHILARASI
105904121015

## CONTENT

- Introduction of grounding system
- Grounding
- Types of grounding system
- Why grounding?
- Characteristics
- Grounding system
- Grounding system consideration

3

## INTRODUCTION OF GROUNDING SYSTEMS

- The primary goal of the grounding system throughout any facility is SAFETY.
- Secondary are effective lightning protection, diminishing EMC, and the protection against (EMP).
- Grounding is implemented to ensure rapid clearing of faults and to prevent hazardous voltage,
- 99.5% survival threshold –
  - 116 mA for one (1) second.
  - 367 mA for zero point one (0.1) second.

5

## Grounding

- Connecting all grounds in the system in a manner such that all of the objectives are met.
- What is ground?
  - Ground wire
  - Ground plane
  - Zero volt

7

## TYPES OF GROUNDING SYSTEMS

- High Resistance Grounded System
- Solidly Grounded System
- Ungrounded System
- Low Resistance Grounded System

9

## Why grounding???

- It is required by electrical codes
- It is required by equipment manufactures
- Protect personnel
- Protect equipment

11

## Characteristics

- Under fault conditions (line-to-ground) increase of voltage stress
- Arc Fault Damage
- Personnel Safety
- Economics' (Maintenance costs)
- Plant continues to operates under single line-to-ground fault
- System coordination
- Upgrade of ground system
- Two voltage levels on same system
- Susceptible to Transient over voltages

13

## Grounding consideration

- System performance
- Safety of personnel
- Af noise emission and susceptibility
- Rf noise emission and susceptibility

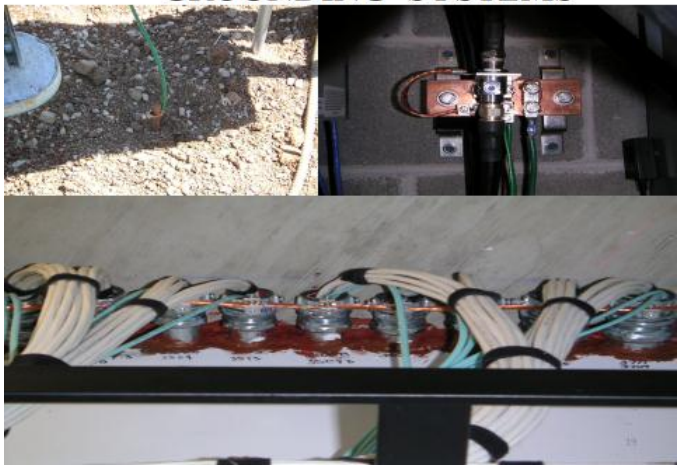
15

## Several factures

- Utilization of area were ground system is to be installed, (i.e., do not install under paved parking lot).
- Available fault currents
- Consideration to the number of lightning strikes and thunder storm days per year.
- Utility ties and/or service entrance voltage levels.

17

## GROUNDING SYSTEMS



19

## GROUNDING SYSTEMS

- System grounds
- Maintenance grounds
- Electronic and computer grounds
- Lightning protection

21

## GROUNDING SYSTEMS

- There are basically six (6) grounding systems in use. The six (6) systems are
- The equipment grounds
- Static grounds
- Systems grounds
- Maintenance grounds
- Electronic grounds and
- Lightning grounds.

23

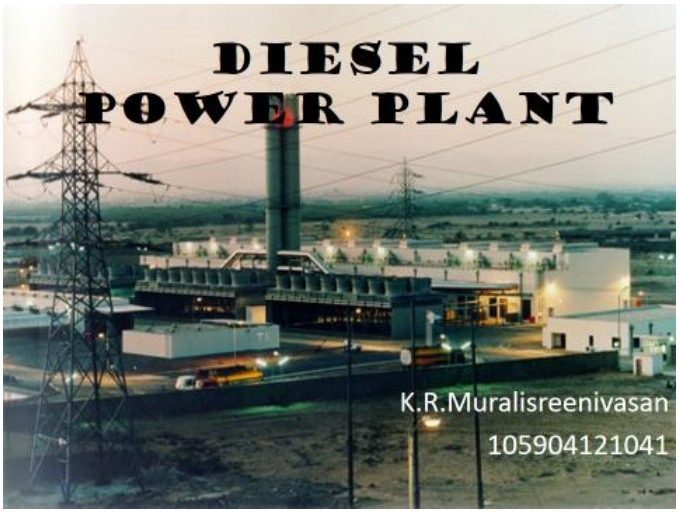
## Grounding system consideration

- Frequency of the signal
- Effective impedance of path
- Current amplitude
- Noise voltage threshold

25

# THANK YOU

27



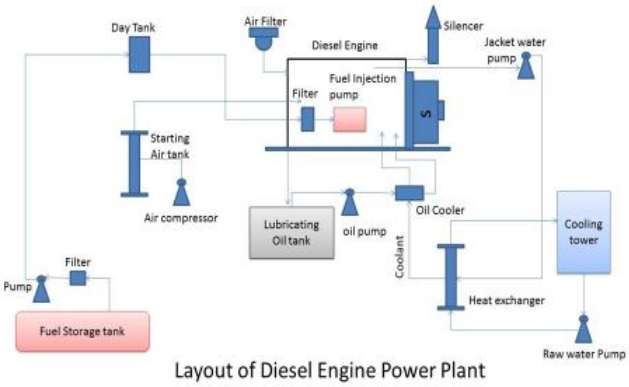

## DIESEL POWER PLANT

- **Power Range : 2 – 50 MW.**
- **Standby sets.**
- **Mobile power generation.**

## TYPES OF DIESEL POWER PLANT

- **Based on number of Strokes**
  - **Two stroke diesel engine.**
  - **Four stroke diesel engine.**
- **Based on orientation**
  - **Horizontal.**
  - **Vertical.**
- **Based on number of Cylinder**
  - **Single.**
  - **Multi.**

## LAYOUT OF DIESEL ENGINE POWER PLANT



Layout of Diesel Engine Power Plant

## LAYOUT OF DIESEL ENGINE POWER PLANT

1. **Diesel Engine**
   - **Compression Ignition.**
   - **Two / Four stroke.**
   - **Air – Air filter.**
   - **Fuel – Diesel – All day tank.**
   - **Ignition cycle process.**
   - **Silencer.**

## LAYOUT OF DIESEL ENGINE POWER PLANT

2. **Starting system**
   - **Not self starting.**
   - **Auxiliary motor or engine.**
3. **Fuel intake system**
   - **All day tank is a storage tank.**
   - **Placement – high.**
   - **Supply.**

## LAYOUT OF DIESEL ENGINE POWER PLANT

4. **Air intake system**
   - **Required for combustion.**
   - **Filter to remove dust**
     - **Wet.**
     - **Dry.**
5. **Exhaust system**
   - **Noisy operation.**
   - **Muffler – to reduce noise**.

## LAYOUT OF DIESEL ENGINE POWER PLANT

6. **Cooling system.**
   - **Burning fuel is1500°C – 2000°C**
   - **Lowering temperature water is used.**
   - **Circulating water for heat transfer.**
   - **Heat exchanger.**
   - **Raw water is cooled in cooling tower.**

## LAYOUT OF DIESEL ENGINE POWER PLANT

7. **Lubricating system**
   - **Includes Lubricating oil tank, pump & cooler**
   - **Purpose – wear and tear reduction.**
   - **To cool engine.**
   - **Cooled by cold water.**
   - **Hot oil returns to tank.**

## DIESEL POWER PLANT

- **Advantage**
  - **Good response to various load.**
  - **Less space.**
  - **Compact and smaller.**
  - **More efficient.**

## DIESEL POWER PLANT

- **Disadvantage**
  - **High operating cost.**
  - **High maintenance and lubrication cost.**
  - **Capacity is limited.**
  - **Noisy operation.**
  - **Overload capacity.**

## DIESEL POWER PLANT

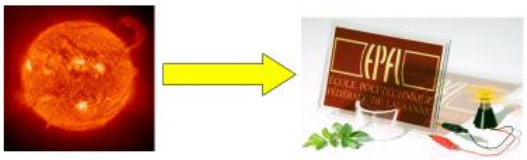
- Application
  - Industrial diesel engines and diesel powered generators have construction, marine, mining, hospital, forestry, telecommunications, underground, and agricultural applications.
  - Power generation for prime or standby backup power is the major application of today's diesel generators.

## The Dye Sensitized Solar Cell

BY

Harihara Raj L.K
105904121020

## Dye-Sensitized Solar Cells are Photovoltaic Devices



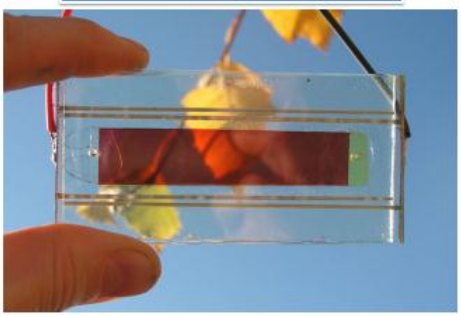
Power from Solar Cell: $P_{PV} = I_{mp} \times V_{mp}$

Power Conversion Efficiency: $\eta_{PV} = \frac{P_{PV}}{P_{sun}}$

On a sunny day, the power from the sun ($P_{sun}$) is one kilowatt per meter squared (1 kW/m$^2$).

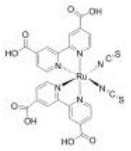
## A new in paradigm in solar energy conversion

The Dye Sensitized solar cell:
Low to medium purity materials
Low cost processing
High Efficiency
High Stability



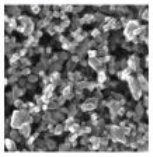
## Dye-Sensitized Solar Cell Components

**Sensitizing Dye**



Chemical Structure of N3 Dye

**Titania Nanoparticles**

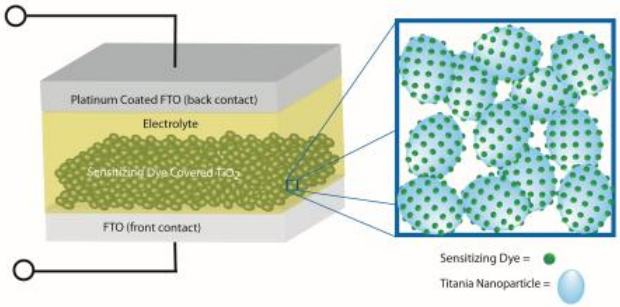


20 nm Titania nanoparticles

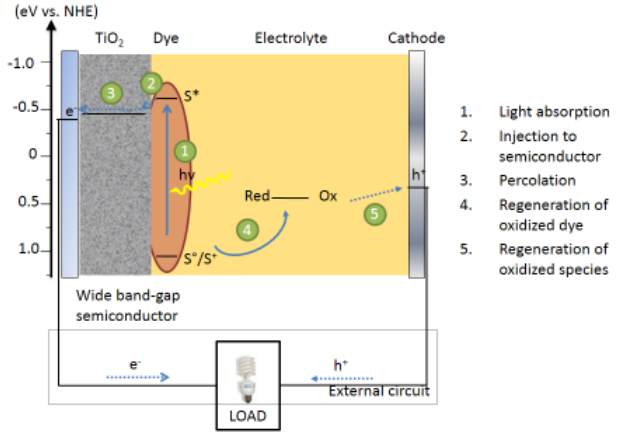
**Electrolyte**

Iodide/Tri-iodide Redox Couple

## Dye-Sensitized Solar Cell Schematic

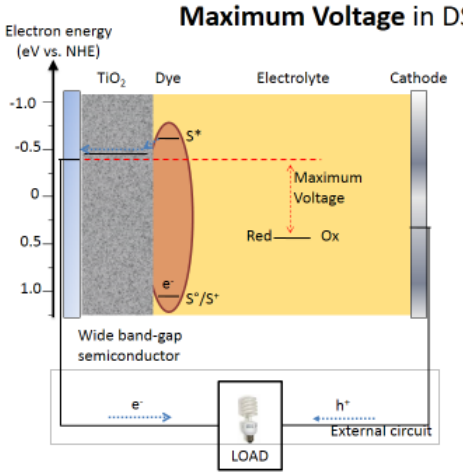



## Current Generation in DSCs




1. Light absorption
2. Injection to semiconductor
3. Percolation
4. Regeneration of oxidized dye
5. Regeneration of oxidized species

## **Maximum Voltage** in DSCs



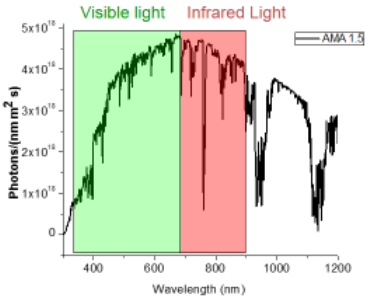

The voltage is determined mainly by the titania and redox couple in the electrolyte.

## Dye-Sensitized Solar Cells are 12% Efficient. What can we do to make them better?

- **Develop dyes to absorb more photons**
- **Create new electrolytes that provide higher voltages.**
- **Develop Dye-Sensitized Solar Cells that can last for 30 years**

## Where do we need to absorb the light?

### Solar Spectrum

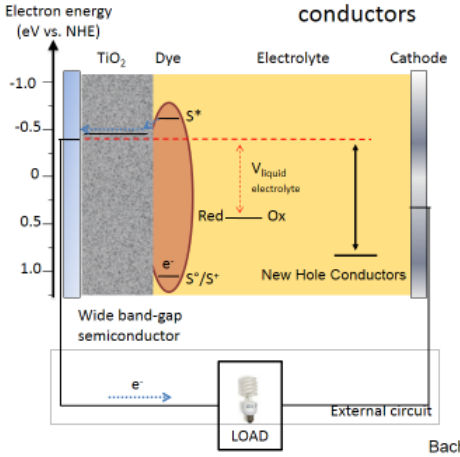



Dye-sensitized solar cells absorb >85% of visible light, but almost no light in the near-infrared.

Various colors in a series-connected dye solar cell module courtesy Dr. Andreas Hinsch, FHI, ISE Freiburg Germany.

Leaf-shaped transparent DSC with four colors courtesy AISIN SEIKI CO.,LTD.

## Increase the maximum voltage using plastic hole conductors




**Potential to make >20% efficient devices by replacing liquid electrolyte with plastic "solid-state" hole conductors.**

Current "solid-state" DSCs are only 6.5% efficient.

Very promising research area.

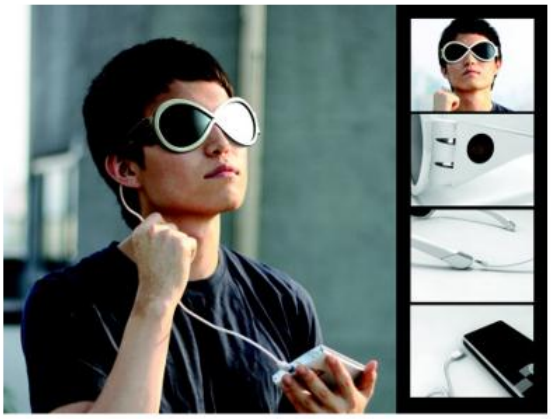
Bach & Grätzel, Nature 1999

## Advantages of DSC versus conventional Solar Devices

- Dyes determine the color of the device.
- Can be transparent
- Can be flexible
- Easy to make

## Solar Powered Solar Panel Sun Glasses

The SIG, or "Self-Energy Converting Sunglasses" are quite simple. The lenses of the glasses have dye solar cells, collecting energy and making it able to power your small devices through the power jack at the back of the frame. "Infinite Energy: SIG"



## Real Outdoor Test of DSC Modules

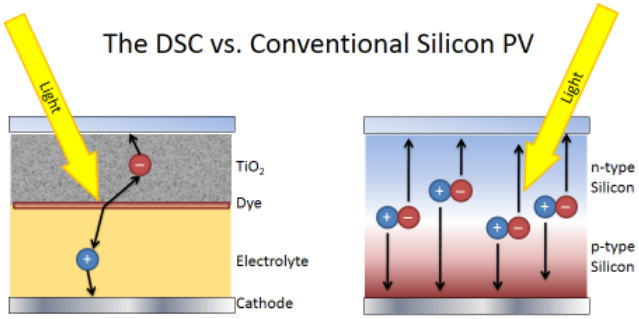
Module Unit

Outdoor Test

Series connected
64 DSC cells

Kariya City at lat. 35°10'N,
Asimuthal angle: 0°
Facing due south, Tilted at 30°

## The DSC vs. Conventional Silicon PV




- Light absorption and charge transport are **decoupled**
- Relaxed constraints on individual components (each can be separately tuned)
- Only monolayer of dye on $TiO_2$

- Charge carriers (excited electrons) are produced throughout the semiconductor
- Semiconductor considerations:
  - Precise doping
  - high purity
  - high crystalinity

## Solar Cell Efficiencies

**Silicon Solar Cell Efficiencies:**
Theoretical Maximum: 26%
Best in Lab: 25% (Green, UNSW)
Modules: 15-22%

**Thin Film Solar Cell Efficiencies:**
Theoretical Maximum: >22%
Best in Lab: 20% (Noufi, NREL)
Modules: 9-12%

**Dye-Sensitized Solar Cell Efficiencies:**
Theoretical Maximum: 14-20%
Best in Lab: 12% (Grätzel, EPFL)
Modules: 6-9%

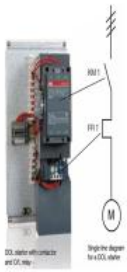
...Thank you...

# SOFT STARTER

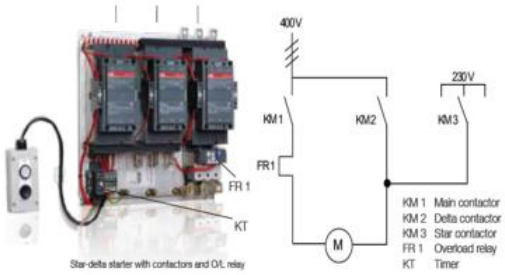
C.MONISHAA
105904121040


## DOL STARTER

- Most commonly used
- Compact and cheap
- Starting torque is high
- Provides high starting current




## STAR DELTA STARTER




Star-delta starter with contactors and O/L relay

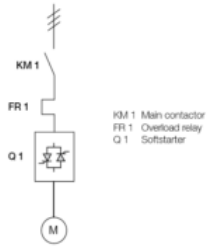
14 | Softstarter Handbook 1SFC132060M0201

## STAR DELTA STARTER

- Consists – 3 contactors, overload relay and a timer
- First star connection
- Then delta connected- full current
- Works well in unloaded or light loaded start
- Not for heavier application

## SOFT STARTER

Softstarter




Single line diagram for a softstarter. The line contactor is not required and sometimes the overload is built-in.*

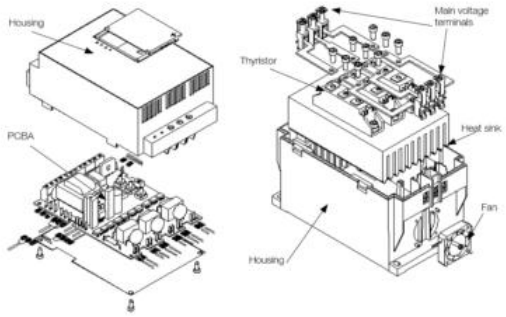
## SOFT STARTER

- It uses solid state device
- Does not change the frequency and the speed, controls the current flow
- Ramps up voltage from initial to full voltage

## SOFT STARTER

- Initial voltage is low
- Gradually voltage and torque increases
- Torque can be adjusted

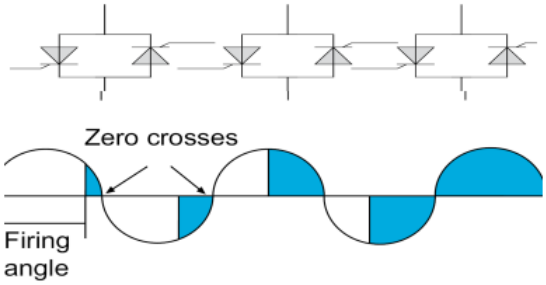
## SOFT STARTER




## VOLTAGES USED

- Operational voltage (Ue)
- Control supply voltage (Us)
- Control circuit voltage (Uc)

## FUNCTIONALITY




## CENTRIFUGAL PUMP

## BY USING SOFT STARTER

- Increases the voltage rapidly during the start sequence
- For stopping also it is used
- Reduces torque and stops the motor
- Also used for under loaded  protection

VOLUME 2 - ISSUE 1 - APRIL 2013

# VISION

TO SET A BENCHMARK FOR PRODUCING ENGINEERS WITH DIVERSE SET OF SKILLS, AND ABILITIES TO HELP FIND A SUSTAINED SOLUTION TO MEET THE NATION'S POWER DEMANDS WITH OPTIMUM UTILIZATION OF GREEN ENERGY

# MISSION

To provide our students with a strong theoretical & practical foundation in Electrical and Electronics Engineering, experience in interpersonal communication, teamwork, professional & ethical conduct and critical thinking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VOLUME 2 - ISSUE 2 - SEPTEMBER 2013
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Pottapalayam - 630 011, Sivagangai Dt., Tamilnadu

# SYNOPSIS

## MESSAGE FROM THE HEAD OF DEPARTMENT

## EDITORIAL BOARD

## 1. PILLARS OF ELECTRICAL ENGINEERING



## 2. TECHNICAL CONTEXT

## MESSAGE FROM THE HEAD OF THE DEPARTMENT

**Dr. S.M. Kannan**

**HOD/EEE,**

**K.L.N College of Engineering**

## MESSAGE

Sharing of information is very essential for everyone to update one's skills. Floods of information are available everywhere. Selecting the information suitable for one's profession is difficult. For any technical professional or student, such information is available in various media, such as Internet, Journals, Magazines and Newspapers. These information are provided by people who are experts in the field. This magazine is an opportunity for exhibiting such talents in our departments, to expose them for the betterment of others. It is an opportunity to every individual, good or average in studies, to exhibit one's own skills. Students should make use of such opportunity to submit relevant materials, suitable to their branch of study. Not only technical part but general information can also be discussed. I'm expecting more in the next issue. Definitely I will present one such article very soon.

Best wishes to all

**(Dr. S.M. Kannan)**

**Head of the Department - EEE**

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# PILLARS OF ELECTRICAL ENGINEERING

# BIOGRAPHY OF NIKOLA TESLA, THE GENIUS WHO LIT THE WORLD

S.R.Akshay Srinivas (112108), II[nd] Year – A Section

Nikola Tesla was born on July 10, 1856 in Smiljan, Lika. It was then part of the Austo -Hungarian Empire, region of Croatia. New York State and many other states in the USA proclaimed July 10, Tesla's birthday- Nikola Tesla Day. The street sign "Nikola Tesla Corner" was recently placed on the corner of the 40th Street and 6th Avenue in Manhattan. There is a large photo of Tesla in the Statue of Liberty Museum. Many books were written about Tesla: Prodigal Genius: The Life of Nikola Tesla by John J. O'Neill and Margaret Cheney's book Tesla: Man out of Time has contributed significantly to his fame.

**DEVELOPMENTS:**

While in Strasbourg in1883, he privately built a prototype of the induction motor and ran it successfully. Tesla joined Continental Edison Company in Paris where he designed dynamos. Nikola Tesla developed polyphase alternating current system of generators, motors and transformers. Tesla introduced his motors and electrical systems in a classic paper, "A New System of Alternating Current Motors and Transformers" which he delivered before the American Institute of Electrical Engineers in 1888.

In February 1882, Tesla discovered the rotating magnetic field, a fundamental principle in physics and the basis of nearly all devices that use alternating current. Tesla's greatest achievement is his polyphase alternating current system, which is today lighting the entire globe. Among his discoveries are the fluorescent light, laser beam, wireless communications, and wireless transmission of electrical energy, remote control, robotics, Tesla's turbines and vertical takeoff aircraft. Tesla's countless experiments included work on a carbon button lamp, on the power of electrical resonance, and on various types of lightning.

Tesla invented the special vacuum tube which emitted light to be used in photography. In 1896 Tesla constructed an instrument to receive radio waves. Tesla made what he regarded as his most important discovery-- terrestrial stationary waves. By this discovery he proved that the Earth could be used as a conductor and would be as responsive as a tuning fork to electrical vibrations of a certain frequency. He also lighted 200 lamps without wires from a distance of 25 miles (40 kilometers) and created man-made lightning. Tesla's concept of wireless electricity was used to power ocean liners, destroy warships, run industry and transportation and send communications instantaneously all over the globe.

**FAME:**

1. Tesla is the father of the radio and the modern electrical transmissions systems.

2. He designed the first hydroelectric power plant in Niagara Falls in 1895, which was the final victory of alternating current. The achievement was covered widely in the world press, and Tesla was praised as a hero worldwide.
3. The Century Magazine published Tesla's principles of telegraphy without wires, popularizing scientific lectures given before Franklin Institute in February 1893.
4. He was the Super Star.
5. In 1894, he was given honorary doctoral degrees by Columbia and Yale University and the Elliot Cresson medal by the Franklin Institute.
6. Tesla is known as the inventor of polyphase alternating current. The Nikola Tesla Corner Sign, is a constant reminder to all New Yorkers of the greatness of this genius.

## NIKOLA TESLA'S AWARDS AND RECOGNITION

In 1917, Tesla was awarded the Edison Medal, the most coveted electrical prize in the United States. Nikola Tesla's name has been honored with an International Unit of Magnetic Flux Density called "Tesla". The United States Postal Service honored Tesla with a commemorative stamp in 1983. In 1934, the city of Philadelphia awarded him the John Scott medal for his polyphase power system. The Nikola Tesla Award is one of the most distinguished honors presented by the Institute of Electrical Engineers. The Nikola Tesla Statue is located on Goat Island to honor the man whose inventions were incorporated into the Niagara Falls Power Station in 1895.

## Man of Science, Father of Electrical-Michael Faraday

J.Micheal Mathan (112907), IV$^{th}$ Year – A Section

**Who**: Michael Faraday **Where**: South London, England

**When**: Sep 22, 1791 - Aug 25, 1867 **What**: Father of Electromagnetism

**F**amed British physicist and chemist, best known for his discoveries of electromagnetic induction and of the laws of electrolysis. His biggest breakthrough in electricity was his invention of the electric motor.

Born in 1791 to a poor family in London, Michael Faraday was extremely curious, questioning everything. He felt an urgent need to know more. At age 13, he became an errand boy for a bookbinding shop in London. He read every book that he bound, and decided that one day he would write a book of his own. He became interested in the concept of energy, specifically force. Because of his early reading and experiments with the idea of force, he was able to make important discoveries in electricity later in life. He eventually became a chemist and physicist.

Michael Faraday built two devices to produce what he called electromagnetic rotation: That is a continuous circular motion from the circular magnetic force around a wire. Ten years later, in 1831, he began his great series of experiments in which he discovered electromagnetic induction. These experiments form the basis of modern electromagnetic technology.

In 1831, using his "induction ring", Michael Faraday made one of his greatest discoveries - electromagnetic induction: the "induction" or generation of electricity in a wire by means of the electromagnetic effect of a current in another wire. The induction ring was the first electric transformer. In a second series of experiments in September he discovered magneto-electric induction: the production of a steady electric current. To do this, Faraday attached two wires through a sliding contact to a copper disc. By rotating the disc between the poles of a horseshoe magnet he obtained a continuous direct current. This was the first generator. From his experiments came devices that led

to the modern electric motor, generator and transformer.

Michael Faraday continued his electrical experiments. In 1832, he proved that the electricity induced from a magnet, voltaic electricity produced by a battery, and static electricity were all the same. He also did significant work in electrochemistry, stating the First and Second Laws of Electrolysis. This laid the basis for electrochemistry, another great modern industry.

In his early years of research, Faraday worked more with chemistry. However, none of his findings in chemistry can compare with his discoveries in electricity. Faraday's biggest breakthrough in electricity was his invention of the electric motor. He began working with magnets and discovered that if a magnet were held fixed, a wire would rotate around it. This was first motor. He kept working with the motor and made many models of it. He did not improve motors to the point of what they are like today, but he did develop the basis for all motors.

Faraday also began working with ways to generate electricity. He discovered that an electric current would be generated if a magnet passed through a loop of wire. This is the basis for generators that are used to generate electricity. It is said to be the biggest breakthrough in electricity in the 1800's, and is known as the electromagnetic induction effect.

Michael Faraday spent most of his life working with science, but he wasn't a very bright mathematician. Most of his discoveries were based on his experiments. He quit his studying of electricity in 1855, but didn't stop altogether. For the next six years, he spent time teaching and lecturing. Michael Faraday died on August 15, 1867, in a small English town.

Famous Faraday's Quotes:

- "But still try, for who knows what is possible"
- "Nothing is too wonderful to be true, if it be consistent with the laws of nature"
- "There is no more open door by which you can enter into the study of natural philosophy than by

considering the physical phenomena
of a candle”

# LIFE OF THOMAS ALVA EDISON

D.Prem Kumar (112309), III[rd] Year – B Section

Thomas Alva Edison was born to Sam and Nancy on February 11, 1847, in Milan, Ohio. Known as "Al" in his youth, Edison was the Youngest of seven children, four of whom survived to adulthood. Edison tended to be in Poor health when young.

Thomas Edison's forebears lived in New Jersey until their loyalty to the British crown During the American Revolution drove them To Nova Scotia, Canada. From there, later Generations relocated to Ontario and fought The Americans in the War of 1812. Edison's Mother, Nancy Elliott, was originally from New York until her family moved to Vienna, Canada, where she met Sam Edison, Jr., Whom she later married. When Sam became Involved in an unsuccessful insurrection in Ontario in the 1830s, he was forced to flee to The United States and in 1839 they made Their home in Milan, Ohio.

In 1859, Edison took a job selling newspapers And candy on the Grand Trunk Railroad to Detroit. In the baggage car, he set up a Laboratory for his chemistry experiments and a printing press, where he started the "Grand Trunk Herald", the first newspaper published on a train. An accidental fire forced him to stop his experiments on board.

Around the age of twelve, Edison lost almost all his hearing. There are several theories as to what caused his hearing loss. Some attribute it to the aftereffects of scarlet fever which he had as a child. Others blame it on a conductor boxing his ears after Edison caused a fire in the baggage car, an incident which Edison claimed never happened.

In 1862, Edison rescued a three-year-old from a track where a boxcar was about to roll into him. The grateful father, J.U. MacKenzie, taught Edison railroad telegraphy as a reward. That winter, he took a job as a telegraph operator in Port Huron. In the meantime, he continued his scientific experiments on the side. Between 1863 and 1867, Edison migrated from city to city in the United States taking available telegraph jobs.

In 1868, Edison moved to Boston where he worked in the Western Union office and worked even more on his inventions. In January 1869 Edison resigned his job, intending to devote himself fulltime to inventing things. His first invention to receive a patent was the electric vote recorder, in June 1869. Daunted by politicians' reluctance to use the machine, he decided that in the future he would not waste time inventing things that no one wanted.

Edison also established the Newark

Telegraph Works in Newark, NJ, with William Unger to manufacture stock printers. He formed the American Telegraph Works to work on developing an automatic telegraph later in the year.

In 1874 he began to work on a multiplex telegraphic system for Western Union, ultimately developing a quadruplex telegraph, which could send two messages simultaneously in both directions. When Edison sold his patent rights to the quadruplex to the rival Atlantic & Pacific Telegraph Co., a series of court battles followed in which Western Union won. Besides other telegraph inventions, he also developed an electric pen in 1875.

Edison opened a new laboratory in Menlo Park, NJ, in 1876. This site later become known as an "invention factory," since they worked on several different inventions at any given time there. Edison would conduct numerous experiments to find answers to problems. He said, "I never quit until I get what I'm after. Negative results are just what I'm after. They are just as valuable to me as positive results." Edison liked to work long hours and expected much from his employees.

For his last two years, a series of ailments caused his health to decline even more until he lapsed into a coma on October 14, 1931. He died on October 18, 1931, at his estate, Glenmont, in West Orange, New Jersey.1 For his last two years, a series of ailments caused his health to decline even more until he lapsed into a coma on October 14, 1931. He died on October 18, 1931, at his estate, Glenmont, in West Orange, New Jersey.

# TECHNICAL CONTEXT

# Nano-Capacitors

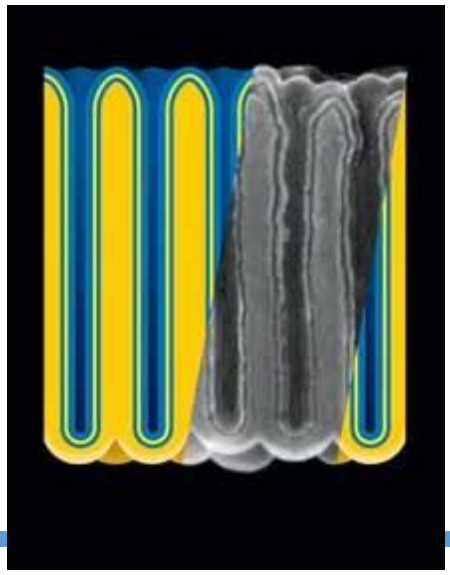
Deepthi Harshini (122012), II$^{nd}$ Year – A Section

Similar to wrist watches electronic goods like mobile phones, cameras can also be used due to the arrival of Nano-capacitors. These capacitors have been designed and developed by German scientists.

It is possible to design human body attachable electronic goods using Nano sized high storage capacitors. All electronic goods work with the help of batteries. In these batteries, high storage capacitors made of compounds such as carbon or some current carrying polymers are used. In this case, instead of above mentioned compounds, scientists have been planned to use Manganese dioxide in capacitors. Due to the usage of MnO2 large amount of electricity can be stored in the capacitor in less time. MnO2 has more storage capacity than others. So carbon and other polymers are replaced by MnO2. It has been proved that batteries made of MnO2 are long lasting.

The electrons present in the outer most orbit of MnO2 are removed by vaporization reaction and thus the compound can be vaporized easily. When this MnO2 gas reacts with molecules of gold which has low density and high current conductivity, very thin nano meter sized capacitors could be produced. Research is undergoing on other cheap conductors instead of using costliest gold in this process. Using these capacitors small sized electronic goods could be produced.

Since these capacitors have high current storage capacity and low current leakage, they play a significant role in all electronic goods.



# POWER ENGINEERING

J.Jeyadheep Vignesh (112314), II[nd] Year – A Section

Power engineering, also called power systems engineering, is a subfield of electrical engineering that deals with the generation, transmission and distribution of electric power as well as the electrical devices connected to such systems including generators, motors and transformers. Although much of the field is concerned with the problems of three-phase AC power - the standard for large-scale power transmission and distribution across the modern world - a significant fraction of the field is concerned with the conversion between AC and DC power as well as the development of specialized power systems such as those used in aircraft or for electric railway networks. It was a subfield of electrical engineering before the emergence of energy engineering.

Electricity became a subject of scientific interest in the late 17th century with the work of William Gilbert. Over the next two centuries a number of important discoveries were made including the incandescent light bulb and the voltaic pile. Probably the greatest discovery with respect to power engineering came from Michael Faraday who in 1831 discovered that a change in magnetic flux induces an electromotive force in a loop of wire—a principle known as electromagnetic induction that helps explain how generators and transformers work.

Power Engineering deals with the generation, transmission and distribution of electricity as well as the design of a range of related devices. These include transformers, electric generators, electric motors and power electronics.

Modern power engineering consists of three main subsystems: the generation subsystem, the transmission subsystem, and the distribution subsystem. In the generation subsystem, the power plant produces the electricity. The transmission subsystem transmits the electricity to the load centers. The distribution subsystem continues to transmit the power to the customers.

Generation of electrical power is a process whereby energy is transformed into an electrical form. There are several different transformation processes, among which are chemical, photo-voltaic, and electromechanical. Electromechanical energy conversion is used in converting energy from coal, petroleum, natural gas, uranium done by into electrical energy. Of these, all except the wind energy conversion process take advantage of the synchronous AC generator coupled to a steam, gas or hydro turbine such that the turbine converts steam, gas, or water flow into rotational energy, and the synchronous generator then converts the rotational energy of the turbine into electrical energy. It is the turbine-generator conversion process that is by far most economical and

consequently most common in the industry today.

# BLOOM BOX

Deepthi Harshini (122012), II[nd] Year – A Section

Lakhs and lakhs people of the world are dwelling in the dark forests and remote villages without even knowing the word electricity. Daily routine of the people belong to Africa and southern Asia runs without electricity. Their need of electricity cannot be fulfill by their poor government sectors. To overcome these inabilities a new magic box called bloom box containing a gjinn called electricity have been found.

This magic box helps the people to


generate electricity of their own for their needs. This renewable source of electricity was found by a man whose hometown is Tamil Nadu did his under graduation in mechanical engineering at Trichy NIT and continued his nuclear engineering and received his doctorate in Illinois' University, America now lives there by named Mr.K.R.Sridhar.

Today, he is the only man who made all Americans frozen by his invention. When he was working in American space research organization i.e. NASA, he made a research on the dwelling of human beings and availability of oxygen and other possibilities for the dwelling of living organisms in the planet MARS. He underwent an experiment on production of oxygen in MARS and successfully finished his goal. But in course of time, the government of America left the research.

However Sridhar reversed the process of oxygen production. And he watched out the effects of the process when it reacts with natural gas. HURRAH! He wondered. Electricity was generated. At once he decided to produce electricity for multilevel usage, but he wanted more and more amount of money to attain this goal. He was in search of a man to invest large amount of money on behalf of his work. Finally, he found a man who is the founder of VENTURE CAPITAL by named Mr. John Doerr. Initially

John invested □ 10crores on behalf of Sridhar's technology. He hopes that Sridhar's technology will become more fruitful because the technology is more efficient and doesn't cause any hazardous to environment. Sridhar found a box of 12 feet height comprise more expensive platinum mixed with an alloy metal. This magic box costs as high as Everest. So it could be used only by the multinational concerns. But the machine is designed in such a way that it could be used both inside

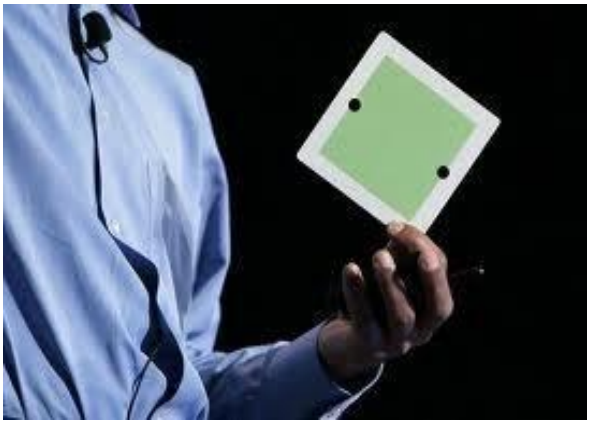
and outside of a building. About 20 Multinational concerns have been generating electricity using this technology.

And along with above companies, concerns such as FedEx, Stable have been invested lots of money on behalf of this technology. If this box costs  2lakhs over the world the technology becomes more success.

*What is a* bloom box*?*

A fuel cell present in the bloom box can generate electricity for a huge machine industry. Fuel cells are produced by the membranes and the ceramic current carrying protons. The energy of the bloom box is six times greater than the solar energy and doesn't pollute the environment. These deeds of the bloom box are the big pro.

The inventor cum chief executive officer of this technology Mr. Sridhar tells about the bloom energy as follows:



The bloom box comprises a plane disc made of saline sand and two types of ink. This disc is responsible for the electricity generation. The energy generated from this technology needs neither transformers nor conductors to store. Since it works with the help of 'wireless router' transmission lines become unnecessary. Combining with natural gas the oxygen produced in the box can generate electricity for the whole day. This box would be presenting in each and every place of the world in few years when it costs  1.8 lakhs. In India, one box could produce electricity for 6 houses.

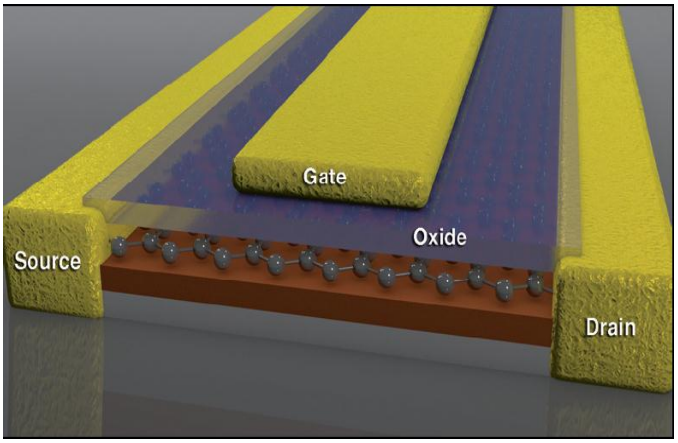
However within few years bloom box will become an inevitable one in every human's life.

# NANO-TECHNOLOGY FOR ELECTRONICS AND SENSORS APPLICATIONS

V. Karthick Kesavan (122306), II[nd] Year – A Section

## CARBON-BASED SENSORS AND ELECTRONICS

The semiconductor industry has been able to improve the performance of electronic systems for more than four decades by downscaling silicon-based devices but this approach will soon encounter its physical and technical limits. This fact, together with increasing requirements for performance, functionality, cost, and portability have been driven the microelectronics industry towards the nano world and the search for alternative materials to replace silicon. Carbon nanomaterials such as one-dimensional (1D) carbon nanotubes and two-dimensional (2D) graphene have emerged as promising options due to their superior electrical properties which allow for fabrication of faster and more power-efficient electronics. At the same time their high surface to volume ratio combined with their excellent mechanical properties has rendered them a robust and highly sensitive building block for nanosensors.



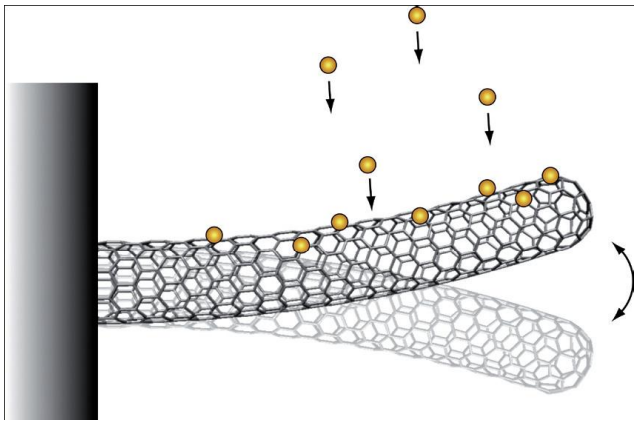

## GRAPHENE TRANSISTOR

In 2004, it was shown for the first time that a single sheet of carbon atoms packed in a honeycomb crystal lattice can be isolated from graphite and is stable at room temperature. The new nanomaterial, which is called graphene, allows electrons to move at an extraordinarily high speed. This property, together with its intrinsic nature of being one-atom-thick, can be exploited to fabricate field-effect transistors that are faster and smaller.

## CARBON NANOTUBE ELECTRONICS

When a layer of graphene is rolled into a tube, a single-walled carbon nanotube (SWNT) is formed. Consequently, SWNTs inherit the attractive electronic properties of graphene but their cylindrical structure makes them a more readily available option for forming the channel in field-effect transistors. Such transistors possess an electron mobility superior to their silicon-based counterpart and allow for larger current densities while dissipating the heat generated from their operation more efficiently. During the last decade, carbon nanotube-based devices have advanced beyond single transistors to include more complex systems such as logic gates and radio-frequency components.

## CARBON-BASED NANOSENSORS



In addition to the exceptional electrical properties of graphene and carbon nanotubes, their excellent thermal conductivity, high mechanical robustness, and very large surface to volume ratio make them superior materials for fabrication of electromechanical and electrochemical sensors with higher sensitivities, lower limits of detection, and faster response time. A good example is the carbon nanotube-based mass sensor that can detect changes in mass caused by a single gold atom adsorbing on its surface.

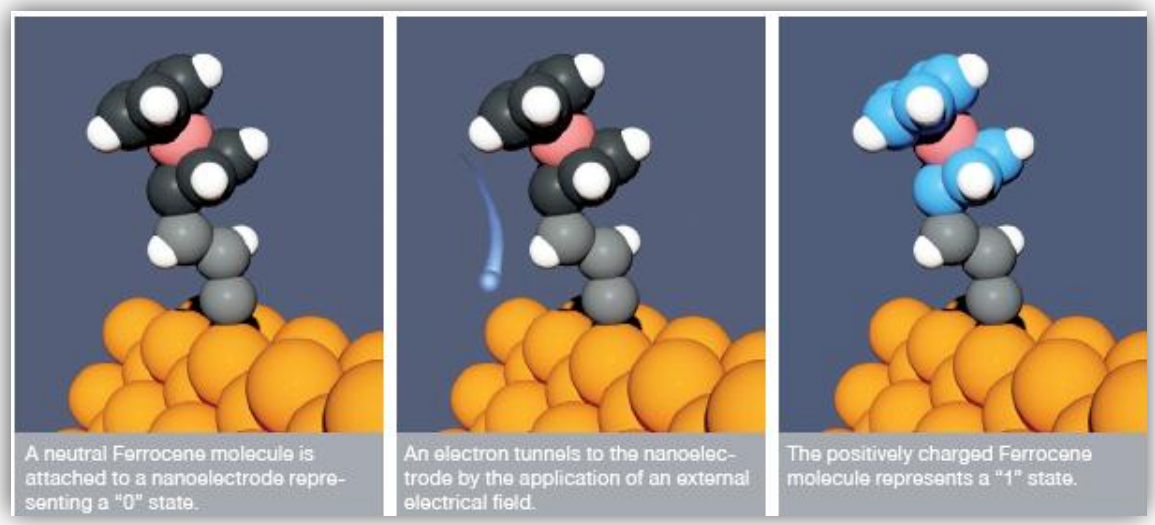
Any additional gold atom that adsorbs on the surface of a vibrating carbon nanotube would change its resonance frequency which is further detected

## MOLECULAR ELECTRONICS

Recent advances in nanofabrication techniques have provided the opportunity to use single molecules, or a tiny assembly of them, as the main building blocks of an electronic circuit. This, combined with the developed tools of molecular synthesis to engineer basic properties of molecules, has enabled the realisation of novel functionalities beyond the scope of traditional solid state devices.

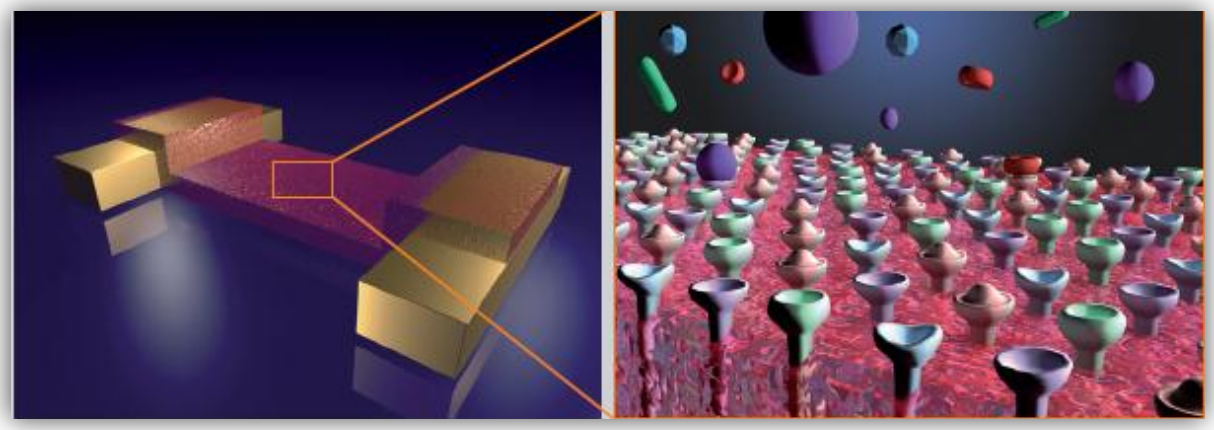
## SINGLE MOLECULE MEMORY DEVICE

A modern memory device, in its most common implementation, stores each bit of data by charging up a tiny capacitor. The continuous downscaling of electronic circuits, in this context, translates to storing less charge in a smaller capacitor. Ultimately, as memory device dimensions approach the nanometre range, the capacitor can be replaced by a single organic molecule such as Ferrocene, whose oxidation state can be altered by moving an electron into or out of the molecule.




**ORGANIC TRANSISTOR ODOUR SENSOR**

Organic field-effect transistors (OFETs) are a good example of the scope of traditional electronic devices being augmented by the chemical reactivity of an organic semiconductor material in their channel. In an odour sensor, for instance, the nano-scale chemical reactions upon exposure of the device to a certain atmospheric condition modify the electronic properties of the organic semiconducting material which is further reflected by a change in the current flowing through the transistor.

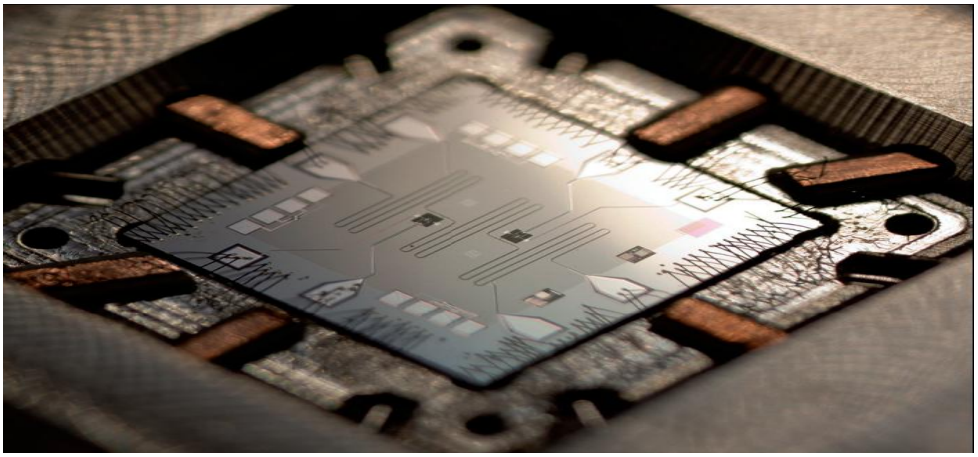


**Nanotechnology for Electronics and Sensors Applications**

**QUANTUM COMPUTING**

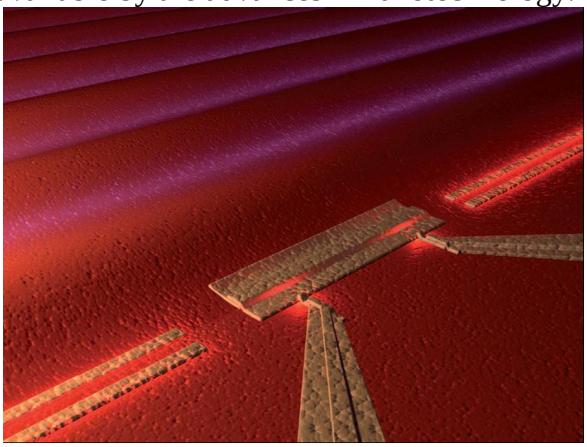
The excitement in the field of quantum computing was triggered in 1994 by Peter Shor who showed how a quantum algorithm could exponentially speed up a classical computation. Such algorithms are implemented in a device that makes direct use of quantum mechanical

phenomena such as entanglement and superposition. Since the physical laws that govern the behavior of a system at the atomic scale are inherently quantum mechanical in nature, nanotechnology has emerged as the most appropriate tool to realise quantum computers.



## SINGLE ELECTRON TRANSISTOR

In contrast to common transistors, where the switching action requires thousands of electrons, a single electron transistor needs only one electron to change from the insulating to the conducting state. Such transistors can potentially deliver very high device density and power efficiency with remarkable operational speed. In order to implement single electron transistors, extremely small metallic islands with sub-100 nm dimensions have to be fabricated. These islands, which are referred to as quantum dots, can be fabricated by employing processes made available by the advances in nanotechnology.



## SPINTRONICS

Similar to electrical charge, spin is another fundamental property of matter. While conventional electronic devices rely on the transport of electrical charge carriers, the emerging technology of spintronics employs the spin of electrons to encode and transfer information. Spintronics has the potential to deliver nanoscale memory and logic devices which process information faster, consume less power, and store more data in less space. The extension of the hard disk capacities to the gigabyte and the terabyte ranges was the main achievement of spintronics by taking advantage of Giant Magneto-Resistance (GMR) and Tunnel Magneto-Resistance (TMR) effects which are effective only at the nano scale.

**NANO-ELECTRO-MECHANICAL SYSTEMS (NEMS)**

All electronic tools have one thing in common: an integrated circuit (IC) acting as their "brain". The extent to which this "brain" has influenced our lives has already been tremendous but what if its decision-making capability is augmented by "eyes" and "arms"? Nano-electro-mechanical systems have evolved during the last 10 years to make this dream come true by creating sensors ("eyes") and actuators ("arms") at the same scale as the accompanying nanoelectronics. Recent developments in synthesis of nanomaterials with excellent electrical and mechanical properties have extended the boundaries of NEMS applications to include more advanced devices such as the non-volatile nano-electro-mechanical memory, where information is transferred and stored through a series of electrical and mechanical actions at the nanoscale

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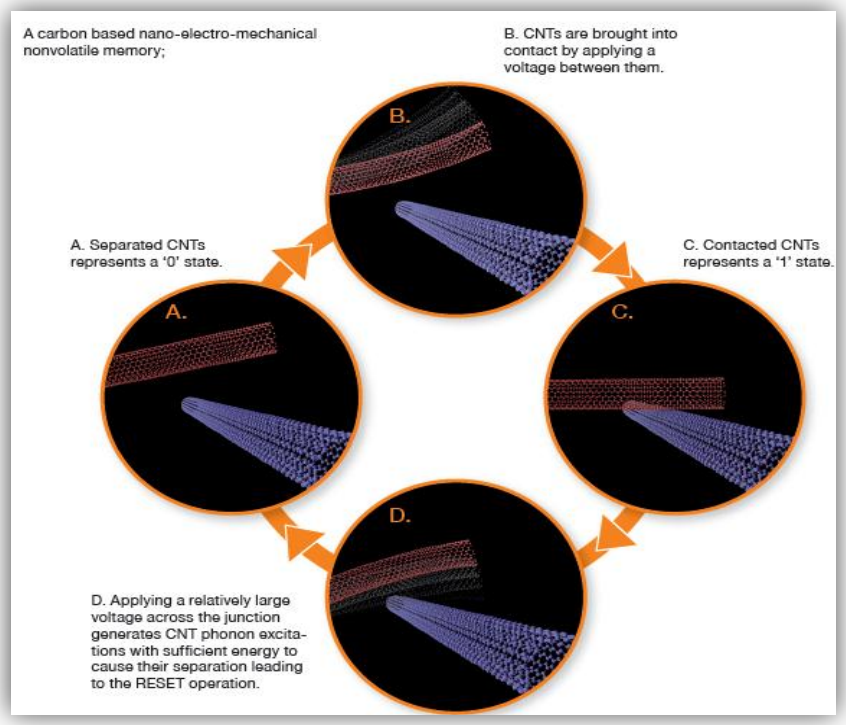



# MODERN TRENDS IN POWER TRANSMISSION SYSTEM

V. Karthick Kesavan (122306), II[nd] Year – A Section

**ABSTRACT**

The concept of six phase transmission lines was introduced by Barns & Barthold during 1972. Six phase power system is a part of multiphase power system. Due to harmonics effect and various other reasons Six phase systems and six phase machines are not popular but six phase transmission lines are more popular due to its increased power transfer capability by times, maintaining the same conductor configuration, rights of way, better efficiency, better voltage regulation, greater stability and greater reliability

High Phase Order (HPO) transmission is the use of more than the conventional three phases to transmit power over a given transmission corridor. Table I illustrates the increased power that can be potentially be transmitted if an existing double circuit line is converted to a 6-phase line.

This increase in power may be coupled with a decrease in electric and magnetic field strengths for certain configurations and reduction in radio and audible noise levels. For the HPO Demonstration Project, a 6-phase system was selected since it represents an optimum between the proportional increase in loading and the proportional

increase in surge impedance obtained by increasing the number of phases with the increase in power transfer capability.

In 1978 the U.S. Department of energy sponsored a project for the construction and testing of experimental 6 and 12 phase lines. As a part of this project, new high phase order tower, insulators and insulator spacer designs were developed. Test lines have successfully shown practical and simple constructions for 6-phase transmission and proved all advantages predicted before.

The 6-phase line was modelled as double circuit 138kV line that had been up rated to 138kV 6-phase to provide additional transmission capability. The construction of the tower is shown in the above figure. The figure below that represents the connection of two transformer banks consisting of six single phase transformers that are used for the three- to six-phase conversion.

## FEASIBILITY OF AN INTERCONNECTED 3-PHASE / 6-PHASE TRANSMISSION SYSTEMS

Basic feasibility of interconnected 3 phase / 6 phase transmission system has been reported for normal steady state operation, over voltages, insulation requirements, power flow etc., in several studies.

The studies reveal several interesting features of six phase transmission system and found to possess better characteristics than those of its 3-phase counter parts. The important findings of these studies are consolidated here for ready reference.

### (i) Power transfer capability:

Consider 3 practical cases as follows:

(A): 138 KV, 3 phase double circuit line configuration

(B): 230 KV, 3ph transmission line configuration

(C): 138 KV, 6 phase transmission line configuration

To convert the existing 3phase double circuit line to 6phase transmission line with little modification of the terminal equipment in the substations to provide 3phase / 6phase transformer etc., without changing the transmission towers, without additional rights of way etc,. Then power transferred is given by

Thus from the above equations (2) & (3) it is clear that 6 phase option not only includes less expenditure but also improves the power transfer capability to 1.732 times i.e., 73.2 % more power can be transferred. On the other hand 230KV, upgraded option not only involves more expenditure due to the change in tower design and increased conductor spacing's, but also improves the power transfer capability by 1.67 times only from eq. (2). Thus 6 phase line will have more power transfer capability at reduced cost.

### (ii) Surge impedance loading (SIL):

It is the power delivered by a transmission line to a purely resistance load equal in

value to the surge impedance (Zs) of the line.

**(iii) Thermal loading:**

Thermal loading follows a straight line relationship with phase order. Thus if thermal loading is the criterion for circuit rating, the capacity increase is proportional to number of phases. Thus 6 phase systems will have more thermal loading which is an advantage.

**(iv) Current unbalance:**

Six phase circuits & currents are better balanced (due to less angle i.e., 60o between any two phases) compared with the 3 phase circuits with the same conductor configuration. Sometimes transposition may be unnecessary [Transposition is normally done to reduce the unbalance between the voltages and currents independently].

**(v) Electric fields:**

The electric field which is maximum at the conductor surface decreases with phase order whereas the ground electric field will be more since line voltage is equal to the phase voltage for enhanced power. For the same power transfer since the line voltage can be reduced the electric field between the two conductors will be less.

**(vi) Radio & Audible noise:**

It is proved that 6 phase transmission system will have less radio & audible noise compared to the 3 phase double circuit line.

**(vii) Switching surges:**

The phase to ground switching surges are approximately same when 3 phase double circuit line is converted into 6 phase line for the same power transfer. But rate of rise of recovery voltage across the breaker terminals during normal opening is found to be less for 6 phase due to less line voltage for the same power transfer.

**(viii) Lightning performance:**

Owing to the reduced conductor spacing & reduced dimensions of 6 phase line the number of lightning strokes to the line are reduced by 20% when compared with the 3 phase counter parts for the same power transfer.

**(ix) Terminal Insulation Level:**

Terminal insulation level will be slightly higher for six phase systems for enhanced power supply.

**(x) Reliability aspect:**

6 phase line is said to have more reliability due to the following reasons.

1. More power demand can be met at the load point since power transfer capability is more in 6 phase systems.

2. Voltage regulation and efficiency are better due to less inductive reactance of the 6 phase line for the same power transfer.

3. It is proved that six phase line is more stable for both symmetrical & unsymmetrical faults.

**CONSTRUCTION OF A SIX-PHASE TRANSMISSION LINE:**

6-phase transmission lines can provide the same power capacity with a lower phase to phase voltage and smaller, more compact towers as compared to standard double circuit 3-phase line. The geometry of 6-phase compact towers may also aid in the reduction of magnetic fields.

Six-phase transmission is accomplished by installing transformers at either end of a double circuit transmission line which shifts one of the three-phase line. This results in a 6-phase line with each p apart. Also the phase t equals the phase to phase v

**Advantages:**

Operating in this ma following advantages

Ø For the same power fl phase to phase voltage i

times, allowing the towers to be built smaller and more compact.

Ø For the same phase to phase voltage the power flow capability could be increased by 73%.

Ø Magnetic fields can be reduced.

**Disadvantages:**

Ø Harmonics may occur

Ø No technical knowledge over the operation of six phase transmission system

**CONCLUSION:**

Six phase transmission technology provides a technique for reducing physical space requirements for transmission lines while for increasing power a new or existing lor. The cost for six-phase line versus a e same voltage level, is ticularly if physical n India, the 6-phase is not existing because l knowledge over the ase systems.

# OPTIMIZATION OF EMBEDDED SYSTEM

T.K.Boosun (122107) & S.Dharun Baskar (122007), II[nd] Year – A Section

**ABSTRACT:**

In recent years, embedded systems have become increasingly more complex. This complexity is tackled in software by abstracting the underlying hardware using an embedded real-time operating system (RTOS) and a suitable board support package (BSP). However, the RTOS imposes overheads on the CPU in return for the run-time support it provides. Modern embedded hardware often comprises multi-core processors, unified core processors, soft-core processors, dedicated hardware logic, or even a system-on-chip. Each of these hardware options can be used to reduce the CPU overhead of the RTOS and numerous methods have been proposed in literature. Due to the large number of optimization options available and the need to meet strict time-to-market pressures, RTOS optimization needs to be a largely autonomous process. In this paper, we present a framework for automated application-specific optimization of embedded real-time operating systems. We identify the components of such a framework and discuss our prototype of the framework

## INTRODUCTION

An **embedded system** is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. Embedded systems control many devices in common use today. Embedded systems contain processing cores that are either micro-controllers, or digital signal processors (DSP).A processor is an important unit in the embedded system hardware. It is the heart of the embedded system.

## PROCESSORS IN EMBEDDED SYSTEMS

Embedded processors can be broken into two broad categories. Ordinary micro-processors (μP) use separate integrated circuits for memory and peripherals. Microcontrollers (μC) have many more peripherals on chip, reducing power consumption, size and cost.

## FUTURE AUTOMATION SYSTEMS

In the world of automation the trend is towards more distributed intelligence, regardless of whether one is thinking about factory automation, substation automation or process automation. These embedded systems will all be networked to enable safe, secure, and highly optimized operation of the installations (quality and reliability of

the production, emissions, energy consumption, maintenance and service, fast production changes, etc).

An application where this trend is very prevalent is the substation automation systems of the future, so called Smart Grids. Smart Grid is a vision of the future evolution of the entire power network. It involves both transmission and distribution, and focuses on the integration of renewable and distributed generation, the reliability and efficiency of the grid. Furthermore, it includes the demand response and the potential of new technologies such as large scale integration of electric vehicles. Smart Grid includes both automation/IT and controllable power devices in the whole value chain from production to consumption.

## DOMAIN OF EMBEDDED SYSTEM IN POWER ELECTRONICS

DTMF appliances control system for rural and agricultural applications. Now-a-Days Automation is playing an important role in each and Every field such as Industrial, Home, Rural and Agricultural Areas. Usually we used to control the industrial equipment by manual operation, which increases the human effort and maintenance cost. In order to overcome this problem, the system is designed to control devices at remote place. To control the devices from remote place we are using a DTMF technique. DTMF (Dual Tone Multi Frequency) is used which converts the desired frequency in to analog signals which is received by DTMF Decoder and given to AT89S52 microcontroller. The micro-controller is used for switching the load equipment according to the frequency received by the DTMF receiver by using a combination of MOC (Opto-Coupler) 3021 and TRIAC (BT136) is used for Load driving. In case of any power failure conditions to store the data we are using EEPROM of 24C04. This project uses regulated 5V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

## RELIABILITY

Embedded systems often reside in machines that are expected to run continuously for years without errors and in some cases recover by themselves if an error occurs. Therefore the software is usually developed and tested more carefully than that for personal computers, and unreliable mechanical moving parts such as disk drives, switches or buttons are avoided.

Specific reliability issues may include:

- The system cannot safely be shut down for repair, or it is too inaccessible to repair.
- The system must be kept running for safety reasons. "Limp modes" are less tolerable. Often backups are selected by an operator

- The system will lose large amounts of money when shut down: Telephone switches, factory controls, bridge and elevator controls, funds transfer and market making, automated sales and service.

**CONCLUSION**

Transportation systems from flight to automobiles increasingly use embedded systems. New airplanes contain advanced avionics such as inertial guidance systems and GPS receivers that also have considerable safety requirements. A small fraction of embedded systems require safe, timely, reliable or efficient behavior unobtainable with any of the above architectures. In this case an organization builds a system to suit. In some cases, the system may be partitioned into a "mechanism controller" using special techniques, and a "display controller" with a conventional operating system.

# MODERN TRENDS IN NANO-MATERIALS

T.S. Kesava Prasad (122117), II[nd] Year – A Section

Nanotechnology is defined as the study and use of structures between 1 nanometer and 100 nanometer in size. To give you an idea of how small that is, it would take eight hundred 100 nanometer particles side by side to match the width of a human hair. Nano electronics refer to the use of nanotechnology on electronic components, especially transistors. Although the term nanotechnology is generally defined as utilizing technology less than 100nm in size, nano electronics often refer to transistor devices that are so small that inter-atomic interactions and quantum mechanical properties need to be studied extensively. In 1965, Gordon Moore observed that silicon transistors were undergoing a continual process of scaling downward, an observation which was later codified as Moore's law. Since his observation transistor minimum feature sizes have decreased from 10 micrometer to the 28-22 nm range in 2011. The field of nano-electronics aims to enable the continued realization of this law by using new methods and materials to build electronic devices with feature sizes on the nano scale.

Single electron transistors are the transistors which involve operation based on a single electron. Nano electrochemical systems also fall under this category. Nanofabrication can be used to construct ultra-dense parallel arrays of nanowires, as an alternative to synthesizing nanowires individually.

Besides being small and allowing more transistors to be packed into a single chip, uniform and symmetrical structure of nanotubes allows a higher electron mobility (faster electron movement in the material), a higher dielectric constant (faster frequency), and a symmetrical electron/hole characteristic.

Molecular electronics is a new technology which is still in its infancy, but also brings hope for truly atomic scale electronic systems in the future. One of the more promising applications of molecular electronics was proposed by the IBM researcher Ari Aviram and the theoretical chemist Mark Ratner in their 1974 and 1988 papers "*Molecules for Memory"* and *"Logic and Amplification".*

This is one of many possible ways in which a molecular level diode / transistor might be synthesized by organic chemistry. A model system was proposed with a Spiro carbon structure giving a molecular diode about a nanometer across which could be connected by polythiophene molecular

wires. Theoretical calculations showed the design to be sound in principle and there is still hope that such a system can be made to work. Single molecule devices are another possibility. These schemes would make heavy use of molecular self-assembly, designing the device components to construct a larger structure or even a complete system on their own. This can be very useful for reconfigurable computing, and may even completely replace present FPGA (Field Programmable Gate Array) technology. Nano photonics studies the behavior of light on the nano scale, and has the goal of developing devices that take advantage of this behavior.

Current high-technology production processes are based on traditional top down strategies, where nanotechnology has already been introduced silently. The critical length scale of integrated circuits is already at the nano scale (50 nm and below) regarding the gate length of transistors in CPUs or DRAM devices.

The production of displays with low energy consumption might be accomplished using carbon nanotubes (CNT). Carbon nanotubes are electrically conductive and due to their small diameter of several nanometers, they can be used as field emitters with extremely high efficiency for field emission displays (FED). The principle operation resembles that of the cathode ray tube, but on a much smaller length scale.

Research is ongoing to use nanowires and other nanostructured materials with the hope to create cheaper and more efficient solar cells. It is believed that the invention of more efficient solar energy would have a great effect on satisfying global energy needs. There is also research into energy production for devices that would operate in vivo, called bio-nano generators. A bio-nano generator is a nano scale electrochemical device, like a fuel cell or galvanic cell, but drawing power from blood glucose in a living body, much the same as how body generates energy from food. The average person's body could, theoretically generate 100 watts of electricity (about 2000 calories per day). The electricity generated by such a device could power devices embedded in the body such as pacemakers, or sugar-fed nano robots.

# LARGEST POWER STATIONS IN THE WORLD

J.Micheal Mathan (112907), IV$^{th}$ Year – A Section

| *Source* | *Station* | *Country* | *Capacity (MW)* |
|---|---|---|---|
| Coal | Taichung Power Plant | Taiwan | 5,780 |
| Fuel Oil | Surgut-2 Power Station | Russia | 5,597 |
| Natural Gas | Futtsu Power Station | Japan | 5,040 |
| Nuclear | Kashiwazaki-Kariwa Nuclear Power Plant | Japan | 8,212 |
| Oil Shale | Eesti Power Station | Estonia | 1,615 |
| Peat | Shatura Power Station | Russia | 1,020 |
| Bio-Fuel | Tilbury B Power Station | United Kingdom | 750 |
| Geo-Thermal | Hellisheidi Power Station | Iceland | 303 |
| Hydroelectric (Conventional) | Three Gorges Dam | China | 22,500 |
| Hydroelectric (Pumped-Storage) | Bath County Pumped Storage Station | United States | 3,003 |
| Hydroelectric (Run-Of-The-River) | Chief Joseph Dam | United States | 2,620 |
| Tide | Sihwa Lake Tidal Power Station | South Korea | 254 |
| Solar Power (Flat-Panel Photovoltaic) | Agua Caliente Solar Project | United States | 250 |
| Solar Power (Concentrated Photovoltaic) | Alamosa Solar Generating Project | United States | 37 |
| Solar Power (Concentrated Solar Thermal) | SEGS VIII, IX | United States | 160 |
| Wave | Aguçadoura Wave Farm | Portugal | 2.25 |
| Wind (Onshore) | Alta Wind Energy Center | United States | 1,020 |
| Wind (Offshore) | Greater Gabbard | United Kingdom | 504 |

# Electromagnetic Bomb

Naga Arjun.R (122313), II$^{nd}$ Year – A Section

The next Pearl Harbor will not announce itself with a searing flash of nuclear light or with the plaintive wails of those dying of Ebola or its genetically engineered twin. You will hear a sharp crack in the distance. By the time you mistakenly identify this sound as an innocent clap of thunder, the civilized world will have become unhinged.

Fluorescent lights and television sets will glow eerily bright, despite being turned off. The aroma of ozone mixed with smoldering plastic will seep from outlet covers as electric wires arc and telephone lines melt. Your Palm Pilot and MP3 player will feel warm to the touch, their batteries overloaded.

Your computer, and every bit of data on it, will be toast. And then you will notice that the world sounds different too. The background music of civilization, the whirl of internal-combustion engines, will have stopped. Save a few diesels, engines will never start again. You, however, will remain unharmed, as you find yourself thrust backward 200 years, to a time when electricity meant a lightning bolt fracturing the night sky.

Anyone who's been through a prolonged power outage knows that it's an extremely trying experience. Within an hour of losing electricity, you develop a healthy appreciation of all the electrical devices you rely on in life.

A couple hours later, you start pacing around your house. After a few days without lights, electric heat or TV, your stress level shoots through the roof. But in the grand scheme of things, that's nothing. If an outage hits an entire city, and there aren't adequate emergency resources, people may die from exposure, companies may suffer huge productivity losses and millions of dollars of food may spoil.

If a power outage hit on a much larger scale, it could shut down the electronic networks that keep governments and militaries running. We are utterly dependent on power, and when it's gone, things get very bad, very fast.

An electromagnetic bomb, or e-bomb, is a weapon designed to take advantage of this dependency. But instead of simply cutting off power in an area, an e-bomb would actually destroy most machines that use electricity.

The generators would be useless, cars wouldn't run, and there would be no chance of making a phone call. In a matter of seconds, a big enough e-bomb could thrust an entire city back 200 years or cripple a military unit. .

## Night Vision

The first thing you probably think of when you see the words night vision is a spy or

action movie you've seen, in which someone straps on a pair of night-vision goggles to find someone else in a dark building on a moonless night. And you may have wondered "Do those things really work? Can you actually see in the dark?"

The answer is most definitely yes. With the proper night-vision equipment, you can see a person standing over 200 yards (183 m) away on a moonless, cloudy night! Night vision can work in two very different ways, depending on the technology used.

**Image enhancement** - This works by collecting the tiny amounts of light, including the lower portion of the infrared light spectrum, that are present but may be imperceptible to our eyes, and amplifying it to the point that we can easily observe the image.

**Thermal imaging** - This technology operates by capturing the upper portion of the infrared light spectrum, which is emitted as heat by objects instead of simply reflected as light.

Hotter objects, such as warm bodies, emit more of this light than cooler objects like trees or buildings.

The Micro Channel Plates are applicable only to image enhancement type of night vision equipments.

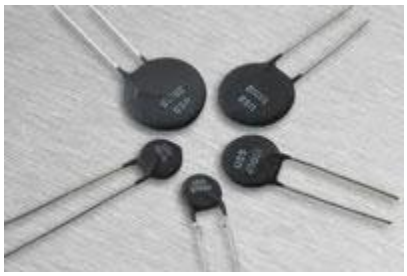
The original purpose of night vision was to locate enemy targets at night. Added advantages provided by the micro channel plate technology has helped in constructing night vision equipments with reduced size, weight and improved performance characteristics compared to conventional cascade tube based image intensifiers.

New generation image intensifier tubes have improved gains, and yet are one-tenth the size and one-third the cost of earlier tubes. The application of micro channel plates in night vision equipments will certainly help to improve the chances of safety and security provided to the user.

Reference: edufive.com

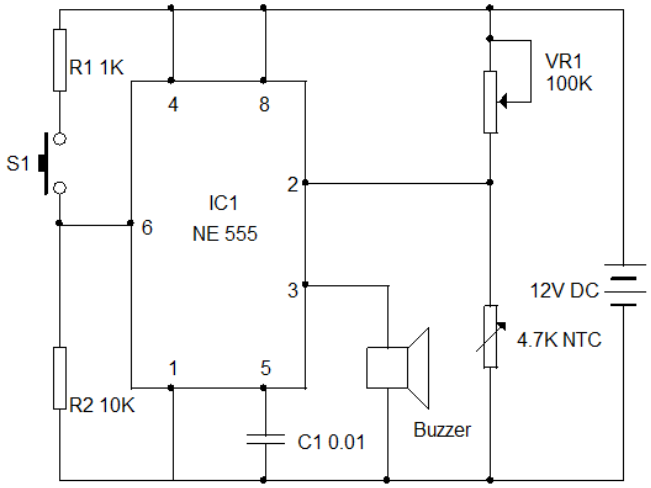
# SIMPLE HEAT SENSOR

Naga Arjun.R (122313), II$^{nd}$ Year – A Section



Make this simple heat sensor circuit to monitor the temperature in heat generating devices like Amplifier and Inverter. When the temperature in the device exceeds the allowable limit, the circuit warns through beeps. It is too simple and can be fixed in the device itself with the power tapped from it. The circuit works in 5 to 12 volts DC. The circuit is designed using the popular timer IC 555 in the Bistable mode. IC 555 has two comparators, a flip flop and an output stage. Its output becomes high when a negative pulse more than 1/3 Vcc is applied to its trigger pin 2. At this time, the lower comparator triggers and changes the state of the flip-flop and the output turns high. That is, if the voltage at pin 2 is less than 1/3 Vcc, output goes high and if it is higher than 1/3 Vcc, the output remains low.

Here an NTC (Negative Temperature Coefficient) Thermistor is used as the heat sensor. It is a kind of variable resistor and its resistance depends on the temperature around it. In NTC Thermistor, the resistance drops when the temperature in its vicinity increases. But in PTC (Positive Temperature Coefficient) Thermistor, the resistance increases when the temperature increases. In the circuit, the 4.7K NTC Thermistor is connected to pin2 of IC1. Variable resistor VR1 adjusts the sensitivity of the Thermistor at the particular temperature level. In order to reset the flip-flop and hence to change the output, the threshold pin 6 of IC1 is used. When a positive pulse is applied to pin 6 through the push switch, the upper comparator of IC1 becomes high and triggers the R input of the flip-flop. This resets and the output turns low.




When the temperature of the device is normal (as set by VR1), output of IC1 remains low because the trigger pin 2 is getting more than 1/3 Vcc. This keeps the output low and the buzzer remains silent. When the temperature in the device increases due to prolonged use or any short in the power supply, resistance of the Thermistor decreases taking the trigger pin less than 1/3 Vcc. The Bistable then triggers and its output goes high. This activates the buzzer and beeps will be generated. This state continues till the temperature decreases or IC resets by pressing S1.

**How to Set?**

Assemble the circuit on a common PCB and fix inside the device to be monitored. Connect the Thermistor (the Thermistor has no polarity) with the circuit using thin wires. Fix the Thermistor near the heat generating parts of the device like, transformer or heat sink. Power can be tapped from the power supply of the device. Power the circuit and switch on the device. Slowly adjust VR1 till the buzzer stops at normal temperature. The circuit will become active when the temperature inside the device rises.

# REGENERATIVE BRAKING SYSTEM

T.Pavithra (122008), II$^{nd}$ Year – B Section

## Introduction:

- Conventional braking systems convert kinetic energy into heat, usually via friction.
  - This wastes a great deal of energy!
- Regenerative braking systems reclaim and storing the kinetic energy in a reusable manner
- Many modern electric drive vehicles including electric locomotives and HEVs have regenerative braking systems.

### Regenerative Braking Principles in Electric Transportation:

- EVs use their drive motors to convert kinetic energy into electromagnetic energy
- Motors and generators operate under the same principle and can be used interchangeably.
- The First Law of Thermodynamics dictates that the EV will slow down as this occurs.
- The generated electrical energy can be dissipated through a resistive network (Dynamic Braking) or stored (Regenerative Braking)

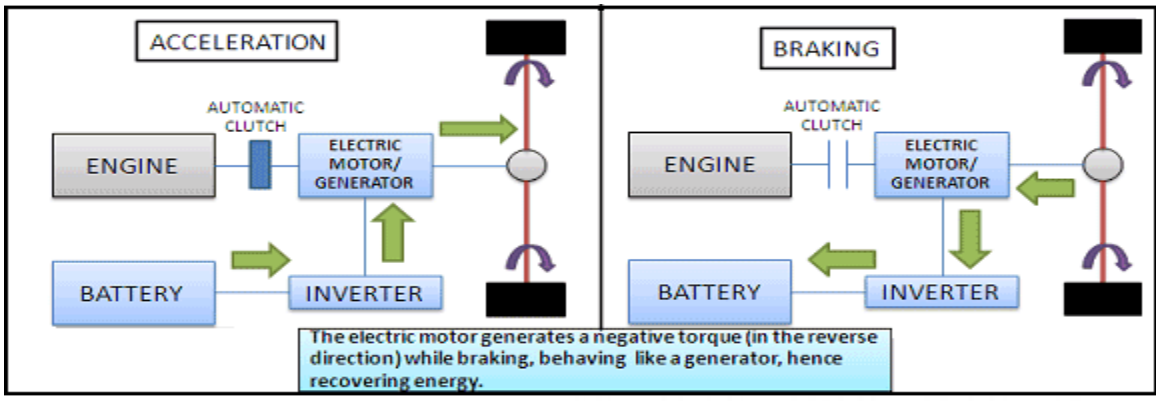
### How Regenerative Braking Works?

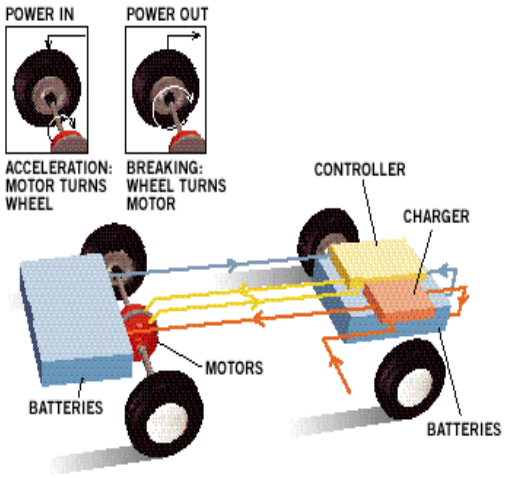
- Vehicle has forward momentum
- The wheels are coupled to the rotors of electric traction motors in an EV
  - Instead of a current being applied to the motor to turn the rotors, the rotors are turned by the wheels of the EV
- The rotors experience opposing torque as current is induced in the motor coils
- This opposing torque slows the vehicle and the generated electrical energy is stored in a Battery

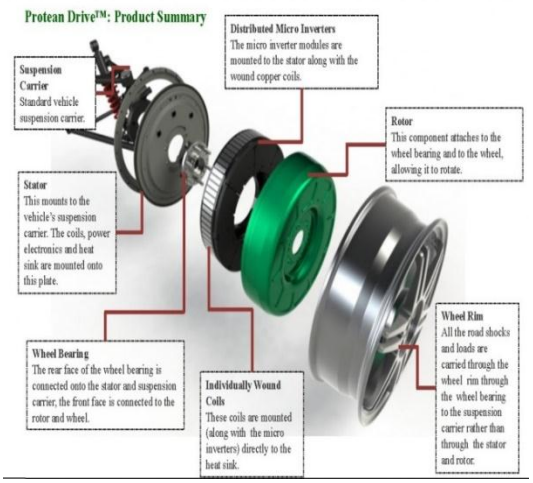
### Benefits of Regenerative Braking

- Increase of overall energy efficiency of a vehicle
  - Increases vehicle range
  - Cuts down on pollution related to electricity generation
- Increases the lifespan of friction braking systems
  - Less use of traditional mechanical brakes leads to less wear over time

**SYSTEM DIAGRAM**




## Options for storing the energy

- Recharging vehicle battery packs

  - State of charge influences how much of the generated current can be safely stored
  - Ubiquitous method for hybrid cars
- Charging an array of capacitors/super-capacitors


  - Pro: Very high charge/discharge rate (high power density)
  - Con: Much lower energy density than batteries
  - Allows for regenerative braking if batteries are at a high state of charge
  - Implemented on some buses
- Non-electrical methods
  - Fluid compression
  - Flywheels

# NANO-GENERATORS

R.Pooja Eswari (122006), II[nd] Year – B Section

## INTRODUCTION

Ever since the wide range applications of laptop computers and cell phones, seeking of power sources for driving portable electronics is becoming increasingly important. The current technology mainly relies on rechargeable batteries. But for the near future, micro/nano-systems will be widely used in health monitoring, infrastructure and environmental monitoring, internet of things and defense technologies; the traditional batteries may not meet or may not be the choice as power sources for the following reasons, like increasingly shrinkage in size, the size of the total micro/nano-systems could be largely dominated by the size of the battery rather than the devices.

## NANO-GENERATORS

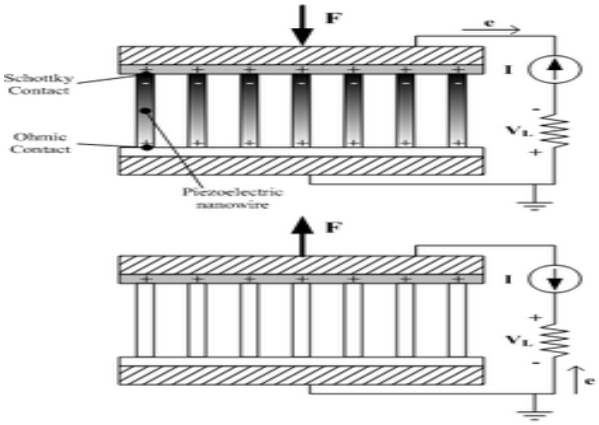
Nano generator is a technology for wireless devices and even required for implanted biomedical devices that they be self-powered without use of a battery. **Nanogenerator** is a technology that converts mechanical /thermal energy as produced by small-scale physical change into electricity. Nanogenerator has three typical approaches:

1. Piezoelectric
2. Turboelectric
3. Pyro electric nano generators

Both the piezoelectric and triboelectric nanogenerators can convert the mechanical energy into electricity.

## PIEZO-ELECTRIC NANO-GENERATOR

**Piezoelectric Nanogenerator** is an energy harvesting device converting the external kinetic energy into an electrical energy
The working principle of nanogenerator will be explained for 2 different cases:




### 1. FORCE PERPENDICULAR TO NANOWIRE

When a piezoelectric structure is subjected to the external force by the moving tip, the deformation occurs throughout the structure. The piezoelectric effect will create the electric field inside the nanostructure; the stretched part with the positive strain will exhibit the positive electrical potential, whereas the compressed part with the negative strain will show the negative electrical potential. As a result, the tip of the nanowire will have an electrical potential distribution on its surface, while the bottom

of the nanowire is neutralized since it is grounded.

## 2. FORCE PARALLEL TO NANOWIRE

When the force is applied toward the tip of the nanowire, the uniaxial compressive is generated in the nanowire. Due to the piezoelectric effect the tip of the nanowire will have a negative piezoelectric potential, increasing the Fermi level at the tip. Since the electrons will then flow from the tip to the bottom through the external circuit as a result, the positive electrical potential will be generated at the tip. The Schottky will barricade the electrons being transported through the interface, therefore maintaining the potential at the tip.

## TRIBOELECTRIC NANOGENERATOR

**Triboelectric nanogenerator** is an energy harvesting device that converts the external the ambient mechanical energy into electricity based on the nano-scale triboelectric effect. It is still in the early stage of the development for triboelectric nano-generators, the output voltage has been enhanced to hundreds of volts and it has been proven to be a simple, cost-effective, robust and efficient approach to scavenge mechanical energy.

## MECHANISM

The working mechanism of the triboelectric nano-generator can be described as the periodic change of the potential difference induced by the cycled separation and re-contact of the opposite triboelectric charges on the inner surfaces of the two sheets. When a mechanical agitation is applied onto the device to bend or press it, the inners surfaces of the two sheets will get into close contact and the charge transfer will begin, leaving one side of the surface with positive charges and the other with negative charges. This is just the triboelectric effect. When the deformation is released, the two surfaces with opposite charges will separate automatically, so that these opposite triboelectric charges will generate an electric field in between and thus induce a potential difference across the top and bottom electrodes. In order to screen this potential difference, the electrons will be driven to flow from one electrode to the other through the external load.

## PYROELECTRIC NANOGENERATOR

**Pyroelectric nanogenerator** is an energy harvesting device converting the external thermal energy the pyro electric effect has to be the choice, which is about the spontaneous polarization in certain anisotropic solids as a result of temperature fluctuation the first pyro electric nano-generator was introduced by Prof. Zhong Lin Wang at Georgia Institute of Technology in 2012. By harvesting the waste heat energy, this new type of nano-generator has the potential applications such as wireless sensors, temperature imaging, medical diagnostics, and personal electronics into an electrical energy by using nano-structured pyroelectric materials.

## Mechanism

The working principle of pyroelectric nano-generator will be explained for 2 different cases: the primary

pyroelectric effect and the secondary pyroelectric effect.

Primary pyro electric

If we apply a change in temperature in the nano-generator form room temperature to a higher temperature, the increase in temperature will result in that the electric dipoles oscillate within a larger degree of spread around their respective aligning axes. The total average spontaneous polarization is decreased due to the spread of the oscillation angles. The quantity of induced charges in the electrodes are thus reduced, resulting in a flow of electrons. If the nano-generator is cooled instead of heated, the spontaneous polarization will be enhanced since the electric dipoles oscillate within a smaller degree of spread angles due to the lower thermal activity. The total magnitude of the polarization is increased and the amount of induced charges in the electrodes are increased. The electrons will then flow in an opposite direction.

Secondary pyro electric

The secondary pyroelectric effect dominates the pyroelectric response in ZnO, CdS, and some other wurzite-type materials. The thermal deformation can induce a piezoelectric potential difference across the material, which can drive the electrons to flow in the external circuit. The output of the nano-generator is associated with the piezoelectric coefficient and the thermal deformation of the materials
.The output current I of the pyroelectric nano-generators can be determined by the equation of

$$I=p\,(dT/dt),$$

Where p is the pyroelectric coefficient, A is the effective area of the NG, dT/dt is the rate of change in temperature.

## CONCLUSION

It is essential to explore innovative nanotechnologies for converting mechanical energy (such as body movement, muscle stretching), vibrational energy (such as acoustic or ultrasonic waves), and hydraulic energy (such as body fluid flow) into electrical energy, which will be used to power nano devices without a battery. This is a key step towards self-powered nano systems.

# WIRELESS POWER TRANSMISSION FOR SOLAR POWER SATELLITE

B.D. Sakthi Mai (122003), II[nd] Year – B Section

**Abstract**

A great concern has been voiced in recent years over the extensive use of energy, the limited supply of resources, and the pollution of the environment from the use of present energy conversion systems. Electrical power accounts for much of the energy consumed. Much of this power is wasted during transmission from power plant generators to the consumer. The resistance of the wire used in the electrical grid distribution system causes a loss of 26-30% of the energy generated. This loss implies that our present system of electrical distribution is only 70-74% efficient.

Nikola Tesla is best known for his remarkable statements regarding the wireless transmission of electrical power. His first efforts towards this end started in 1891 and were intended to simply "disturb the electrical equilibrium in the nearby portions of the earth... to bring into operation in any way some instrument." In other words the object of his experiments was simply to produce effects locally and detect them at a distance.

## I. INTRODUCTION

It is known that electromagnetic energy is associated with the propagation of electromagnetic waves. Theoretically, we can use all electromagnetic waves for a wireless power transmission (WPT). The difference between the WPT and communication systems is only efficiency. Maxwell's Equations indicate that the electromagnetic field and its power diffuse to all directions. Though we transmit energy in a communication system, the transmitted energy is diffused to all directions. Though the received power is enough for a transmission of information, the efficiency from the transmitter to receiver is quiet low. Therefore, we do not call it the WPT system.

Typical WPT is a point-to-point power transmission. For the WPT, we had better concentrate power to receiver. It was proved that the power transmission efficiency can approach close to 100%. We can more concentrate the transmitted microwave power to the receiver aperture areas with taper method of the transmitting antenna power distribution. Famous power tapers of the transmitting antenna are Gaussian

taper, Taylor distribution, and Chepachet distribution. Such taper of the transmitting antenna is commonly used for suppression of side lobes. It corresponds to increase in the power transmission efficiency. Concerning the power transmission efficiency of the WPT, there are some good optical approaches in Russia.

Future suitable and largest application of the WPT via microwave is a Space Solar Power Satellite (SPS). The SPS is a gigantic satellite designed as an electric power plant orbiting the Geostationary Earth Orbit (GEO). It consists of mainly three segments; solar energy collector to convert the solar energy into DC (direct current) electricity, DC-to-microwave converter, and large antenna array to beam down the microwave power to the ground. The first solar collector can be either photovoltaic cells or solar thermal turbine. The second DC-to-microwave converter of the SPS can be either microwave tube system and/or semiconductor system. It may be their combination. The third segment is a gigantic antenna array.

Table 1.1 shows some typical parameters of the transmitting antenna of the SPS. An amplitude taper on the transmitting antenna is adopted in order to increase the beam collection efficiency and to decrease side lobe level in almost all SPS design. A typical amplitude taper is called 10 dB Gaussian in which the power density in the center of the transmitting antenna is ten times larger than that on the edge of the transmitting antenna.

The SPS is expected to be operational around 2030. Before realization of the SPS, we can consider other applications of WPT. In recent years, mobile devices advanced significantly and require decreasing power consumption. It means that we can use the diffused weak microwave power as power source of the mobile devices with low power consumption such as RF-ID. The RF-ID is radio IC-tug with wireless power transmission and wireless information. This is a new WPT application like broadcasting.

Table 1.1 Typical parameters of the transmitting antenna of the SPS [7]

| Model | Old JAXA model | JAXA1 model | JAXA2 Model | N |
|---|---|---|---|---|
| Frequency | 5.8 GHz | 5.8 GHz | 5.8 GHz | |
| Diameter of transmitting antenna | 2.6 kmϕ | 1 kmϕ | 1.93 kmϕ | |
| Amplitude taper | 10 dB Gaussian | 10 dB Gaussian | 10 dB Gaussian | 10 |
| Output power (beamed to earth) | 1.3 GW | 1.3 GW | 1.3 GW | |
| Maximum power density at center | 63 mW/ $cm^2$ | 420 mW/$cm^2$ | 114 mW/$cm^2$ | |
| Minimum power density at edge | 6.3 mW/ $cm^2$ | 42 mW/ $cm^2$ | 11.4 mW/$cm^2$ | 0 |
| Antenna spacing | 0.75 λ | 0.75 λ | 0.75 λ | |
| Power per one antenna (Number of elements) | Max. 0.95 W (3.54 billion) | Max. 6.1W (540 million) | Max. 1.7 W (1,950 million) | N ( |
| Rectenna Diameter | 2.0 kmϕ | 3.4 kmϕ | 2.45 kmϕ | |
| Maximum Power Density | 180 mW/$cm^2$ | 26 mW/$cm^2$ | 100 mW/cm2 | |
| Collection Efficiency | 96.5 % | 86 % | 87 % | |

JAXA : Japan Aerospace Exploration Agency, NASA : National Aeronautic Administration, DOE : U.S. Department Of Energy

## II. HISTORY OF WIRELESS POWER TRANSMISSION

In 1864, James C. Maxwell predicted the existence of radio waves by means of mathematical model. In 1884, John H. Poynting realized that the Poynting vector would play an important role in quantifying the electromagnetic energy. In 1888, bolstered by Maxwell's theory, Heinrich Hertz succeeded in showing experimental evidence of radio waves by his spark-gap radio transmitter. The prediction and evidence of the radio wave in the end of 19th century was start of the wireless power transmission.

During the same period of Marchese G. Marconi and Reginald Fessenden who are pioneers of communication via radio waves, Nicola Tesla suggested an idea of the wireless power transmission and carried out the first WPT experiment in 1899[1][2]. He said "This energy will be collected all over the globe preferably in small amounts, ranging from a fraction of one to a few horse-powers. One of its chief uses will be the illumination of isolated homes". He actually built a gigantic coil which was connected to a high mast of 200-ft with a 3 ft-diameter ball at its top. He fed 300 Kw power to the Tesla coil resonated at 150 kHz. The RF potential at the top sphere reached 100 MV.

Unfortunately, he failed because the transmitted power was diffused to all directions with 150 kHz radio waves whose wave length was 21 km.

To concentrate the transmitted power and to increase transmission efficiency, we have to use higher frequency than that used by Tesla. In 1930s, much progress in generating high-power microwaves, namely 1-10 GHz radio waves, was achieved by invention of the magnetron and the klystron. After World War II, high power and high efficiency microwave tubes were advanced by development of radar technology. We can concentrate a power to receiver with microwaves. We call the wireless power transmission with microwaves as microwave power

transmission (MPT). Based on the development of the microwave tubes during the World War II, W. C. Brown started the First MPT research and development in 1960.

First of all, he developed a retina, rectifying antenna which he named, for receiving and rectifying microwaves. The efficiency of the first rectenna developed in 1963 was 50 % at output 4WDC and 40% at output 7WDC, respectively.

With the rectenna, he succeeded in MPT experiments to wired helicopter in 1964 and to free-flied helicopter in1968 (Fig. 1). In 1970s; he tried to increase DC-RF-transmission-RF-DC total efficiency with 2.45 GHz microwave. In 1970, overall DC-DC total efficiency was only 26.5 % at 39WDC in Marshall Space Flight Center.

In parallel, he and his team succeeded in the largest MPT demonstration in 1975 at the Venus Site of JPL Goldstone Facility (fig 2). Distance between a transmitting parabolic antennas, whose diameter was 26m, and a rectenna array, whose size was 3.4 m x 7.2 m, was 1 mile.

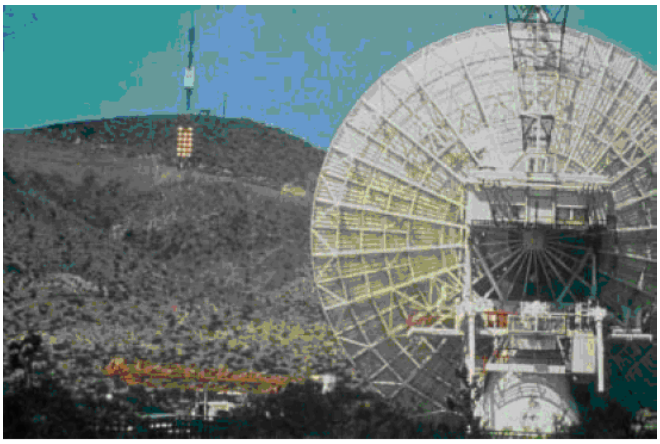


Fig.2 First Ground-to-Ground MPT Experiment in 1975 at the Venus Site of JPL Goldstone Facility

After 1990s, many MPT laboratory and field experiments were carried out in the world. We often use 2.45 GHz or 5.8 GHz of the ISM band (ISM=Industry, Science, and Medical) for the MPT system. A Canadian group demonstrated fuel-free airplane flight experiment with MPT in 1987 which was called SHARP (Stationary High Altitude Relay Platform) with 2.45 GHz.

Fig.3 Stationary High Altitude Relay Platform.

In Japan, there were many field MPT experiments such as fuel-free

airplane flight experiment with MPT phased array with 2.411 GHz in 1992, ground-to-ground MPT experiment with Power Company and universities in 1994-95.

Fig. 4. Ground-to-Ground MPT Experiment in Japan in 1994-95

## III. RECENT TRENDS

*Antennas for Microwave Power Transmission:* All antennas can be applied for both the MPT system and communication systems, for example, Yagi-Uda antenna, horn antenna, parabolic antenna, micro strip antenna, phased array antenna or any other type of antenna.

To fixed target of the MPT system, we usually select a large parabolic antenna, for example, in MPT demonstration in 1975 at the Venus Site of JPL Goldstone Facility and in ground-to-ground MPT experiment in 1994-95 in Japan. In the fuel-free airship light experiment with MPT in 1995 in Japan, they changed a direction of the parabolic antenna to chase the moving airship.

However, we have to use a phased array antenna for the MPT from/to moving transmitter/receiver which include the SPS because we have to control a microwave beam direction accurately and speedily. The phased array is a directive antenna which generates a beam form whose shape and direction by the relative phases and amplitudes of the waves at the individual antenna elements.

It is possible to steer the direction of the microwave beam. The antenna elements might be dipoles [1], slot antennas, or any other type of antenna, even parabolic antennas [2, 3]. In some MPT experiments in Japan, the phased array antenna was adopted to steer a direction of the microwave beam (Fig.5). All SPS is designed with the phased array antenna.

Fig.5. Phased Array used in Japanese Field

MPT experiment

**Recent Technologies for Transmitters:**

The technology employed for generation of microwave radiation is an

important subject for the MPT system. We need higher efficient generator/amplifier for the MPT system than that for the wireless communication system. For highly efficient beam collection on rectenna array, we need highly stabilized and accurate phase and amplitude of microwaves for phased array system for the MPT.

There are two types of microwave generators/amplifiers. One is a microwave tube and the other is semiconductor amplifier.

**Magnetron:** Magnetron is a crossed field tube in which electrons emitted from the cathode take cyclical path to the anode. The magnetron is self-oscillatory device in which the anode contains a resonant RF structure. The magnetron has long history from invention by A. W. Hull in 1921.

The practical and efficient magnetron tube attracted worldwide interest only after K. Okabe proposed divided anode-type magnetron in 1928. Magnetron technologies received a boost during the World War II, especially with the Japanese Army. The magnetrons were also useful for microwave ovens. As a result, the magnetron of 500 – 1,000 W is widely in use for microwave ovens in 2.45 GHz, and is a relatively inexpensive oscillator (below $5). There is a net global capacity of 45.5GW/year for all magnetrons used in microwave ovens whose production is 50– 55 millions. It was W. C. Brown who invented a voltage controlled oscillator with a cooker-type magnetron in PLL.

**Semiconductor Amplifier:** After 1980s, semiconductor devices became dominant in microwave world instead of the microwave tubes. This was driven by advances in mobile phone networks. The semiconductor device is expected to expand microwave applications, for example, phased array and active integrated antenna (AIA), because of its manageability and mass productivity. After 1990s, some MPT

Experiments were carried out in Japan with phased array of semiconductor amplifiers.

Typical semiconductor devices for microwave circuits are FET (Field Effect Transistor), HBT (Hetero junction Bipolar Transistor), and HEMT (High Electron Mobility Transistor). Present materials for the semiconductor devices are Si for lower frequency below a few GHz and GaAs for higher frequency. It is easy to control phase and amplitude through the microwave circuits with semiconductor devices, for example, amplifiers, phase shifters, modulators, and so on.

Currently, new materials are under development to enable semiconductor devices yield increased output power and efficiency.

**Transmitter Issues and Answers for Space Use:** Largest MPT application is a SPS in which over GW microwave will be transmitted from space to ground at distance of 36,000km. In the SPS, we will use microwave transmitters in space. For space use, the microwave transmitter will be required lightness to reduce launch cost and higher efficiency to reduce heat problem.

A weight of the microwave tube is lighter than that of the semiconductor amplifier when we compare the weight by power-weight ratio (kg/kW). The microwave tube can generate/amplify higher power microwave than that by the semiconductor amplifier. Kyoto University's groups have developed a light weight phase controlled magnetron called COMET, Compact Microwave Energy Transmitter with a power-weight ratio below 25g/W (fig.3.2.)

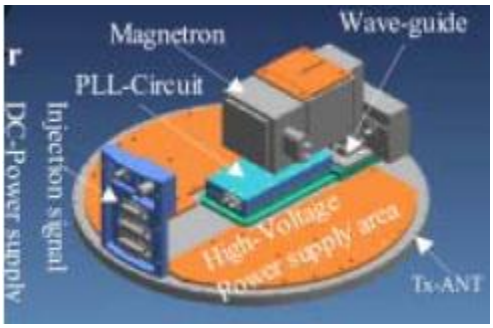



Fig. 6 Compact Microwave Energy Transmitter with the PCM (COMET)

The COMET includes DC/Converters, a control circuit of the phase controlled magnetron with 5.8 GHz, a heat radiation circuit, a wave guide, and an antenna [4]. The power-weight ratio of the COMET is lightest weight in all microwave generators and amplifiers. TWTA for satellite use has lighter power weight ratio: 220Wat 2.45GHz at 2.65 kg (the TWTA weighs 1.5kg, the power supply weighs 1.15kg). 130W at 5.8 GHz at 2.15 kg (the TWTA weighs 0.8kg, the power supply weighs 1.35kg). Hence, they can deliver12g/W and 16.5g/W, respectively. They do not include a heat radiation circuit, a wave guide, and an antenna.

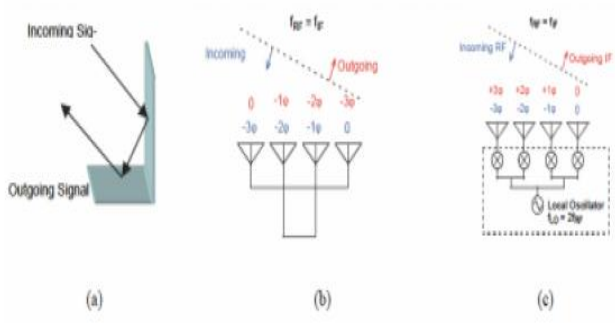
## IV. RECENT TECHNOLOGICAL TRENDS

*Retro directive Beam Control:* A microwave power transmission is suitable for a power transmission from/to moving transmitters/targets.

Therefore, accurate target detection and high efficient beam forming are important. Retro directive system is always used for SPS.

A corner reflector is most basic retro directive system. The corner reflectors consist of perpendicular metal sheets, which meet at an apex. Incoming signals are reflected back in the direction of arrival through multiple reflections off the wall of the reflector. Van Atta array is also a basic technique of the retro directive system. This array is made up of pairs of antennas spaced equidistant from the center of the array, and connected with equal length transmission lines. The signal received by an antenna is re-radiated by its pair, thus the order of re-radiating elements are inverted with respect to the center of the array, achieving the proper phasing for retro directivity.

Usual retro directive system have phase conjugate circuits in each receiving/transmitting antenna, which play same role as pairs of antennas spaced equidistant from the center of the array in Van Atta array. The signal is called a pilot signal. We do not need any phase shifters for beam forming. The retro-directive system is usually used for satellite communication, wireless LAN, military, and so on.




(a) two-sided corner reflector, (b) Van Atta Array, (c) retrodirective array with phase conjugate circuits.

*Environmental Issues:* One of the characteristics of the MPT is to use more intense microwave than that in wireless communication systems. Therefore, we have to consider MPT safety for humans.

*Interaction with Atmosphere:* In general, effect of atmosphere on microwaves is quite small. There are absorption and scatter by air, rain, and irregularity of air refraction ratio. In 2.45 GHz and 5.8 GHz, the absorption by water vapor and oxygen dominate the effect in the air. Especially, it is enough to consider only absorption by the oxygen in the microwave frequency. It is approximately 0.007 dB/km. In the SPS case, the amount of total absorption through the air from space is approximately 0.035 dB.

*Interaction with Space Plasmas:* When microwaves from SPS propagate through

ionosphere plasmas, some interaction between microwaves and the ionospheric plasmas occurs. It is well known that refraction, Faraday rotation, scintillation, and absorption occur between weak microwave used for satellite communication and the plasmas. However, influence on the MPT system is negligible. It is nonlinear interaction between intense microwave and the space plasmas that we have to investigate before the commercial SPS. We theoretically predict that the following may occur: heating of the plasmas, plasma hall effect, thermal self-focusing effect of the microwave beam, and three-wave interactions and excitation of electrostatic waves in MHz bands. These interactions don't not occur in existent satellite communication systems because microwave power is very weak.

## V. RECENT TRENDS: WIRELESS POWER TRANSMISSION-RECEIVERS AND RECTIFIERS

Point-to-point MPT system needs a large receiving area with a rectenna array because one rectenna element receives and creates only a few W. Especially for the SPS, we need a huge rectenna site and a power network connected to the existing power networks on the ground. On contrary, there are some MPT applications with one small rectenna element such as RF-ID.

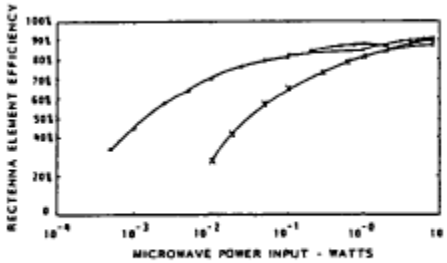
**Recent Technologies of Rectenna:** The word "rectenna" is composed of "rectifying circuit" and "antenna". The rectenna can receive and rectify a microwave power to DC. The rectenna is passive element with a rectifying diode, operated without any power source. The circuit, especially diode, mainly determines the RF-DC conversion efficiency. Silicon Schottky barrier diodes were usually used for earlier rectenna. New devices like SiC and GaN are expected to increase the efficiency. The rectenna with FET or HEMT appeared recently. The single shunt full-wave rectifier is always used for the rectenna. It consists of a diode inserted in the circuit in parallel, a $\lambda/4$ distributed line, and a capacitor inserted in parallel. In an ideal situation, 100% of the received microwave power should be converted into DC power.

**Recent Technologies of Rectenna Array:** The rectenna will be used as an array for high power MPT because one rectenna element rectifies a few W only. For usual phased array antenna, mutual coupling and phase distribution are problems to solve. For the rectenna array, problem is different from that of the array antenna because the rectenna array is connected not in microwave phase but in DC phase.

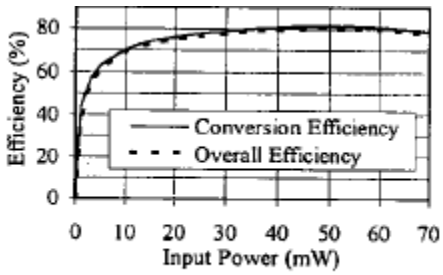
When we connect two rectenna in series or in parallel, they will not operate at their optimum power output and their combined power output will be less than that if operated independently. This is theoretical prediction.

## VI EFFICIENCY

We classify the MPT efficiency roughly into three stages; DC-RF conversion efficiency which includes losses caused by beam forming, beam collection efficiency which means ratio of all radiated power to collected power on a receiving antenna, and RF-DC conversion efficiency.




(a) Efficiency of 2.45GHz Rectenna[1]




(b) Efficiency of 5.8GHz Rectenna[2]

**RF-DC Conversion Efficiency:** The RF-DC conversion efficiency of the rectenna or the CWC is over 80 % of experimental results as shown. Decline of the efficiency is caused by array connection loss, change of optimum operation point of the rectenna array caused by change of connected load, trouble of the rectenna, and any losses on the systems, for example, DC/AC conversion, cables, etc. [6] However, it is easier to realize higher efficiency than that on the other two stages.

**Beam Collection Efficiency:** The beam collection efficiency depends on the transmitter and receiver aperture areas, the wavelength, and the separation distance between the two antennas.

## VII. CONCLUSION

Electrical energy can be economically transmitted without wires to any terrestrial distance. The economic transmission of power without wires is of crucial importance to man. It will enable him to dispense with innumerable causes of sinful waste. This technology opened up the possibility of constructing power stations on the moon. These power stations will be capable of transmitting power to earth using

microwave energy. Such microwave energy would then be converted into electricity using a vast array of rectenna receivers on the earth. Nevertheless with all the challenges that face wide-scale deployment of this new technology wireless power transmission for solar power satellite is still considered as a next-generation power transmission system.

# PAVEGEN SYSTEM

J.R.Thakshaayene (112048), III[rd] Year – C Section

**P**avegen Systems is a renewable energy organization who have developed an innovative paving technology that converts the **kinetic energy from human footfall** to **renewable ELECTRICITY**. It is a technology company that has developed paving slabs to convert energy from people's tube station. Pavegen have received significant media exposure their innovation and has been featured on the homepage of the CNN.com website. Power is generated when a footfall compresses the slab by approximately 5 mm (0.2 in). Pavegen uses what it calls a hybrid black box technology to convert the energy of a footstep into electricity, with a hybrid solution of mechanisms that include the **piezoelectric effect and induction**, which uses copper coils and magnets. The power thus generated can be **used to run low-voltage equipment such as streetlights and vending machines.** A typical tile is made of recycled polymer, with the top surface made from recycled truck tires. According to Pavegen, each step produces enough **power to light an LED-powered street lamp for 30 seconds.**

Pavegen was developed by Laurence Kemball-Cook who is the founder and CEO of the company. Laurence has done 3 TED talks, including at TED Active in Palm Springs, March 2012 and London, April 2012 and Rio de Janerio at the Rio+20 Climate summit on behalf of the United Nations. In April, 2013 a demonstration installation harvested energy from the runners in the Schneider **Paris Marathon 2013 - powered by Pavegen**

**PRINCIPLE:**

Every time someone walks over a Pavegen tile, renewable energy is harvested from the footstep. The technology converts the kinetic energy to electricity which can be stored and used for a variety of applications.

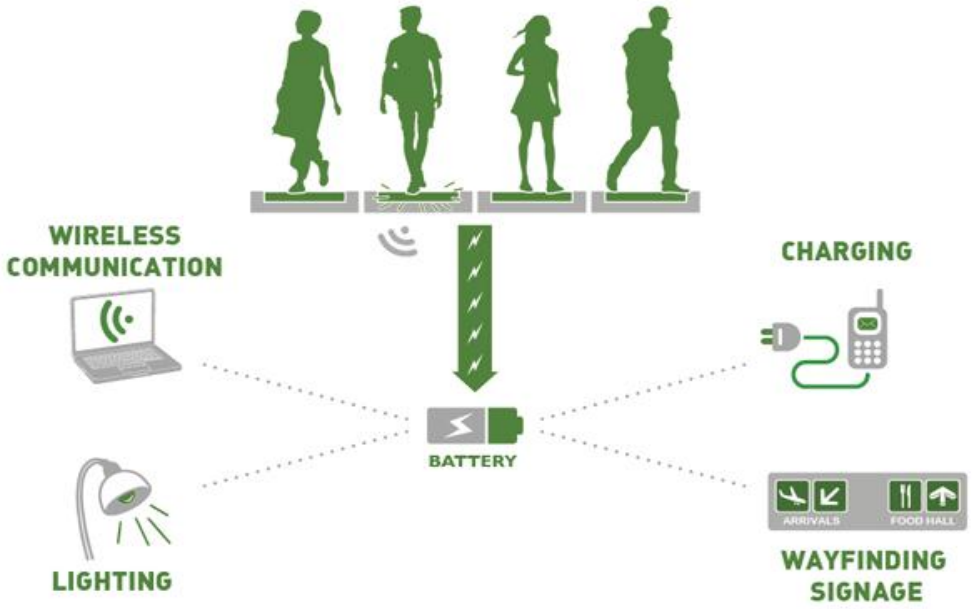
**Materials:**

The top surface of the flooring unit is made from 100% recycled rubber and the base of the slab is constructed from over 80% recycled materials. The system can be simply retrofitted in place of existing flooring systems as well as specified for new developments.

**Durability:**

The Pavegen tiles are designed to be used in the harsh outdoor locations with high footfall. The slabs are waterproof to allow them to operate

efficiently in both internal and external environments.

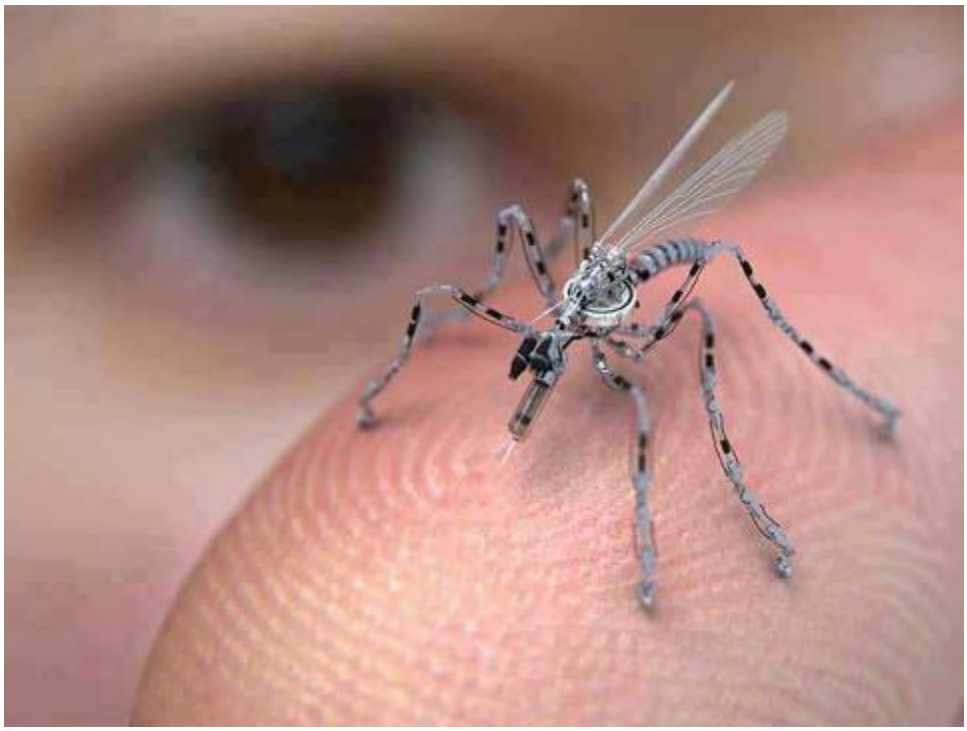



Pavegen works best in **urban settings** where conventional renewable solutions such as solar and wind power are frequently not suitable sources of energy generation.

# TINY ROBOT MOSQUITO

J.R.Thakshaayene (112048), III[rd] Year – C Section

It's an insect **spy drone** for urban areas, already in production, funded by the US Government. It can be **remotely controlled** and is equipped with a **camera** and a **microphone**. It can land on you, and it may have the potential to take a **DNA sample** or leave RFID tracking nanotechnology on our skin. It can fly through an open window, or it can attach to our clothing until you take it in our home. Given their propensity to request macro-sized drones for surveillance, one is left with little doubt that police and military may look into these gadgets next.



# CAREER EYE OPENERS

# INTERVIEW QUESTIONS ON ELECTRICAL ENGINEERING

R.Naveen Raj, II[nd] Year – B Section

Electrical interview question: What is electric traction?
Answer: Traction means using the electric power for traction system i.e. for railways, trams, trolleys etc. electric traction means use of the electricity for all these. Now a day, magnetic traction is also used for bullet trains. Basically dc motors are used for electric traction systems.

Electrical interview question: How can you start-up the 40w tube lite with 230v AC/DC without using any choke/Coil?
Answer: It's possible by means of Electronic choke. Otherwise it's not possible to ionize the particles in tube. Light, with normal voltage.

Electrical interview question: What is "P.U" in electrical engineering?
Answer: P.U stands for per unit and this will be used in power system single line diagram there it is like a huge electrical circuit with no of components (generators, transformers, loads) with different ratings (in MVA and KV). To bring all the ratings into common platform we use P.U concept in which, in general largest MVA and KV ratings of the component is considered as base values, then all other component ratings will get back into this basis. Those values are called as P.U values. (P.U = actual value/base value).

Electrical interview question: Operation carried out in Thermal power station?
Answer: The water is obtained in the boiler and the coal is burnt so that steam is obtained this steam is allowed to hit the turbine, the turbine which is coupled with the generator generates the electricity

Electrical interview question: Why link is provided in neutral of an AC circuit and fuse in phase of ac circuit?
Answer: Link is provided at a Neutral common point in the circuit from which various connection are taken for the individual control circuit and so it is given in a link form to withstand high Amps. In the case of Fuse in the Phase of AC circuit it is designed such that the fuse rating is calculated for the particular circuit (i.e. load) only. So if any malfunction happens the fuse in the particular control circuit alone will blow off.

Electrical interview question: what is the diff. between Electronic regulator and ordinary rheostat regulator for fans?
Answer: The difference between the electronic and ordinary regulator is that in electronic reg. power losses are less because as we decrease the speed the electronic reg. give the power needed for that particular speed but in case of ordinary rheostat type reg. the power wastage is same for every speed and no power is saved. In electronic regulator TRIAC is employed for speed control.by varying the firing angle speed is controlled but in rheostatic control resistance is decreased by steps to achieve speed control.

Electrical interview question: How tube light circuit is connected and how it works?
Answer: A choke is connected in one end of the tube light and a starter is in series with the circuit. When supply is provided, the starter will interrupt the supply cycle of AC. Due to the sudden change of supply the chock will generate around 1000volts. This volt will capable of to break the electrons inside the tube to make electron flow. Once the current passes through the tube the starter circuit will be out of part. Now there is no change of supply causes choke voltage normalized and act as minimize the current.

Electrical interview question: what is MARX CIRCUIT?
Answer: It is used with generators for charging a number of capacitor in parallel and discharging them in series. It is used when voltage required for testing is higher than the available.

Electrical interview question: What is encoder, how it function?
Answer: An encoder is a device used to change a signal (such as a bit-stream) or data into a code. The code may serve any of a number of purposes such as compressing information for transmission or storage, encrypting or adding redundancies to the input code, or translating from one code to another. This is usually done by means of a programmed algorithm, especially if any part is digital, while most analog encoding is done with analog circuitry.

Electrical interview question: What are the advantages of speed controlusing thyristor?
Answer: Advantages: 1. Fast Switching Characteristics than MOSFET, BJT, and IGBT 2. Low cost 3. Higher Accurate.

Electrical interview question: Why Human body feel Electric shock in an Electric train during running, we don't feel any Shock? Why?
Answer: Unfortunately our body is a pretty good conductor of electricity, The golden rule is Current takes the lowest resistant path if you have insulation to our feet as the circuit is not complete (wearing rubber footwear which doing some repairs is advisable as our footwear is a high resistance path not much current flows through our body).The electric train is well insulated from its electrical system.

# TOP MNCs IN INDIA

K.R SanthoshKumar (122103), II[nd] Year – B Section

The country has got many M.N.C.s operating here. Following are names of some of the most famous multinational companies, who have their headquarters of operational branches based in the nation

**IBM**: IBM India Private Limited, a part of IBM has been operating from this country since the year 1992. This global company is known for invention and integration of software, hardware as well as services, which assist forward thinking institutions, enterprises and people, who build a smart planet. The net income of this company post completion of the financial year end of 2010 was $14.8 billion with a net profit margin of 14.9 %. With innovative technology and solutions, this company is making a constant progress in India. Present in more than 200 cities, this company is making constant progress in global markets to maintain its leading position.

**Microsoft**: A subsidiary, named as Microsoft Corporation India Private Limited, of the U. S. (United States) based Microsoft Corporation, one of the software giants has got their headquarter in New Delhi. Starting its operation in the country from 1990, this company has got the following business units:

- Microsoft Corporation India (Pvt.) Limited (Marketing Division)
- Microsoft Global Services India
- Microsoft Global Technical Support Centre
- Microsoft India Development Center
- Microsoft IT
- Microsoft Research India

The net income of Microsoft Corporation grew from $ 14,569 million in 2009 to $ 18, 760 million in 2010. Working in close association with all the stakeholders including the Government of India, the company is committed towards the development of the Indian software as well as I.T (Information Technology) industry.

**Nokia Corporation**: Nokia Corporation was started in the year 1865. Being one of the leading mobile companies in India, their stylish product range includes the following:

- Normal mobile handsets
- Smartphones
- Touch screen phones
- Dual sim phones
- Business phone

The net sales of the company increased by 4 % in the last financial year with sales of EUR 42.4 billion as compared to 2009's EUR 41 billion. Over the past few years, this company in India has been acquiring companies, which have got new and interesting competencies and technologies so as to enhance their ability of creating the mobile world. Besides new developments to fight against mineral conflicts, they are even to set up Bridge Centers in the country for supporting re-employment. Their first onsite

for the installation of renewable power generation are already in place.

**PepsiCo**: PepsiCo. Inc. entered the Indian market with the name of PepsiCo India from the year 1989. Within a short time span of 20 years, this company has emerged as one of the fast growing as well as largest beverage and food manufacturer. As per the annual report of the company in the last business year, the net revenue of PepsiCo grew by 33 %. By the year 2020, this food manufacturing company intends to triple their portfolio of enjoyable and wholesome offerings. The expansion of their Good-For-You portfolio is believed to be assisting the company in attaining the competitive advantage of the growing packaged nutrition market in the world, which is presently valued at $ 500 billion.

**Ranbaxy Laboratories Limited**: Ranbaxy Laboratories Limited, one of the biggest pharmaceutical companies in India, started their business in the country from the year 1961. The company made its public appearance in 1973 though. Headquartered in this nation, this international, research based, integrated pharmaceutical company is the producer of a huge range of affordable cum quality medicines that are trusted by both patients and healthcare professionals all over the world. In the business year 2010, the registered global sales of the company was US $ 1, 868 Mn. Successful development of business forms the key component of their trading strategy. Apart from overseas acquisitions, this company is making a continuous endeavor to enter the new global markets, which have got high potential. For this, they are offering value adding products as well.

**Reebok International Limited**: This global brand is a famous name in the field of sports as well as lifestyle products. Reebok International Limited, a subsidiary of Adidas AG, is based in U. S. A. (United States of America) started its operation in 1890s. During the last financial year, Adidas's currency neutralized group sales increased by 9 %. Apart from their alliance with CrossFit that is among the largest contemporary fitness movements, in the current year, Reebok's announcement of its partnership with artist, designer and producer Swizz Beatz reflects its long term future growth.

**Sony**: Sony India is a part of the renowned brand name Sony Corporation, which started their business operation in the year 1946 in Japan. Established in India in November 1994, this company has captured one of the leading positions in the field of consumer electronics goods. By the end of the business year 2010 on 31st March, 2011, the company showed a remarkable increase in the share related to numerous categories. Sony India is planning to invest around INR. 150 crore for the marketing of the activities related to ATL and BTL. As far as Bravia TVs are concerned, they are looking forward to hold their market share of 30 %. In between the last and the current financial year, the number of their outlets in the

country increased by 1, 000.

**Tata Consultancy Services**: Commonly known as T. C. S., this multinational company is a famous name in the field of I. T. (Information Technology) services, Business Process Outsourcing (B. P. O.) as well as business solutions. This company is a subsidiary of the Tata Group. The first center for software researching was established in the country in 1981 in the city of Pune. Tata Consultancy earned a growth of 8.9 % during the latest quarter of this financial year, which ended on 30th September, 2011. This renowned company is presently looking forward to the 10 big deals that they have received besides the Credit Union Australia's contract as well as Government of Karnataka's INR. 94 crore deal for a total period of 6 years. In this current business year, they are about to employ 60, 000 people to meet their business requirement.

**Vodafone**: Vodafone Group Plc is an international telecommunication company, which has got it's headquarter based in London in the United Kingdom (U. K.). Earlier known as Vodafone Essar and Hutchison Essar, Vodafone India is among the largest operators of mobile networking in the country. The parent company Hutchison started its business in the year 1992 along with the Max Group, which was its business partner in India. Much later in 2011, Vodafone Group Plc decided to buy out mobile operating business of Essar Group, its partner. The turnover of the Vodafone Group Plc after the completion of the last financial year grew to £ 44, 472 m from £ 41, 017 m that was the turnover of the business year 2009.

**Tata Motors Limited**: The biggest automobile company in India, Tata Motors Limited, is among the leading commercial vehicles manufacturer in the country. They are one of the top 3 passenger vehicle manufacturers. Established in the year 1945, this company, a part of the famous Tata Group, has got its manufacturing units located in different parts of the nation. Some of their well-known products of the company are categorized in the following heads:

- Commercial Vehicles
- Defense Security Vehicles
- Homeland Security Vehicles
- Passenger Vehicle

# INSPIREEE

INSPIRATIONAL SCRITS, PERSONALITIES AND INNOVATIVE RESEARCHES

NEWS LETTER / EEE / VOLUME 2 : ISSUE 3 - MARCH 2014

K.L.N. COLLEGE OF ENGINEERING
(Approved by AICTE and Afflicated to Anna University)
An ISO 9001 : 2008 Certified Institution
Pottapalayam - 630 611, Sivagangai Dt., Tamilnadu.

# *INSPIREEE*

**IN**spirational **S**cripts, **P**ersonalities and **I**nnovative **R**esearches of **EEE**

## VISION :

To become a high standard of excellence in Education, Training and Research in the field of Electrical & Electronics Engineering and allied applications.

## MISSION :

To produce excellent, innovative and Nationalistic Engineers with Ethical Values and to advance the field of Electrical & Electronics Engineering and allied areas.


## K.L.N. College of Engineering

**Pottapalayam – 630 611, Sivagangai District, Tamil Nadu, India**

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## MESSAGE FROM THE HEAD OF THE DEPARTMENT

**Dr. S.M. Kannan, M.E., Ph.D., MIE, MISTE, MIEEE (USA)**
**HOD/EEE.**
**K.L.N.College of Enigneering.**

## MESSAGE

This issue has been contributed by second year students of B.E – EEE. Topics focusing on great people in the field of Engineering, recent inventions were presented well by the students. Lot of books on simple Electrical and Electronics projects are available in the market. Students should go through such books to familiarize them to know the gadgets and if two or three projects are combined, that may be considered as innovations, looking forward to do such projects in future.

Best wishes to all

(Dr. S.M. Kannan)

Head of the Department - EEE

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| S.DeepthiHashini [122012,II$^{Yr}$ - A] | Article Grammar and Spelling Check |
| S.R.Akshay Srinivas [122108,II$^{Yr}$ - A] | Poster Creation |
| R.Pooja Eswari [122005,II$^{Yr}$ - B] | Text Alignment checking |
| T.S.Kesava Prasad [122117,II$^{Yr}$ - B] | Text Alignment checking |

# SPARKERS OF ELECTRICAL ENGINEERING

# ALESSANDROGIUSEPPE VOLTA

## G.DAVID (122019) – II$^{Yr}$ A Sec

**Early life and works**

Volta was born in **Como**, a town in present-day northern **Italy** (near the Swiss border) on February 18, 1745. In 1774, he became a professor of physics at the Royal School in Como. A year later, he improved and popularized the electrophorus, a device that produced ***static electricity***. His promotion of it was so extensive that he is often credited with its invention, even though a machine operating on the same principle was described in 1762 by the Swedish experimenter *Johan Wilcke*.

In the years between 1776–78, Volta studied the*chemistry* of gases. He discovered***methane*** after reading a paper by *Benjamin Franklin* of *America* on "flammable air", and Volta searched for it carefully in Italy. In November, 1776, he found methane at *Lake Maggiore* and by 1778 he managed to isolate methane.He devised experiments such as the*ignition* of methane by an electric *spark* in a closed vessel. Volta also studied what we now call electrical *capacitance*, developing separate means to study both electrical potential ($V$) and charge ($Q$), and discovering that for a given object, they are proportional. This may be called Volta's Law of capacitance, and it was for this work the unit of electrical potential has been named the***volt***.

In 1779 he became a professor of experimental physics at the*University of Pavia*, a chair that he occupied for almost 40 years. In 1794, Volta married an aristocratic lady also from Como, Teresa *Peregrini*, with whom he raised three sons: Giovanni, *Flaminio and Zanino.*

**Volta and Galvani**

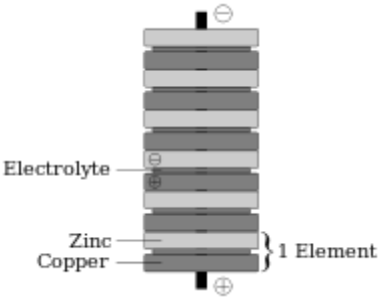
**Luigi Galvani** discovered something he named "animal electricity" when two different metals were connected in series with the frog's leg and to one another. Volta realized that the frog's leg served as both a conductor of electricity (what we would now call an electrolyte) and as a detector of electricity. He replaced the frog's leg with brine-soaked paper, and detected the flow of electricity by other means familiar to him from his previous studies. In this way he discovered the **electrochemical series,** and the law that **the electromotive force (emf)** of a galvanic cell, consisting of a pair of **metal electrodes** separated by electrolyte, is the difference between their two electrode potentials (thus, two identical electrodes and a common electrolyte give zero net emf). This may be called Volta's Law of the electrochemical series.

In 1800 as the result of a professional disagreement over the galvanic response advocated by Galvani, he invented thevoltaic pile, an early electric battery, which produced a steady electric current.Volta had determined that the most effective pair of dissimilar metals to produce electricity was zinc and silver. Initially he experimented with individual cells in series, each cell

being a wine goblet filled with brine into which the two dissimilar electrodes were dipped. The voltaic pile replaced the goblets with cardboard soaked in brine.

**First battery**

In announcing his discovery of his voltaic pile, Volta paid tribute to the influences of William Nicholson, Tiberius Cavallo, and Abraham Bennet




Voltaic pile

The battery made by Volta is credited as the first electrochemical cell. It consists of two electrodes: one made of zinc, the other of copper. The electrolyte is either sulfuric acid mixed with water or a form of saltwater brine. The electrolyte exists in the form $2H^+$ and $SO_4^{2-}$. The zinc, which is higher than both copper and hydrogen in the electrochemical series, reacts with the negatively charged sulfate ($SO_4^{2-}$). The positively charged hydrogen ions (protons) capture electrons from the copper, forming bubbles of hydrogen gas, $H_2$. This makes the zinc rod the negative electrode and the copper rod the positive electrode.

Thus, there are two terminals, and an electric current will flow if they are connected. The chemical reactions in this voltaic cell are as follows:

Zinc: $Zn \rightarrow Zn^{2+} + 2e^-$
Sulphuric acid

$$2H^+ + 2e^- \rightarrow H_2$$

The copper does not react, but rather it functions as an electrode for the electric current.However, this cell also has some disadvantages. It is unsafe to handle, since sulfuric acid, even if diluted, can be hazardous. Also, the power of the cell diminishes over time because the hydrogen gas is not released. Instead, it accumulates on the surface of the zinc electrode and forms a barrier between the metal and the electrolyte solution.

**Last years and retirement**

Volta explains the principle of the *"**electric column**"* to Napoleon

In honor of his work, Volta was made a count by Napoleon Bonaparte in 1801. Furthermore, his image was depicted upon the Italian 10,000 lira note (no longer in circulation, since the lira has been replaced by the euro) along with a sketch of his well-known voltaic pile.

Volta retired in 1819 to his estate in **Camnago,afrazione of Como, Italy**, now named "Camnago Volta" in his honor. He died there on March 5, 1827. Volta's remains were also buried in Camnago Volta.

Volta's legacy is celebrated by the**TempioVoltiano** memorial located in the public gardens by the lake. There is also a museum which has been built in his honor, and it exhibits some of the original equipment that Volta used to conduct experiments. Not far away stands the**Villa Olmo**, which houses the Voltian Foundation, an organization promoting scientific activities. Volta carried out his experimental studies and produced his first inventions near Como.

# ANDRE-MARIE AMPERE

## T.K.BOOSUN ( 122107 )

## II$^{Yr}$ A Sec

Andre-Marie Ampere was born on 20 January 1775 to Jean-Jacques Ampere, a prosperous businessman, and Jeanne Antoinette Desutieres-Sarcey Ampere during the height of the French Enlightenment. He spent his childhood and adolescence at the family property at Poleymieux-au-Mont-d'Or near Lyon.Jean-Jacques Ampere, a successful merchant, was an admirer of the philosophy of Jean-Jacques Rousseau, whose theories of education were the basis of Ampere's education. Rousseau believed that young boys should avoid formal schooling and pursue instead an "education direct from nature." Ampere's father actualized this ideal by allowing his son to educate himself within the walls of his well-stocked library. The SI unit of measurement of **electric current, the ampere**, is named after him.

**French Revolution**

In addition, Ampere used his access to the latest mathematical books to begin teaching himself advanced mathematics at **age 12**. In later life Ampere claimed that he knew as much about mathematics and science when he was eighteen as ever he knew; but, **a polymath**, his reading embraced history, travels, poetry, philosophy, and the natural sciences. His mother was a devout woman, so Ampere was also initiated into the Catholic faith along with Enlightenment science. The French Revolution (1789–99) that began during his youth was also influential: Ampere's father was called into public service by the new revolutionary government, becoming a justice of the peace in a small town near Lyon. When the Jacobin faction seized control of the Revolutionary government in 1792, his father Jean-Jacques Ampere resisted the new political tides, and he was guillotined on 24 November 1793, as part of the Jacobin purges of the period.

Ampere's maturation corresponded with the transition to the Napoleonic regime in France, and the young father and teacher found new opportunities for success within the technocratic structures favoured by the new French First Counsel. In 1802 Ampère was appointed a professor of physics and chemistry at the EcoleCentrale in Bourg-en-Bresse, leaving his ailing wife and infant son in Lyon. He used his time in Bourg to research mathematics, producing *Considerations sur la theoriemathematique de jeu* (1802; "Considerations on the Mathematical Theory of Games"), a treatise on mathematical probability that he sent to the Paris Academy of Sciences in 1803!

**Teaching career**

After the death of his wife in July 1803, Ampère moved to Paris, where he began a tutoring post at the new EcolePolytechnique in 1804. Despite his lack of formal qualifications, Ampere was appointed a professor of mathematics at the school in 1809. As well as holding positions at this school until 1828, in 1819 and 1820 Ampere offered courses in

philosophy and astronomy, respectively, at the University of Paris, and in 1824 he was elected to the prestigious chair in experimental physics at the College de France. In 1814 Ampere was invited to join the class of mathematicians in the new Institute Imperiale, the umbrella under which the reformed state Academy of Sciences would sit.

Ampere engaged in a diverse array of scientific inquiries during the years leading up to his election to the academy—writing papers and engaging in topics from mathematics and philosophy to chemistry and astronomy. Ampère claimed that "at eighteen years he found three culminating points in his life, his *First Communion*, the reading of Antoine Leonard Thomas's "Eulogy of Descartes", and the *Taking of the Bastille*. On the day of his wife's death he wrote two verses from the *Psalms*, and the prayer, 'O Lord, God of Mercy, unite me in Heaven with those whom you have permitted me to love on earth.'.

For a time he took into his family the young student *Antoine-Frederic Ozanam* (1813–1853), one of the founders of the Conference of Charity, later known as the Society of Saint Vincent de Paul. Through Ampère, Ozanam had contact with leaders of the neo-Catholic movement, such as *Francois-Rene de Chateaubriand, Jean-Baptiste Henri Lacordaire, and Charles Forbes Rene de Montalembert*. Ozanam*was beatified by Pope John Paul II* in 1998.

**Electromagnetism Field work**

In September 1820, Ampere's friend and eventual eulogist Francois Arago showed the members of the French Academy of Sciences the surprising discovery of Danish physicist **Hans Christian Orsted**that **a magnetic needle** is deflected by an adjacent**electric current.** Ampere began developing a mathematical and physical theory to understand the relationship between **electricity** and **magnetism**. Furthering Orsted's experimental work, Ampere showed that two parallel wires carrying electric currents attract or repel each other, depending on whether the currents flow in the same or opposite directions, respectively - this laid the foundation of electrodynamics. The most important of these was the principle that came to be called **Ampere's law**, which states that the mutual action of two lengths of current-carrying wire is proportional to their lengths and to the intensities of their currents. Ampere also applied this same principle to magnetism, showing the harmony between his law and French physicist **Charles Augustin de Coulomb'**s law of magnetic action. Ampere also provided a physical understanding of the electromagnetic relationship, theorizing the existence of an "electrodynamic molecule" (the forerunner of the idea of **the electron**) that served as the component element of both electricity and magnetism. Using this physical explanation of electromagnetic motion, Ampere developed a physical account of electromagnetic phenomena that was both empirically demonstrable and mathematically predictive. In 1827 Ampere was elected **a Foreign Member of the Royal Society** and in 1828, a foreign member of the**Royal Swedish Academy of Science**.In recognition of his contribution to the creation of modern electrical science, an international convention signed in 1881 established the **ampere** as a standard unit of electrical measurement. His name is one of the ***72 names inscribed on the Eiffel Tower.***

# HENRI BECQUEREL


## S. VALLIAMMAI (122009),

## N. E. VAISHNAVI (122120),

## II$^{Yr}$ – C Sec


Whenever we study or talk about radio activity, the name **Henri Becquerel** at once clicks to our minds. He was the discoverer of **radioactivity**, for which he also won the **1903 Nobel Prize in Physics**.

**EARLY LIFE:**

Antoine Henri Becquerel was born in **Paris on December 15, 1852**, a member of a distinguished family of scholars and scientists. His father, Alexander Edmond Becquerel, was a Professor of Applied Physics and had done research on solar radiation and on phosphorescence. He entered the Polytechnic in 1872 and ultimately became a professor in the same institute of the Applied Physics.

**CONTRIBUTIONS AND ACHIEVEMENTS**:

The early research of Becquerel was almost entirely in optics. His first extensive investigations dealt with the **rotation of plane-polarized light by magnetic fields**. He next turned to **infra-red spectra**, making visual observations by means of the light released from certain phosphorescent crystals under infra-red illumination. He then studied the **absorption of light** in crystals. With these researches, Becquerel obtained his **doctorate from the Faculty of Sciences of Paris in 1888** and election to the Academy of Sciences in 1889. Thus at the age of forty three, Becquerel was established in the rank and liability, his years of active research behind him and all that for which he is still now remembered. Talking of radioactivity Becquerel decided to investigate whether there was any connection between X-rays and naturally occurring phosphorescence. The glow of X-ray emission put Becquerel in mind of the light in his study although he had not done much active research in the last few years. He had inherited from his father a supply of uranium salts, which phosphoresce when exposed to light. When the salts were placed near to a photographic plate covered with opaque paper, the plate was discovered to be fogged. The phenomenon was found to be common to all the uranium salts studied and was concluded to be a property of the uranium atom. Finally Becquerel showed that the rays emitted by uranium caused gases to ionize and that they differed from X-rays in that they could be deflected by electric or magnetic fields.

In this way his spontaneous discovery of radioactivity took place as like most

physicists, he had a better understanding of the nature of matter that brought him closer to reaching this final philosophical goal. Nowadays it is generally considered that Becquerel discovered radioactivity by chance, but it is truer to say that he was looking for an effect so similar to radioactivity that he must have discovered it sooner or later, and he was so great a scientist that he quickly realized the importance of his evidence. It is also known that Becquerel discovered one type of radioactivity **beta particles** which is due to high-speed electrons leaving the nucleus of the atom. Becquerel also authored detailed studies of the physical properties of cobalt, nickel, and ozone, studied how crystals absorb light, and researched the **polarization of light**. He is the namesake of the **Becquerel, the basic unit of radioactivity** used in the **international system of radiation units**, referred to as **"SI" units**.

From handling radioactive stones he developed serious and recurring burns on his skin, which may have been a contributing factor in history. Besides being a **Nobel Laureate**, Becquerel was elected a member of the **Academe des Sciences de France** and succeeded **Berthelot as Life Secretary** of that body. He was a member also of the **AccademiadeiLincei** and of the Royal Academy of Berlin, amongst others. He was also made an **Officer of the Legion of Honour**. Becquerel published his findings in many papers, principally in the **Annales de Physique et de Chimie** and the **ComptesRendus de l'Academie des Sciences.**

**Death:**

The famous scientist died in **1908 in croissic in Brittany** and is still remembered up till now among the most famous physicists.

# V A SHIVA AYYADURAI

## M. A. ARUL FLAWRENCE (122904), III$^{Yr}$ – A Sec

**VA Shiva Ayyadurai**(born 2 December 1963 in Mumbai, India) is an Indian-American scientist, inventor and entrepreneur.

**Early life and education:**

VA Shiva Ayyadurai was born 2 December 1963 in Bombay, India. At the age of seven, he left with his family to live in the United States. At 14, he attended a special summer program at the Courant Institute of Mathematical Sciences of New York University (NYU) to study computer programming, and later went on to graduate from Livingston High School in Livingston, New Jersey. While attending high school, he also worked at the University of Medicine and Dentistry of New Jersey (UMDNJ) as a research fellow.[19] His undergraduate degree from MIT was in electrical engineering and computer science; he took a master's degree in visual studies

From the MIT Medical laboratory on scientific visualization; concurrently, he completed another master's degree in mechanical engineering, also from MIT; and in 2007, he obtained a Ph.D. in biological engineering from MIT in systems biology, with his thesis focusing on modeling the whole cell by integrating molecular pathway models. In 2008, he was awarded a Fulbright U.S. Student Program grant to study the integration of Siddha, India's oldest system of traditional medicine, with modern systems biology in India.

**Systems visualization:**

Systems visualization provides a viewer of systems visualization the ability to quickly understand the complexity of a system. Unlike other visualization approaches - such as data visualization,information visualization, flow visualization, scientific visualization and network visualization, which focus mainly on data representation - systems visualization seeks to provide new way to visualize complex systems of systems through an integrative approach.

The field of systems visualization quickly gained popularity due to its usefulness in visualizing and communicating complex systems in an understandable way. In fall of 2010, VA Shiva offered a new course at MIT that he called Systems Visualization. The Harvard Graduate School of Design recently established a similar course, Visualizing Systems, being taught by Andrea Hansen.Ayyadurai's earlier work in scientific visualization at the MIT Media Lab provided the basis of several aspects of systems visualization. In 1988, he created a flow visualization system for visualizing fluid ice bed reactors, along with GordanaVunjak-

Novakovic and Robert S. Langer.[34] In 1989, he was elected chair of the first Scientific Visualization Conference at the IEEE Engineering in Medicine and Biology Conference, held in Seattle, WA.

**Development of email:**

In 1979, as a 14-year-old high school student at Livingston High School in New Jersey, Ayyadurai began his work on an email system for the University of Medicine and Dentistry of New Jersey. Based on this work, Ayyadurai won a Westinghouse Science Talent Search award for high school seniors in 1981. In 1982, he copyrighted his software, called "EMAIL", as well as the program's user documentation. Two years later, he copyrighted "EMS", which included EMAIL and other programs.

Haigh argued that while EMAIL was impressive for a teenager's work, it contained no features that were not present on previous electronic mail systems and had no obvious influence on later systems. "The most striking thing about Ayyadurai's claim to have invented electronic mail is how late it comes. Somehow it took him thirty years to alert the world to [his] greatest achievement."Another computer historian, Marc Weber, a curator at the Computer History Museum, said that by 1978, "nearly all the features we're familiar with today had appeared on one system or another over the previous dozen years", including emoticons, mailing lists, flame wars, and spam. After the controversy unfolded, MIT disassociated itself from Ayyadurai's EMAIL Lab and funding was dropped. MIT also revoked Ayyadurai's contract to lecture at the bioengineering department. Ayyadurai did win a contract from the United States Postal Service to continue advising the organization on email management.

**United states postal service:**

VA Shiva Ayyadurai's research center, the International Center for Integrative Systems (ICIS), was hired by the USPS-OIG to do a detailed analysis on how email and other initiatives could produce new revenues for the USPS. In September 2012, VA Shiva Ayyadurai's International Center for Integrative Systems submitted a report to the USPS-OIG which projected that the USPS could potentially generate over $250 million per year through email servicing.

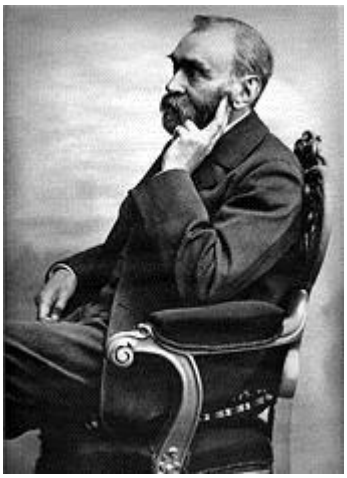
# The Nobel Prize

**S.R.AKSHAY SRINIVAS**
**(122108), II year – A section**

(Swedish pronunciation: [noˈbɛl], Swedish definite form, singular: *Nobelpriset*; Norwegian: *Nobelprisen*) is a set of annual international awards bestowed in a number of categories by Swedish and Norwegian committees in recognition of cultural and/or scientific advances. The will of the Swedish inventor Alfred Nobel established the prizes in 1895. The prizes in Physics, Chemistry, Physiology or Medicine, Literature, and Peace were first awarded in 1901. The related Nobel Memorial Prize in Economic Sciences was created in 1968. Between 1901 and 2012, the Nobel Prizes and the Prize in Economic Sciences were awarded 555 times to 856 people and organizations. With some receiving the Nobel Prize more than once, this makes a total of 835 individuals and 21 organizations.

The Royal Swedish Academy of Sciences awards the Nobel Prize in Physics, the Nobel Prize in Chemistry, and the Nobel Memorial Prize in Economic Sciences; the Nobel Assembly at Karolinska Institutet awards the Nobel Prize in Physiology or Medicine; the Swedish Academy grants the Nobel Prize in Literature; and the Nobel Peace Prize is awarded not by a Swedish organisation but by the Norwegian Nobel Committee.

(c. US$1.2 million, €0.93 million). The prize is not awarded posthumously; however, if a person is awarded a prize and dies before receiving it, the prize may still be presented. Though the average number of laureates per prize increased substantially during the 20th century, a prize may not be shared among more than three people.



Alfred Nobel had the unpleasant surprise of reading his own obituary, titled *The merchant of death is dead*, in a French newspaper. He was born on 21 October 1833 in , Sweden, into a family of engineers. He was a chemist, engineer, and inventor. In 1894, Nobel purchased the Bofors iron and steel mill, which he made into a major armamentsmanufacturer. Nobel also invented ballistite. This invention was a precursor to many smokeless military explosives, especially the British smokeless powder cordite. As a consequence of his patent claims of which dynamite is the most famous

Nobel wrote several wills during his lifetime. He composed the last over a year before he died, signing it at the Swedish–Norwegian Club in Paris on 27 November 1895 a series of prizes for those who confer the "greatest benefit on mankind" in physics, chemistry, peace, physiology or medicine, and literature.[1] Nobel bequeathed 94% of his total assets, 31 million SEK (c. US$186 million, €150 million in 2008), to establish the five Nobel Prizes. Because of scepticism

surrounding the will, it was not until 26 to take care of Nobel's fortune and organise the award of prizes.

According to the statutes, the Foundation consists of a board of five Swedish or Norwegian citizens, with its seat in Stockholm. An Executive Director is chosen from among the board members, a Deputy Director is appointed by the King in Council, and two deputies are appointed by the trustees. The Nobel Assembly at Karolinska Institute, the Swedish Academy, and the Norwegian Nobel Committee), the trustees of these institutions, and auditors.

# First prizes

Wilhelm Conrad Röntgen received the first Physics Prize for his discovery of X-rays.

Once the Nobel Foundation and its guidelines were in place, the Nobel Committees began collecting nominations for the inaugural prizes. Subsequently they sent a list of preliminary candidates to the prize-awarding institutions. Originally, the Norwegian Nobel Committee appointed prominent figures including Jørgen Løvland, Bjørnstjerne Bjørnson and Johannes Steen to give the Nobel Peace Prize credibility. The committee awarded the Peace Prize to two prominent figures in the growing peace movement around the end of the 19th century. These were Frédéric Passy, co-founder of the Inter-Parliamentary Union, and Henry Dunant the founder of the International Committee of the Red Cross.

The Nobel Committee's Physics Prize shortlist cited Wilhelm Conrad Röntgen's discovery of X-rays and Philipp Lenard's work on cathode rays. The Academy of Sciences selected Röntgen for the prize. In the last decades of the 19th century, many chemists had made significant contributions. Thus, with the Chemistry Prize, the Academy "was chiefly faced with merely deciding the order in which these scientists should be awarded the prize." The Academy received 20 nominations, eleven of them for Jacobus van't Hoff. Van't Hoff was awarded the prize for his contributions in chemical thermodynamics.

The Swedish Academy chose the poet Sully Prudhomme for the first Nobel Prize in Literature. A group including 42 Swedish writers, artists and literary critics protested against this decision, having expected Leo Tolstoy to be awarded. Some, including Burton Feldman, have criticised this prize because they consider Prudhomme a mediocre poet. During the 1890s, von Behring developed an antitoxin to treat diphtheria, which until then was causing thousands of deaths each year.

# INNOVATIVE INVENTIONS

# Rectiformer

## T.K.BOOSUN (122107), II Year – A Section

A Rectiformer is a rectifier and transformer designed and built as a single entity for converting alternating current into direct current. It is piece of power systems equipment rather than an electronics component. Rectiformers are used for supplying power to different field of ESP (electrostatic precipitator).

Rectiformers are also used to create dc supply for Hall process cells in the aluminium smelting industry. Rectiformers are commonly found in Electro winning operations, where a direct current is required to convert base metal ions such as copper to a metal at the cathode.

The passage of an electrical current through a purified copper sulfate solution produces cathode copper. Rectifier Transformers are combined with a diode or thyristor rectifier. The applications range from very large aluminiumelectrolyses to various medium-size operation.

It is a piece of power system equipment rather than an electronics component. The applications range from large aluminium electrolysis to various medium-size operations, such as electrowinning industry, chlor-alkali industry, aluminum industry, DC arc furnace industry, etc. A rectiformer may have a separate voltage regulation unit.

A Rectifier Transformer may have built-in or a separate voltage regulation unit. Due to a large variety of applications, they can have various designs up to a combination of voltage regulation. Rectifier transformers are used for industrial processes which require a significant direct current (DC) supply. Typical processes would include DC traction, electrolysis, smelting operations, large variable speed drive trains, etc.

Rectifier Transformers in double-stack configuration, phase-shifting, interphase reactors, transductors and filter-winding. Rectiformers may be designed to output dc voltages from 30V dc to over 120KV dc. They can weigh over 400 tons.

With different connection, rectifier transformers can be classified as below:

- Three-phase bridge commutation circuit,
- Cophase counter parallel three-phase bridge commutation circuit,
- Double backward star & balance reactor commutation circuit,
- Cophase counter parallel double backward star & balance reactor commutation circuit,

Ampcontrol's custom designed rectiformers, high power transformers and rectifiers built as a single entity, are built for the continuous high loads and occasional system faults associated with typical traction and smelting applications.

In electrolysis operations, rectiformers convert a steady but continuously high loading alternating current into direct current for use in the production process of

copper, zinc, magnesium, aluminium and nickel.

Rectifiers incorporate large capsule thyristors normally matched to ensure proper current sharing when connected in parallel mounted on a heat sink designed to allow easy access for maintenance. The heat sink provides suitable insulation between the anode and cathode connections.

High speed semiconductor protection fuses are provided in each parallel leg of each phase for isolating shorted thyristors. Visual indication can be incorporated via a monitoring device to indicate fuse rupture.

The operation of the rectiformer is controlled by the double redundant, microprocessor based Integrated Control Electronics Module (ICEM), which controls the firing of the thyristors. The self-monitoring capability of the module provides extensive diagnostics for detection, alarm and display of any fault.

The high secondary currents and LV bushing arrangements for large units, together with the secondary current harmonics in general are essential design requirements to manage.

**Rectiformer control system**

The rectiformer units can be controlled from the central control room via the SCADA (System Control and Data Acquisition) system or from the master controller.

From the master controller as well as the SCADA system it is possible to connect to the power plant via a fibre optic cable to link the power plant and smelter substation together for load control.

**Power Quality Control**

With each pot line requiring over 500MW, power quality is critical. Many different operational scenarios need to be accommodated to allow the smelter to operate without power quality restrictions. Power factor control and minimal harmonic current distortion are two of the many parameters to be addressed.

These power quality levels can only be met by an overall system approach. For example, ensuring a suitable transformer design and specifying tolerances so that the rectiformer and power quality equipment are a perfect fit.

A team of experts in transformer, rectifier and harmonic currents filtering technologies simulated the power grid at different operation points as well as the pot line operational behavior and then selected suitable parameters for the power quality system.

# A RESISTOR WITH MEMORY –MEMRISTOR


## K. CHANDRA ( 122026) , II Year – A section

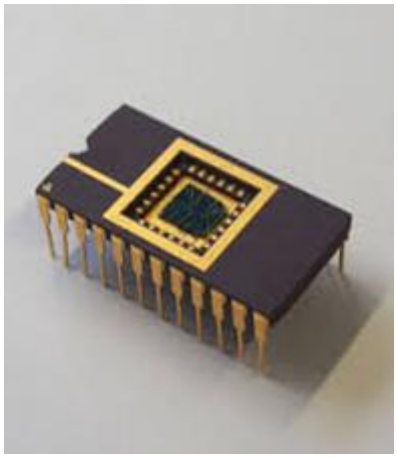

**INFO ABOUT MEMRISTOR :**

The memristor was the fourth fundamental circuit element, forming a non-linear relationship between electric charge and magnetic flux linkage. When current flows in one direction through a memristor, its electrical resistance increases; and when current flows in the opposite direction, resistance decreases.

When the current is stopped, the memristor retains the resistance that it had, and when the flow of charge resumes, the resistance level again does not change. In contrast to a linear (or nonlinear) resistor the memristor has a dynamic relationship between current and voltage including a memory of past voltages or currents.

**MEMRISTANCE:**

Memristor resistance depends on the integral of the input applied to the terminals (rather than on the instantaneous value of the input as in a varistor). Since the element "remembers" the amount of current that last passed through, it was tagged by Chua with the name "memristor".



Another way of describing a memristor is as any passive two-terminal circuit element that maintains a functional relationship between the time integralof current (called charge) and the time integral of voltage (often called flux, as it is related to magnetic flux). The slope of this function is called **memristance** *M* and is similar to variable resistance.

**SPECIAL CHARACTERISTICS**

Current flows through the memristor alters its electrical resistance .Retains that electrical resistance even after power is switched off. This is a perfect feature for non-volatile memory.

**STOCHASTIC CATOSTROPHE**

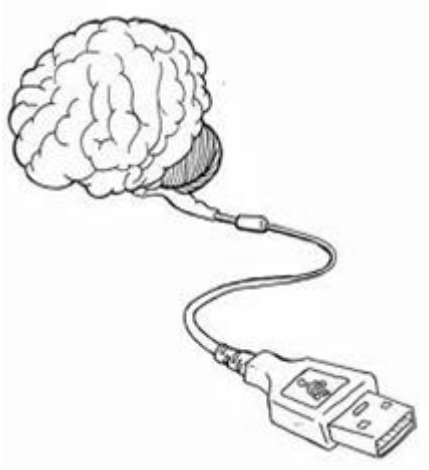
Nonvolatile information storage requires the existence of energy barriers that separate distinct memory states from each other. Memristors whose resistance states depend only on

the current or voltage history would be unable to protect their memory states against unavoidable fluctuations and thus permanently suffer information loss.

The proposed hypothetical concept provides no physical mechanism enabling such systems to retain memory states after the applied current or voltage stress is removed. Such elements can therefore not exist,

**ASSUMPTIONS:**

Other researchers noted that memristor models based on the assumption of linear ionic drift do not account for asymmetry between set time (high-to-low resistance switching) and reset time (low-to-high resistance switching) and do not provide ionic mobility values consistent with experimental data.



as they would always be susceptible to a so-called "stochastic catastrophe".

Non-linear ionic drift models have been proposed to compensate for this deficiency.

**APPLICATIONS :**

**Mimic brain neurons :**

Memristors can be used to make brain like circuits because they REMEMBER the amount of current

that has flowed through them. Memristor patents include applications in programmable logic, signal processing, neural networks, control systems, reconfigurable computing interfaces.

# WIRELESS ELECTRICAL POWER SYSTEM A NEW TECHNOLOGY


## G. DAVID (122019), II Year - A section



**ABSTRACT:**

Generally the power is transmitted through transmission networks. This article describes an original idea to eradicate the hazardous usage of electrical wires which involve lot of confusion in particularly organizing them.cellphones, household robots, mp3 players, laptop computers and other portable electronic devices capable of charging themselves without ever being plugged. This paper includes the techniques of transmitting power without using wires with an efficiency of about 95% with nonradioactive methods


**INTRODUCTION:**

Electrical energy is playing a vital part in development of society. The electrical energy is transmitted to customers via the three sections

(1) Generation

(2) Transmission

(3) Distribution System.

There is a mesh of grid of lines so fault occurring frequency is high. At resonance, so this setup could recharge all the devices in a room at once the unmanned planes or robots which are run by the wireless power over an area, as they could fly for months at

a time, could be used for research as well as a mini satellite.

**DIFFERENT METHODOLOGIES**

Various techniques are used for wireless transmission network. These techniques include resonating inductive coupling in sustainable moderate range. The coupling consists of an inductor along with a capacitor with its own resonating frequency. Electrical energy demand is

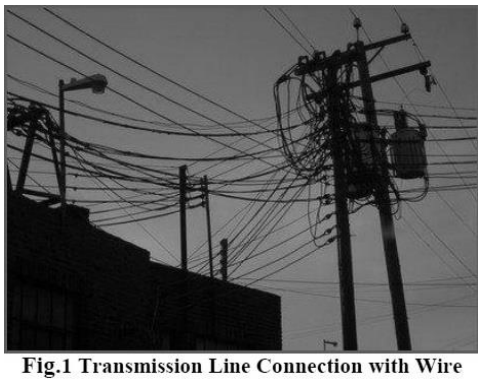
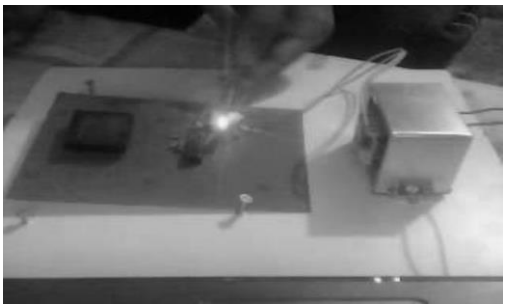


**Fig.1 Transmission Line Connection with Wire**

increasing rapidly today, everyone require a continuous power supply. In any system of coupled resonators there often exists a so-called "strongly coupled" regime of operation. This article as a whole gives an effective, high performance techniques which can efficiently transmit the power to the required area vary in given distances for the power transmission through induction.

**SHORT DISTANCE INDUCTION:**



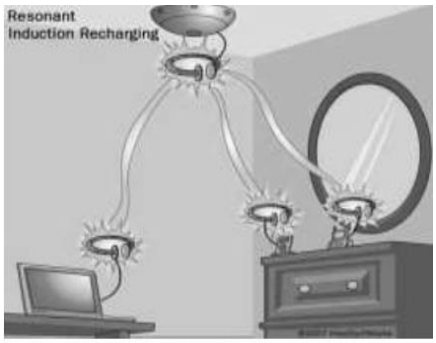
In this method power transfer can take place up to centimeters (15-20cm). The action of an electrical transformer is the simplest instance ofwireless energy transfer. The primary and secondary circuits of atransformer are electrically isolated from each other. The transfer

ofenergy takes place by electromagnetic coupling through a processknown as mutual induction. For example, the Splash power recharging mat and Edison Electric's Power desk both use coils to create a magnetic field. Electronic devices use corresponding built-in or plug-in receivers torecharge while resting on the mat.

**MODERATE DISTANCE INDUCTION:**

It can be used transfer power between the coils speared by a few meters (3-4m). A splash power mat uses induction to recharge multiple devices simultaneously. Since a magnetic field spreads in all directions, making a larger one would waste a lot of energy. An efficient way to transfer power between coils separated by a few meters is that it can be extended the distance between the coils by adding resonance to the equation. An object's physical structure -- like the size and shape of a trumpet -- determines the frequency at which it naturally vibrates. This is it's resonant frequency.

It's easy to get objects to vibrate at their resonant frequency and difficult to get them to vibrate at other frequencies .The theory uses a curved coil of wire as an inductor. A capacitance plate, which can hold a charge, attaches to each end of the coil. As electricity travels through this coil, the coil begins to resonate. Its resonant frequency is a product of the inductance of the coil and the capacitance of the plates According to the theory, one coil can recharge any device that is in range "Resonant inductive coupling" has key implications in solving the two main problems associated with non-resonant inductive coupling and electromagnetic radiation, one of which is caused by the other distance and efficiency.




Moderate Distance Wireless

Electromagnetic induction works based on the principle of a primary coil generating a predominantly magnetic field and a secondary coil being within that field so a current is induced within its coils. This causes the relatively short range due to the amount of power required to produce an electromagnetic field. But if two resonating coils with the same frequency get within a few meters of each other, streams of energy move from the transmitting coil to the receiving coil. According to the theory, one coil can even send electricity to several receiving coils, as long as they all resonate at the same frequency. The researchers have named this non-radioactive energy transfer since it involves stationary fields around the coils rather than fields that spread in all directions.

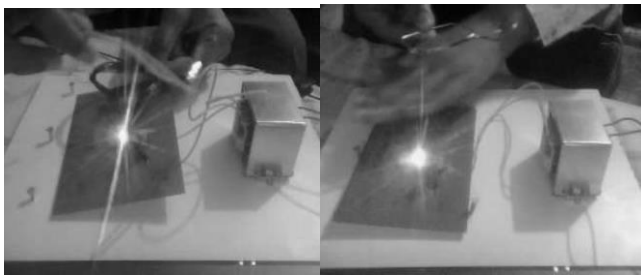
**LONG-DISTANCE INDUCTION:**

This method can be used to transfer electrical power in range of kilometers. Whether or not it incorporates resonance, induction generally sends power over relatively short distances. But some plans for wireless power involve moving electricity over a span of miles. A few proposals even involve sending power to the Earth from space. A large, disc-shaped rectifying antenna, or retina, just behind the plane's wings changed the microwave energy from the transmitter into direct-current (DC) electricity. Because of the microwaves' interaction with the rectenna, the system had a constant power supply as long as it was in range of a functioning

microwave array. Rectifying antenna is central to many wireless power transmission theories. They are usually made an array of dipole antenna, which have positive and negative poles. These antennas connect to short key diodes.

**TEST SYSTEM:**

It consists of using a transmission and receiving coils as the coupling antennas.



Although the coils do not have to be solenoid they must be in the form of closed loops to both transmit and receive power. To transmit power an alternating current must be passed through a closed loop coil.

Thealternating current will create a time varying magnetic field at 125KHz/6V/1.6A. The flux generated by the time varying Magnetic field will then induce a voltage on a receiving coil closed loop system (Up to3V, 100 mA). This seemingly simple system outlines the major principle that our research investigated. The primary benefits to using inductive coupling are the simplicity of the transmission and receiving antennas, additionally for small power transmission this is a much safer means of conveyance. In this system a receiving circuit to maximize the amount of received power and light an LED at a distance up to two feet. It was able to create both transmission and receiving circuits capable of transmitting the necessary power to light an LED in a pulsed mode. On average with transmitting one watt of power the receiving circuit was able to receive 100 micro-watts of power.

**EFFICIENCY**

In Research successfully demonstrated the ability to power a 60 watt light bulb from a power source that was seven feet (2 meters) away using resonating coils. This kind of setup could power or recharge all the devices in one room. Some modifications would be necessary to send power over long distances, like the length of a building or a city. A rectenna may be used to convert the microwave energy back into electricity. Rectenna conversion efficiencies exceeding 95%.

**CONCLUSION:**

In this article power transfer using wireless technique had been discussed. Moderate distance induction technique is presently in use. Emerging technology can be useful for long transmission system. In the long run, this can reduce our society's dependency on batteries. The test system have shown the practically feasibility of the system and shown the concept of wireless power transfer up to 6cm & 15cm.which increase the efficiency of system and reducing the cost.

# WIRELESS POWER TRANSMISSION REBELLION IN AUTOMOBILE


## S. DEEPTHIHASHINI (122012), IIYear – A Section

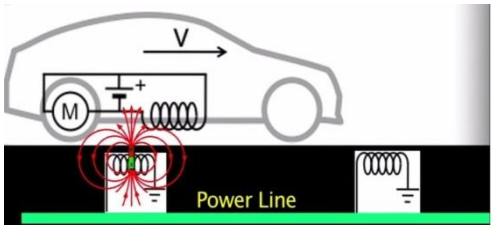

Inventions of every year use to begin from the world's largest Stanford University. Stanford researchers have designed a new technology that could lead to wireless charging of electric vehicles while they cruise down the highway. A crew which comprises a doctoral scholar Xiaofang Yu, Shanhui Fan, the managing director of Global climate and Energy Project (GCEP) Richard Sassoon, Sven Beiker, executive director of the Center for Automotive Research at Stanford (CARS) and Michael Lepech, an assistant professor of civil and environmental engineering worked on this project and succeeded.

An electric car gets less than 100 miles on a single charge, and the battery takes several hours to fully recharge. Since it was a tedious process, the crew wanted to find a better solution to overcome the above problem. They remind an old incident happened in 2007, some researchers at the Massachusetts Institute of Technology used magnetic resonance to light a 60-watt bulb. The experiment demonstrated that power could be transferred between two stationary coils about six feet apart, even when humans and other obstacles are placed in between.

Thus they used this kind of technology in charging an electric automobile. The research team has designed a high efficiency charging system that uses magnetic fields to wirelessly transmit large electric currents between metal coils placed several feet apart. The wireless power transfer is based on a technology called magnetic resonance coupling. The crew tuned two copper coils to resonate at same natural frequency. Then they placed the coils a few feet apart and connected one part of the wire to power supply which generates magnetic field and it correspondingly made the other coil to resonate. Thus they wondered that air became a medium to transfer electric energy from one coil to another and also it didn't cause any effects on human beings who stood between the two coils.

***How does it work practically?***

A series of coils connected to an electric current would be embedded in the highway. Receiving coils attached to the bottom of the car would resonate as the vehicle speeds along, creating magnetic fields that continuously transfer electricity to charge the battery. A coil bent at a 90-degree angle and attached to a metal plate




can transfer 10 kilowatts of electrical energy to an identical coil 6.5 feet away. Thus this fast is enough to maintain a constant speed. To actually charge the car battery would require arrays of coils embedded in the road. This has an efficiency of about 97%. The remaining 3 % is lost as heat and not as any other radiation.

# LET'S ALL OUR HEART BEAT CHARGES OUR NEXT G PHONE


## S. DEEPTHIHASHINI (122012), II year – A section


All mobile fonders are being in eager to see the next generation of mobile phones. But all those people think that charging power to mobile phone is an unwanted process. To satisfy them Scientists reveal implantable battery that can charge from the movement of our organs. A team of US and Chinese researchers has revealed the process and is shortlisted as follows:

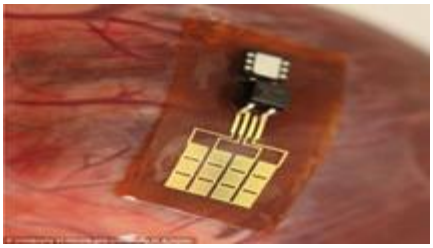
- A tint Implanted battery can already power a pacemaker.
- Could be implanted on constantly moving organs such as the heart, lungs or diaphragm.
- Transforms movement of the organ into energy.

***How does it performs?***

The small strip converts the constant movement of organs such as the heart, lungs and diaphragm into energy. The tiny piezoelectric power plants are comprised of lead zirconatetitanatenano ribbons, housed inbiocompatible plastic. There's also an integrated rectifier that converts the electric signal and a tiny rechargeable battery, all encased in the same plastic. To produce more power, multiple units could be placed on an organ, the team believe. The tiny piezoelectric power plants are comprised of lead zirconatetitanatenano ribbons, housed in biocompatible plastic. There's also an integrated rectifier that converts the electric signal and a tiny rechargeable battery, all encased in the same plastic.

It is hoped it could be used for medical implants initially. The strip has already been implanted in a cow, and it is hoped several could be used on each organ to create enough power to charge electronic devices. 'Heart rate monitors, pacemakers, cardioverter-defibrillators, and neural stimulators constitute broad classes of electronic implants that rely on battery power for operation,' the team wrote 'Means for harvesting power directly from natural processes of the body represent attractive alternatives for these and future types of biomedical devices.

'Here we demonstrate a complete, flexible, and integrated system that is capable of harvesting and storing energy from the natural contractile and relaxation motions of the heart, lung, and diaphragm at levels that meet requirements for practical applications.'



# BRAIN CELL SIZED BATTERIES

## R. PARAMESWARI (122022), II Year – B section

**Forget 9-volts, AAs, AAAs batteries:** The energy for tomorrow'sminiature electronic devices could come from tiny micro batteries about half the size of ahuman cell and built with viruses. MIT engineers have developed a way to atonce create and install such micro batteries — which could one day power a range of miniature devices, from labs-on-a-chip to implantable medical sensors — by stamping
them onto a variety of surfaces.

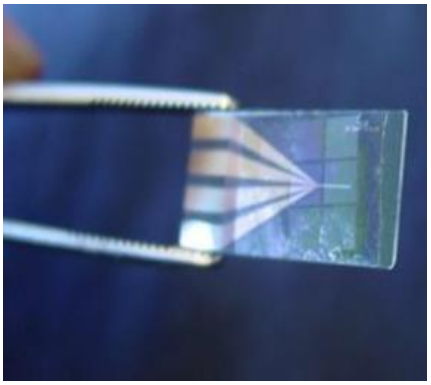
**TECHNIQUE:**

An array of micro battery electrodes, each only about four micrometers, or millions of a meter, in diameter. The team describes assembling and successfully testing two of the three key components of battery. A complete battery is on its way." ***This is the first instance in which micro contact printing has been used to fabricate and position micro battery electrodes and the first use of virus-based assembly in such a process,"*** wrote MIT professors Paula T. Hammond, Angela M..***Further, the technique itself "does not involve any expensive equipment, and is done at room temperature,"***
Batteries consist of two opposite electrodes an anode and cathode separated by an electrolyte. In the current work, the MIT team created both the anode and the electrolyte. First, on a clear, rubbery material the team used a common technique called soft lithography to create a pattern of tiny posts either four or eight millionths of a meter in diameter.

On top of these posts, they then deposited several layers of two polymers that together act as the solid electrolyte and battery separator. Next came viruses that preferentially self-assemble atop the polymer layers on the posts, ultimately forming the anode also they altered the virus's genes so it makes protein coats that collect molecules of cobalt oxide to form ultrathin wires — The final result: a stamp of tiny posts, each covered with layers of electrolyte and the cobalt oxide anode.

**CONCLUSION:**

The team concludes in their PNAS paper: ***the resulting electrode arrays exhibit full electrochemical functionality."*** Belcher said. ***"We're also interested in integrating [the batteries] with biological organisms."***



# HOLEY OPTO CHIP

**R. PARAMESWARI (122022) , II Year – B section**

## INTRODUCTION :

When people think about green energy, typically solar, electric vehicles, wind, bio fuels, and LED lighting come to mind; however, much of the world's energy is consumed from electronic devices and computers, and the industry has been researching new, faster, power-saving microchip technology that consumes dramatically less energy .

## DEFINITION:

Recently, IBM scientists announced the development of a prototype optical chipset, which was named "Holey Opto chip" and is the first parallel optical transceiver to transfer one terabit of information per second or the equivalent of downloading 500 high-definition movies and only consumes 5W of power. Thus, this initiative supports green computing as the Holey Opto chip achieves record speed at a power efficiency (the amount of power required to transmit one bit of information) that is one of the best. Besides the enormous power-savings benefit, the raw speed of one transceiver is incredible, in being equivalent to the bandwidth consumed by 100,000 users at the current high-end rate of 10 Mb/s high-speed internet access.

## PROCESS:

The optical microchip by IBM was fabricated with 48 laser-drilled holes through a standard silicon CMOS chip. These holes allow optical access through the back of the chip to 24 receiver and 24 transmitter channels to produce an ultra-compact, high-performing and power-efficient optical module capable of generating record-breaking data transfer rates. The Holey Opto chip module is constructed with components that are commercially available today; thus the chip technology is closer to production than more exotic competitive technologies by virtue of economies of scale. Furthermore, lower performance optical chips have already been implemented in supercomputers; thus establishing a track record of reliability.

## ADVANTAGES:

Optical networking has been demonstrated across the industry to significantly boost data transfer rates by speeding the flow of data using light pulses, as opposed to sending slower, electrons through wires. Moreover, current advances in commonly-used microchip technology for higher-speed applications rely on shrinking the size of critical transistor features.

# BIONIC EYE

## R. POOJAESWARI (122005), II Year B-Section

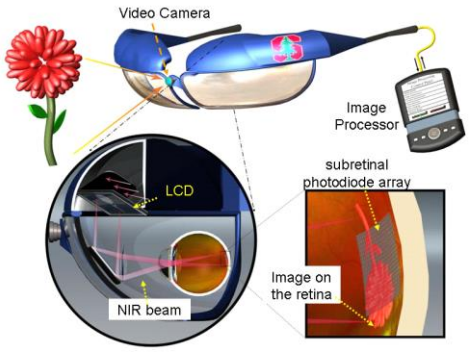
**Introduction :**

For those millions of us whose vision isn't perfect, but there lenses to correct. But for those hundreds of thousands who are blind, devices that merely assist the eyes just aren't enough. What they need are alternative routes by which the sights of the world can enter the brain and be interpreted. `Bionic eye' also called a Bio Electronic eye, is the electronic device that replaces functionality of a part or whole of the eye. It is still at a very early stage in its development, but if successful, it could restore vision to people who have lost sight during their lifetime. This technology can add life to their visionless eyes.Retina implant technology involves the use of microelectronics and microchip electrodes surgically implanted into the back of the eye (retina) to restore the function of the damaged light-activated cells found there.

**Required properties of components:**

All components of the retinal chip must be biocompatible and demonstrate long term stability for many years. This is a huge challenge, which has led the team to explore the use of new materials and combinations. The components that are in contact with the surrounding tissue must be in a sealed protective layer to protect the device from the corrosive environment of the body.

. **The Surgery :**The microsurgery starts with three incisions smaller than the diameter of a needle in the white part of the eye. Through the incisions, surgeons introduce a vacuuming device that removes the gel in the middle of the eye and replaces it with saline solution. Surgeons then make a pinpoint opening in the retina to inject fluid in order to lift a portion of the retina from the back of the eye, creating a pocket to accommodate the chip. The retina is resealed over the chip, and doctors inject air into the middle of the eye to force the retina back over the device and close the incisions. During the entire surgery, a biomedical engineer takes part actively to ensure that there is no problem with the chip to be implanted.




## IV. Working Procedure

A bionic eye works by stimulating nerves, which are activated by electrical impulses. In this case the patient has a small device implanted into the body that can receive radio signals and transmit those signals to nerves. The Argus II implant consists of an array of electrodes that are attached to the retina and used in conjunction with an external camera and video processing system to provide a rudimentary form of sight to

implanted subjects The Argus II Retinal Prosthesis System can provide sight, the detection of light, to people who have gone blind from degenerative eye diseases. Diseases damage the eyes' photoreceptors, the cells at the back of the retina that perceive light patterns and pass them on to the brain in the form of nerve impulses, where the impulse patterns are then interpreted as images. The Argus II system takes the place of these photoreceptors. The second incarnation of Second Sight's retinal prosthesis consists of five main parts: Digital Camera - built into a pair of glasses, captures images in real-time sends images to microchip. Video processing microchip - built into a handheld unit, processes images into electrical pulses representing patterns oflight and dark; sends pulses to radio transmitter in glasses Radio transmitter - wirelessly transmits pulses to receiver implanted above the ear or under the eye Radio receiver - receiver sends pulses to the retinal implant by a hair-thin, implanted wire Retinal implant - array of 60 electrodes on a chip measuring 1 mm by 1 mm The entire system runs on a battery pack that is housed with the video processing unit. When the camera captures an image-of, say, a tree-the image is in the form of light and dark pixels. It sends this image to the video processor, which converts the tree-shaped pattern of pixels into a series of electrical pulses that represent "light" and "dark." The processor sends these pulses to a radio transmitter on the glasses, which then transmits the pulses in radio form to a receiver implanted underneath the subject's skin. The receiver is directly connected via a wire to the electrode array implanted at the back of the eye, and it sends the pulses down the wire. The array acts as the artificial equivalent of the retina's photoreceptors. The electrodes are stimulated in accordance with the encoded pattern of light and dark that represents the tree, as the retina's photoreceptors would be if they were working (except that the pattern wouldn't be digitally encoded). The brain, in turn, interprets these signals as a tree, and tells the subject, "You're seeing a tree". All of this takes some training for subjects to actually see a tree. At first, they see mostly light and dark spots. But after a while, they learn to interpret what the brain is showing them, and eventually perceive that pattern of light and dark as a tree. Thus bionic eye helps a blind people to see the objects and recognize them.

**Implementation of bionic eye :**

Two British men who have been totally blind for many years have had part of their vision restored after surgery to fit pioneering eye implants.

**Conclusion**

Higher quality, better resolution, and even color are possible in the future. Restoration of sight for the blind is the bionic eye has changed the world of the visually challenged people .

# BLACK HORNET NANO


## J.R.THAKSHAAYENE (112048), III Year C- Section


The **Black Hornet Nano** is a military micro **unmanned aerial vehicle** (UAV) developed by **ProxDynamics** AS of Norway, and in use by the British Army.

The unit measures around 10 × 2.5 cm (4 × 1 in) and provides troops on the ground with local situational awareness. They are small enough to fit in one hand and weigh just over half an ounce (16 gm-including batteries). The UAV is equipped with a camera which gives the operator full-motion video and still images. They were developed as part of a £20 million contract for 160 units with **Marlborough Communications** Ltd.

**PURPOSE**:

To look around corners or over walls and other obstacles to **identify** any **hidden dangers** and **enemy positions**.

Now the British Army has **324** Hornet Nanos in service.

# DESTINATION OF SOUND IS ELECTRICITY


## S.DHARUNBASKAR (122007), M.GOKULNATH (122106),

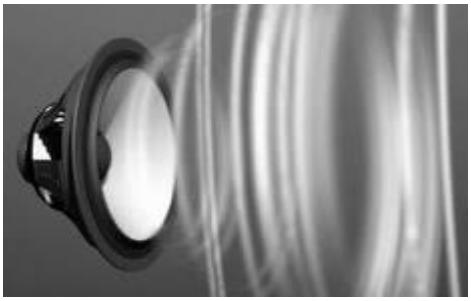
## II Year - A Section


We all know everywhere there is huge scarcity of energy and for running most of our appliances and to carry out daily work we need electricity. It's really very difficult to imagine our life without electricity, our life would really stop so there is high need, to produce electricity at faster rate and find some other feasible method to produce electric energy. On the other hand we see that in this modern world there is lot of noise pollution in roads, airports, industries....Just think if we would be able to convert this NOISE **POLLUTION TO ELECTRIC ENERGY....???**

Yes this could be made possible let's see how **Scientific explanation:-** sound is a mechanical form of energy which travel in the form of wave, mechanical wave that is an oscillation of pressure this pressure created by the\sound could be used to convert it into electric energy or other form of energy. Also according to law of thermodynamics mechanical energy could be converted into electricity. Piezo material converts mechanical strain into electric energy this property of piezo material could be used to make a device which would be able to sustainably convert the sound energy to electric energy as piezo material convert sound energy to electric energy. Transducer is also used to convert Mechanical energy to electric energy

**USAGE :**

It could be used in lightning the street lights by using the noise pollution made by vehicles, it could also be used in industries ,airports runways(as the sound pollution is to a great extent there, and the energy of sound here is very high so we will get pleasant output),also the electricity produce in nuclear power station could increase as the sound produce during nuclear fission also will be used to more electric energy...it doesn't get over here yet... suppose your mobile phone get discharge u could shout at it and then it will again get charged …for emergencies or it could also get charge in road by using sound pollution at road to produce electric energy...it doesn't ends over here...there are many applications of it. So it would not be wrong if in future we see sound energy as new source of power.



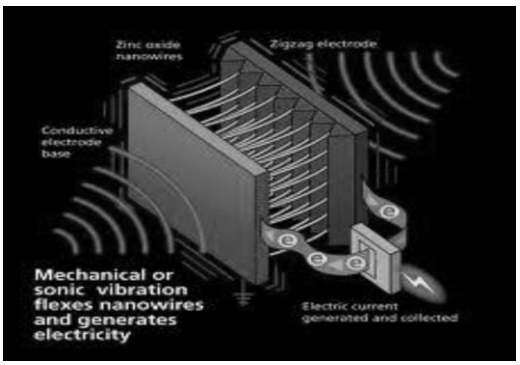
**IN FUTURE YOU CAN CHARGE YOUR MOBILE THROUGH CONVERSATON:**

Have you ever wondered that your mobile phones charged automatically. Well we have thought of that most of the time when we forget to get my phone charged. we are really excited about this new technology that may change the entire concept of electricity power. Scientists from Korea have predicted with a brand new technology that converts sound to electricity.

The scientists proved that reaction of calamine lotion right into some type of tiny material would create electrical from sound waves. The Discovery news and Yahoo has already reported the latest technology. The future development of this may lead to the creation of mobile phones that will be capable of charging the battery through the voice of the conversations. Another application of the technology that are suggested by the Scientists are that this can be used to generated electricity from the sound of the city traffic. This will be very helpful increasing a percentage of total power consumption of the world. The experiment was conducted using zinc oxide, the main ingredient in calamine lotion, Young Jun Park, Sang-Woo Kim and their colleagues created a discipline of nano wires sandwiched between two electrodes.

The researchers blasted that sandwich with sound waves, which at one hundred decibels weren't quite as loud as a rock concert. A normal conversation is about **60-70 decibels**. The sound waves produced a mild electrical present of about **50 millivolts**. The typical mobile phone requires a couple of volts to operate, a number of instances the facility this expertise can at the moment produce.

**IT'S SCOPE:**




If we will be able to convert sound energy to Electric energy efficiently it could help us to reduce the scarcity of electrical energy globally and help in the development of mankind and reduction of CO2 as electric energy is one of the cleanest energy. The noise pollution in the road would be able to convert into electric energy and lights the street lightning, signals and various other electrical appliances. The noise pollution in runway could be used to produce electricity. The electricity produce in nuclear power station could increase as the sound produce duringnuclear fission also could be used to get more electric energy.

# FREQUENCY SYNTHESIZER
# V. KARTHICKKESAVAN (122306) – IIYear A section

**Introduction:**

A frequency synthesizer is a device (an electronic system) that generates a large number of precise frequencies from a single reference frequency.

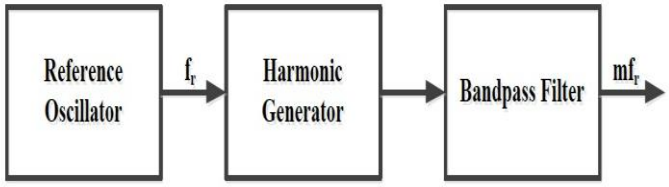
A frequency synthesizer can replace the expensive array of crystal resonators in a multichannel radio receiver. A single-crystal oscillator provides a reference frequency, and the frequency synthesizer generates the other frequencies. Because they are relatively inexpensive and because they can be easily controlled by digital circuitry, frequency synthesizers are being included in many new communication system designs. Frequency synthesizers are found in many devices, including radio receivers, mobile telephones, radiotelephones, walkie-talkies, satellite receivers, GPS systems, etc.

A frequency synthesizer can combine frequency multiplication, frequency division, and frequency mixing (the frequency mixing process generates sum and difference frequencies) operations to produce the desired output signal.

**Direct Frequency Synthesizer**

Direct frequency synthesizer is the oldest of the frequency synthesis methods. It synthesizes a specified frequency from one or more reference frequencies from a combination of harmonic generators, band-pass filters, dividers, and frequency mixers.

One method of using a harmonic generator is shown in Figure.




A direct frequency synthesizer

The desired frequency is obtained with a filter tuned to the desired output frequency. Highly selective filters are required with this method.

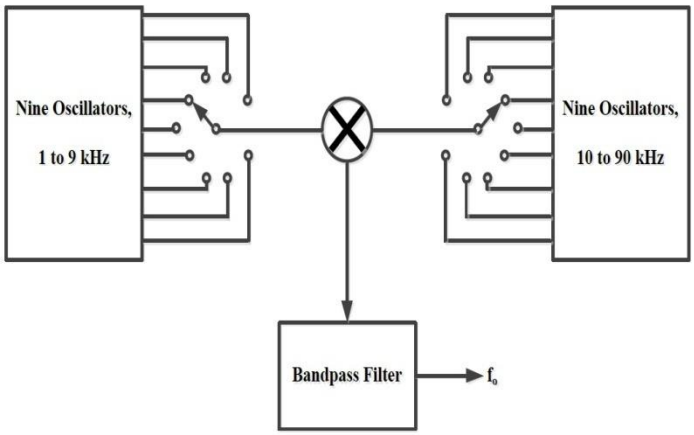



Figure (2): A two-decade direct frequency synthesizer

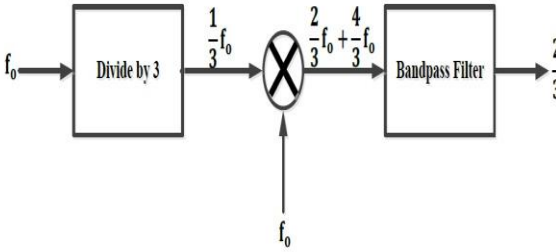
The multiple-oscillator approach is an alternative method. The oscillators are usually easier to realize than the bandpass filters. Figure (2) illustrates a method of generating 99 discrete frequencies from 18 crystal oscillators.

One switch selects one of the nine oscillators that cover the frequency range 1 to 9 kHz in 1-kHz steps, and the other switch covers the frequency range 10 to 90 kHz in 10-kHz steps. The two signals are then combined in a frequency mixer, and the bandpass filter selects the higher of the two mixer output frequencies.

Direct frequency synthesis refers to the generation of new frequencies from one or

more reference frequencies by using a combination of multipliers, dividers, bandpass filters, and mixers.

A simple example of direct synthesis is shown in Figure (3).




Example of direct frequency synthesizer

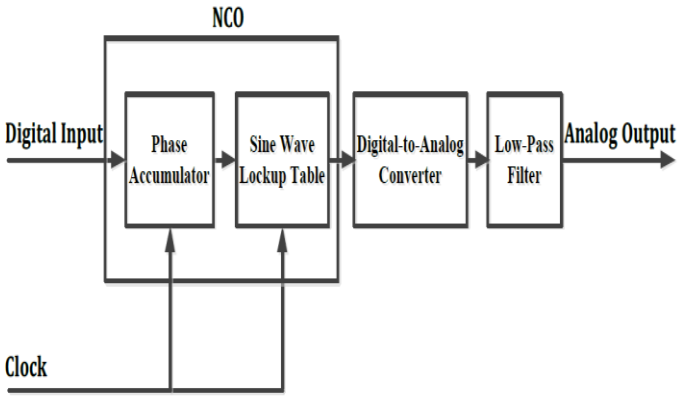
The new frequency $2/3f_o$ is realized from $f_o$ by using a divide-by-3 circuit, a mixer, and a bandpass filter. In this example $2/3f_o$ has been synthesized by operating directly on $f_o$.One of the foremost considerations in the design of direct frequency synthesizer is the mixing ratio:

$$\mathbf{r=f_1/f_2}$$

where f1 and f2 are the two input frequencies to the mixer. If the mixing ratio is too large or too small, the two output frequencies will be too close together, and it will be difficult to remove one of the signals with filtering.

**Direct Digital Frequency Synthesizer**

The direct digital frequency synthesizer DDFS is a technology that has been around since the early 1970's. DDFS is achieved by storing the sine wave values in a lookup table. DDFS consists of a numerically controlled oscillator (NCO), a digital-to-analog converter (DAC or D/A converter) and a low pass filter.




Block diagram of direct digital frequency synthesizer (DDFS).

The NCO consists of an adder-register pair (also known as phase accumulator) and a ramp-to-sine wave lookup ROM (a read-only memory). The low-pass filter attenuates the unwanted sampling components and the spurious signals. Figure shows the block diagram of a DDFS.

The basic idea is to store N uniformly spaced samples of a sine wave in memory and then to output these samples at a uniform rate to a digital-to-analog converter, where they are converted to an analog signal. The lowest-output frequency waveform then will contain N distinct points. To generate the lowest frequency, the value 1 is added to the phase accumulator each reference cycle, and the next value from the lookup table is outputted. To output the frequency which is K times as fast as the lowest frequency, the value K is added to the phase accumulator each time and the corresponding value from the lookup table is outputted.

To determine the frequency resolution of a DDFS system, consider a $2^N$-bit phase accumulator and a reference clock $f_{clock}$. This phase accumulator can address up to $2^N$ different ROM locations.

# ANTI- CRASH CAR SYSTEM


## M. GOKILA (122030), II Year – A section


**OBJECTIVE :**

The concept in design the anti-crash vehicle system is strategic control of an accident being vehicles. The system is design to prevent the driver and passenger inside the vehicle gets an accident with detect the object in front of them in the safety distance and speed. To study about the safety distance, vehicle speed, wheel speed and signal transmitter and signal receiver. The objective of this project is to develop and design an anti-crash vehicle security system by using Ultrasonic Sensor with switch off the engine system.

**SPECIAL FEATURES :**

The system using the combination of integrated circuit, sensing technology and computerized technology like Programmable Integrated Circuit microcontroller (PIC-microcontroller) where the integrated circuit will be programmed by computer. The sensing technology was advanced and significant year by year especially in security system industry where most physical phenomena can be detected by sensors, monitored by amplifiers and trigger circuits, and then presented by meters or personal computers. The Anti-Crash Vehicle Security System is developing by using an ultrasonic sensor with application of Antilock-Braking System (ABS) and Motor Speed Control.

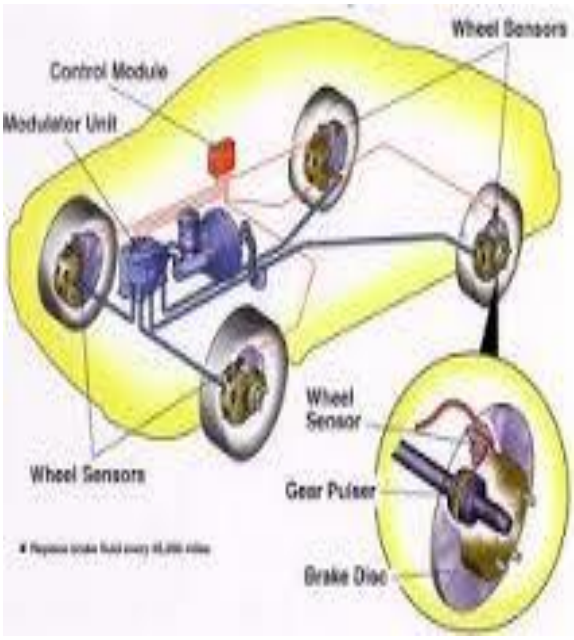
**ANTI CRASHING**:

In this project , we consider the distance of ultrasonic sensor and the application in the system to avoid an accident. The system will reduce the speed of vehicle by using motor speed control and will apply the antilock-braking system (ABS) to avoid the accident between them.

The system also provides the speedometer or tachometer to measure the high speed that will cause the dangerous accident. This project also applies the function of PIC micro-controller as the most important part for hardware circuit. The PIC microcontroller is programmed to control input from sensor and tachometer and remote to output as motor speed control and anti-braking system. It also converts an analog output signal from the sensors into digital signal.

**SCOPE OF ANTI CRASHING:**

The scope for this project is divided into two parts which a simulation and hardware part. The simulation for this project to obtain the expected result and function of the circuit system. In this part, I will use the MULTISIM software to design and simulate the circuit and result and MATLAB software to run the simulation of ABS application and analysis to construct the hardware of anti-crash vehicle security system prototype which consist the ultrasonic motion sensor, motor speed controller, tachometer and antilock-braking system (ABS) by using the PROTELL 99 software.



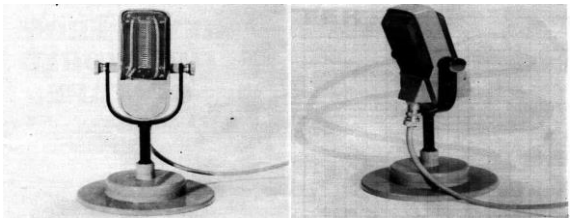

# RIBBON MICROPHONE


## N. HEMALATHA(122005), II year - A section

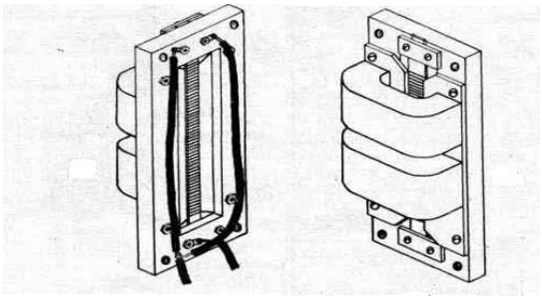

**SE ELECTRONICS R1**

I am something fan of ribbon microphone in general and venerable coles 4038 in particular.The latter was 'studio talk' mic serves remarkably well on manner of other source,particularly those with complex harmonic structures.

The inherent design attributes of a ribbons microphone means that the diaphragm resonances are at relatively low frequencies. This is in complete contrast to most capacitor mic diaphragm which is generally tensioned in such a way that their resonances are towards the top end of the audio spectrum. This fundamental aspect of the design that I think plays a big part in '*ribbon sound'* a very natural, fatigue free sound with a smooth but always detail top end.The ***R1*** is certainly



a nice sounding ribbon and I thought it seemed to have a decent output level compared to many older ribbon mic and especially the very quiet 4038.the polar response has nice, deep and well defined side nulls, making it easy to position the mic to reject unwanted spill while the proximity effect is strong but progressive



and predicable which makes it usable as a creative tool.

Initially, I was concerned about the design of shock mount because it appeared that the mic was intended to simply sit in a felt lined cup with a relatively loose fit. However, closer inspection revealed that a grey threaded collar at the base of the mic unscrewed, allowing the micstem to be passed through a hole in the bottom of the shock mount cup. The threaded collar can be screwed back on the mic, to provide a much more stable and secure fitting, with a reasonable level of mechanical isolation.

The only downside of the arrangement is that the mics has to be removed from shock mount before it can be put back in the case and you really do want to put the mic back in the case after use. Ribbons are easily damaged and although the warranty generously provides for three replacement ribbons it would be better not to use them all the first year of ownership.

# LTE- ADVANCED NEXT-GENERATION WIRELESS BROADBAND TECHNOLOGY

**J. R .THAKSHAYAANEE (112048), III Year– C Section**

**LTE(Long Term Evolution) Advanced-Release-10** is a mobile communication standard. It is standardized by the **3rd Generation Partnership Project (3GPP**).The target of 3GPP LTE Advanced is to reach and surpass the **ITU(International Telecommunication Union)** requirements. LTE Advanced,3GPP determined that LTE Advanced would meet the ITU-R requirements for 4G.

LTE Release 8 is one of the primary broadband technologies based on OFDM, which is currently being commercialized. LTE Release 8, which is mainly deployed in a macro/microcell layout, provides

improved system capacity and coverage,

- High peak data rates
- Low latency
- Reduced operating costs
- Multi-antenna support
- Flexible bandwidth operation
- Seamless integration with existing systems.

LTE-Advanced (also known **as LTE Release 10)** significantly enhances the existing LTE Release 8 and supports much higher peak rates, higher throughput and coverage, and lower latencies, resulting in a better user experience.

LTE Release 10 will support heterogeneous deployments where low-power nodes comprising picocells, femtocells, relays, remote radio heads, and so on are placed in a macrocell layout. The LTE-Advanced features enable one to meet or exceed IMT-Advanced requirements.

It may also be noted that LTE Release 9 provides some minor enhancement to LTE Release 8 with respect to the air interface, and includes features like dual-layer beamforming and time-difference- of-arrival-based location techniques. In this article an overview of the techniques being considered for LTE Release 10 (aka LTEAdvanced) .This includes bandwidth extension via carrier aggregation to **support deployment bandwidths up to 100 MHz, downlink spatial multiplexing including single-cell multi-user multiple-input multiple-output transmission and coordinated multi point transmission, uplink spatial multiplexing including extension to four-layer MIMO, and heterogeneous networks with emphasis on Type 1 and Type 2 relays.** Finally, the performance of LTEAdvanced using IMT-A scenarios is presented and compared against IMT-A targets for full buffer and bursty traffic model.

**Advanced benefits:**

➔The ability to take advantage of advanced topology networks.

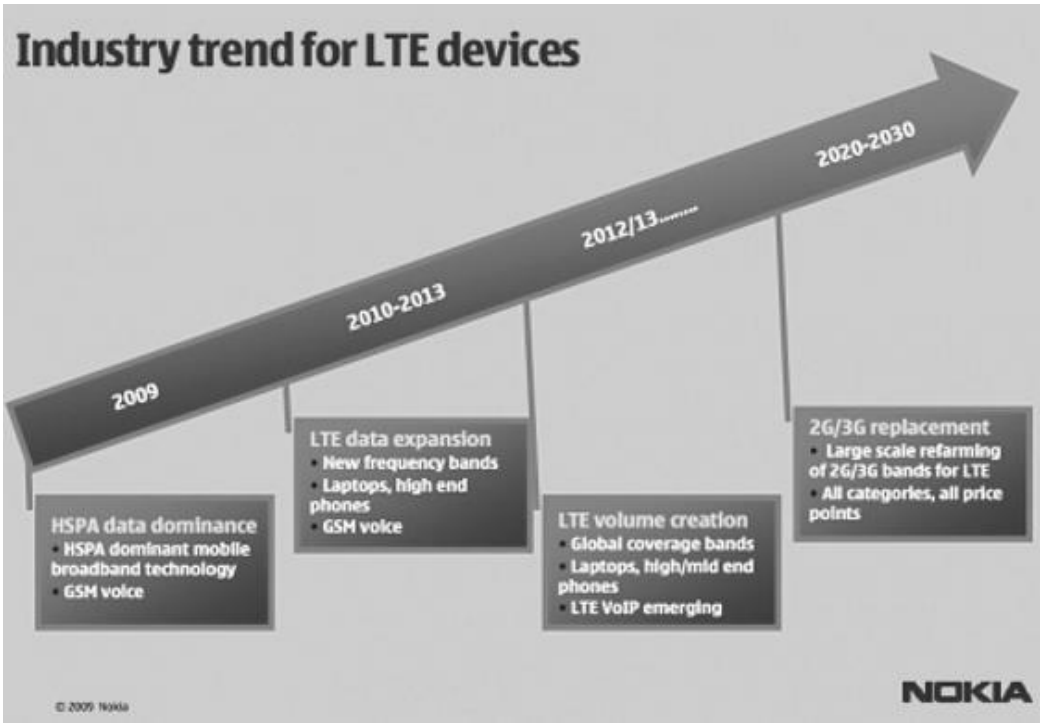
➔Optimized heterogeneous networks with a mix of macrocells with low power nodes such as picocells, femtocells and new relay nodes.

➔The next significant performance leap in wireless networks will come from making the most of topology.

➔Brings the network closer to the user by adding many of these low power nodes.

➔Improves the capacity and coverage, and ensures user fairness.

➔Introduces multicarrier to be able to use ultra wide bandwidth, up to 100 MHz of spectrum supporting very high data rates.



# BLUETOOTH ENERGY METER

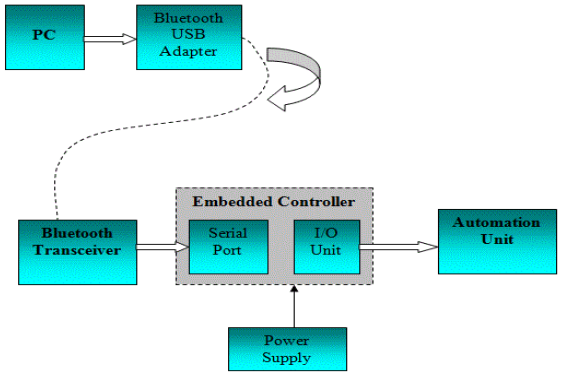

## R.MATHANAATHISHRI (122024),II Year – B Section


### INTRODUCTION :

Bluetooth is a promising new wireless technology, which enables portable devices to form short-range wireless ad hoc networks .Bluetooth is a frequency hopping system, which defines multiple channels for communication .A group of devices sharing a common channel is called a piconet. Each piconet has a master unit, which selects a frequency hopping sequence for the piconet and controls the access to the channel. Other participants of the group known as slave units are synchronized to the hopping sequence of the piconet master.

### BENEFITS:

Bluetooth enabled devices have generated sufficient interest in the networking community. Bluetooth based automation offers flexibility, even when the devices actually present far from the master unit.




The commands for the automation unit are given through the software module in PC. From PC the command is given to Bluetooth USB adapter. The Bluetooth USB adapter enables the Bluetooth communication and converts the data into airborne signals. The Bluetooth transceiver has a built-in antenna receives the air borne signals and transfer the data to the embedded controller through serial port.

### DATA PROCESSOR :

The embedded microcontroller is programmed to read the data. The embedded controller is the CPU that decides the operation of the automation unit. The embedded controller used here is 89C51 microcontroller. It is a derivative of 8051 microcontroller whose architecture and instruction set are same as 8051 microcontroller with some additional functionality. Since the controller has the inbuilt peripherals it is called as embedded controller. The embedded controller controls the automation unit as per the commands

### ADVANTAGES:

Bluetooth based systems are developed to manage proper safeguards to prevent unauthorized leakage of information. Synchronizing data between cell phones, laptops, and PDAs; using cell phones as cordless phones when at home.

# MOSAR'S LIGHT-A SMART ENGINEERING WORK

V. YUVARAJ (112047), III Year C-Section

What can we do with a water bottle? To throw after using it.But ,AlfredMosar has brought millions of homes out from dark. Mosar ,who, now,seen as the 'Edison of the century' used water bottle for this project. Infact, when he began to use it for his own mechanic shop, he was not aware that he had discovered such a thing which would be going to brighten millions of home. Now it is also called liter of light. Shall we have a quick glance of it?

**Liter of Light**

**Liter of Light** is a global open source movement with the aim to provide an ecologically and economically sustainable source of light to underprivileged households that do not have access to electricity or are unable to afford it.

The invention is relatively simple. It involves filling up a 1.5L PET bottle with purified water and bleach and installing it onto the roof of a house. The water inside the bottle refracts the sunlight during the daytime and creates the same intensity as a 55 watt light bulb. With the correct installation and materials a solar bottle can last up to 5 years. As the light relies on the sun it cannot be used at night and is only meant to provide light to buildings and homes during daylight hours.

**History**

The idea of using plastic bottles for daylight was first pioneered by Alfredo Moser from Brazil in 2002. Using the technology as a social enterprise was first launched in the Philippines by Illac Diaz under the MyShelter Foundation in April 2011. In order to help the idea to grow sustainably, the Foundation implemented a "local entrepreneur" business model, whereby bottle bulbs are put together and installed by locals who can in turn earn a small income for their work. Within months, one carpenter and one set of tools in one community in San Pedro, Laguna, expanded the organization to 15,000 solar bottle bulb installations in 20 cities and provinces around the Philippines and began to inspire local initiatives around the world.

MyShelter Foundation also established a training center that conducts workshops with youth, business companies, and other groups who are interested in volunteering their time to build lights in their communities.

In 2011, the technology behind Liter of Light was designed and developed by students from the Massachusetts Institute of Technology (MIT) and is based on the

concept of "Appropriate Technologies" – a concept to provide simple and easily replicable technologies to communities in need. The students had the idea to build solar bottle bulbs when they were constructing a school classroom made out of recycled bottles in the Philippines and they noticed that the school could not afford to pay the electricity bills, even though the building was sustainable. They realized that the walls made with clear bottles let light in during the daytime, and began to experiment with ways to use recycled bottles to bring in light through the roof.

In less than a year since inception, over 200,000 bottle bulbs were installed in communities around the world. Liter of Light has a goal to light up 1 million homes by the end of 2015.

**Technology description**

The Solar Bottle Bulb, as it has also been called, is installed in the roof of homes with the purpose of refracting sunlight in order to light up a room. The project's innovation lies in its utilization of cheap, durable and readily available materials to produce high quality natural lighting enabling the urban poor to have access to an affordable, environmentally friendly long-term alternative to electric light for use during the day.

Most of the plastic bottles used are recycled, 1.5 liter bottles that lend the technology its name. After being filled with water and bleach, the bottle is pushed through a steel sheet that serves as a metal lock to prevent it from slipping. It is then embedded into a corrugated iron roof. A small part of the bottle is left outside while the rest of it protrudes into the house. Sealant is put around the hole made in the roof to keep it weather proof.

The refractive properties of water ensures that the light from the sun that reaches the inside of the bottle becomes omni-directional mimicking an electric light bulb and emitting the same amount of light as a 40-60 W incandescent bulb depending on the amount of solar insolation available. Adding bleach to the water prevents it from turning green with algae and ensures a high quality light keeping the water clear for a longer time. In order to facilitate use of the invention through open source mechanisms, step-by-step guides on materials and installation are available online.

**But what Moser says?**

*"I'm proud that millions of them are using this solar bottle light. But I wouldn't claim for the discovery. Because I'm not making sun light. Hence I can't ask for copy right."*

# GREEN TECH


## R. NAGA ARJUN (122313), II Year – B section


### EXERCISE MACHINES → ENERGY MACHINES

**INTRODUCTION :**

**By adopting power-producing** exercise machines in this way, gyms can promote themselves as environmentally friendly and also reduce their electric bills The energy output from a single exercise machine is quite small. So a gym might have to wait decades to recover the money it spent converting its exercise machines to generate electricity.

**EVOLUTION:**

**ELLIPTICAL TRAINER:**

Hudson Harr, then a 21-year-old graduate of the University of Florida with degrees in electrical and mechanical engineering .He found that some elliptical models already had small DC generators inside. These power the monitoring console and also serve to increase the amount of resistance the user feels when exercising. That's because the current generated creates a magnetic force that opposes the motion that creates this current. By adjusting the amount of current created, the user can vary the resistance he or she feels.

Essentially, we remove the internal resistance the machine has and give it an external load, which is our equipment," he says. Harr's strategy is to wire each elliptical machine to a central unit containing an inverter that converts the DC power generated to AC. The inverter in turn connects to the building's electrical system and ultimately feeds the grid.

**STATIONARY BIKES :**

a custom-designed power-producing stationary bike is brought into focus. In addition to the usual pedals, the machine has hand cranks to provide a rigorous upper-body workout and generate even more electricity. With their sprockets chained together, the hand and leg cranks spin at the same speed to turn the bike's

45-centimeter-diameter flywheel about 300 revolutions per minute during a typical workout. A belt connects the flywheel to the generator, which spins at something like 1500 rpm.

It can connect several of Taggett's machines together to drive a single generator. It really cut down expense and maintenance because you have one big generator and one electronics package for up to 10 machines.

**HUMAN DYNAMO MACHINES:**

The Green Microgym in Portland, Ore. Adam Boesel opened the facility in 2008 with Human Dynamo machines inside and solar panels on the roof. Boesel reports that his gym generates about 36 percent of its own electricity, saving nearly 40 000 kWh per year—although he admits that the savings come mostly from the solar panels.

"People are very receptive," says Boesel. He even initiated a program called **Burn and Earn**, which rewards customers with $1 coupons—redeemable for food, beverages, clothing, and other merchandise—for every hour they operate the electricity-generating equipment.

**BENEFIT :**

An elite cyclist can produce more than 400 watts, more than half a horsepower, for an hour or more at a stretch. But the average person, can generate only 50 to 150 watts during an hour of strenuous exercise.

**SCOPE :**

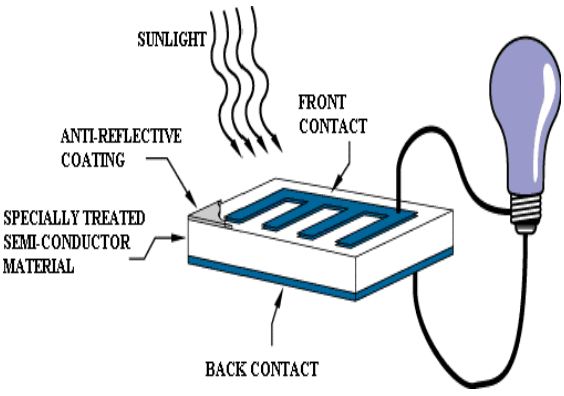
Boesel says "I hope this technology is in every piece of equipment in 10 or 15 years, A few watts here and there from all of us as we sweat may add up to something significant."

# PHOTOVOLTAIC TANDEM CELLS


## K.THENMOZHI (122013) II$^{Yr}$ - C R.PREETHI (122316) II$^{Yr}$ - B


Photo voltaics is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current results that can be used as electricity.

The photoelectric effect was first noted by a French physicist, Edmund Bequerel, in 1839, who found that certain materials would produce small amounts of electric current when exposed to light. In 1905, Albert Einstein described the nature of light and the photoelectric effect on which photovoltaic technology is based, for which he later won a Nobel prize in physics.




The first photovoltaic module was built by Bell Laboratories in 1954. It was billed as a solar battery and was mostly just a curiosity as it was too expensive to gain widespread use. In the 1960s, the space industry began to make the first serious use of the technology to provide power aboard spacecraft. Through the space programs, the technology advanced, its reliability was established, and the cost began to decline. During the energy crisis in the 1970s, photovoltaic technology gained recognition as a source of power for non-space applications.

This illustrates the operation of a basic photovoltaic cell, also called a solar cell. Solar cells are made of the same kinds of semiconductor materials, such as silicon, used in the microelectronics industry. For solar cells, a thin semiconductor wafer is specially treated to form an electric field, positive on one side and negative on the other. When light energy strikes the solar cell, electrons are knocked loose from the atoms in the semiconductor material. If electrical conductors are attached to the positive and negative sides, forming an electrical circuit, the electrons can be captured in the form of an electric current -- that is, electricity. This electricity can then be used to power a load, such as a light or a tool.

A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module. Modules are designed to supply electricity at a certain voltage, such as a common 12 volts system. The current produced is directly dependent on how much light strikes the module.

Multiple modules can be wired together to form an array. In general, the larger the area of a module or array, the more

electricity that will be produced. Photovoltaic modules and arrays produce direct-current (dc) electricity. They can be connected in both series and parallel electrical arrangements to produce any required voltage and current combination.

Today's most common PV devices use a single junction, or interface, to create an electric field within a semiconductor such as a PV cell. In a single-junction PV cell, only photons whose energy is equal to or greater than the band gap of the cell material can free an electron for an electric circuit. In other words, the photovoltaic response of single-junction cellsis limited to the portion of the sun's spectrumwhoseenergy is above the band gap of the absorbing material, and lower-energy photons are not used.

One way to get around this limitation is to use two (or more) different cells, with more than one band gap and more than one junction, to generate a voltage. These are referred to as "multi junction" cells (also called "cascade" or "tandem" cells). Multijunction devices can achieve a higher total conversion efficiency because they can convert more of the energy spectrum of light to electricity.

A multi junction device is a stack of individual single-junction cells in descending order of band gap (Eg). The top cell captures the high-energy photons and passes the rest of the photons on to be absorbed by lower-band-gap cellsf today's research in multi junction cells focuses on gallium arsenide as one (or all) of the component cells. Such cells have reached efficiencies of around 35% under concentrated sunlight. Other materials studied for multi junction devices have been amorphous silicon and copper indium diselenide.

As an example, the multi junction device below uses a top cell of gallium indium phosphide, "a tunnel junction," to aid the flow of electrons between the cells, and a bottom cell of gallium arsenide.

# ELECTRIC VEHICLES

## S.SELVAPRIYA (122307), II Year – C Section

**INTRODUCTION :**

An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more **electric motors** or **traction motors** for **propulsion**. Three main types of electric vehicles exist, those that are directly powered from an external power station, those that are powered by stored electricity originally from an external power source, and those that are powered by an on-board electrical generator, such as an **internal combustion engine** (**hybrid electric vehicles**) or a **hydrogen fuel cell**.[3] EVs include **plug-in electric cars**, **hybrid electric cars**, **hydrogen vehicles**, **electric trains**, electric lorries, **electric airplanes**, **electric boats**, **electric motorcycles and scooters** and **electric spacecraft**.[4] Diesel submarines operating on battery power are, for the duration of the battery run, electric submarines, and some of the lighter **UAVs** are electrically-powered. Proposals exist for **electric tanks**.

**ADVANTAGES AND DISADVANTAGES OF EV'S:**

EVs release almost no air pollutants at the place where they are operated. In addition, it is generally easier to build pollution-control systems into centralised power stations than retrofit enormous numbers of cars. EVs typically have less noise pollution .Electric motors are mechanically very simple Electric motors often achieve 90% energy conversion efficiency[53] over the full range of speeds and power output and can be precisely controlled. They can also be combined with regenerative braking systems that have the ability to convert movement energy back into stored Electricity.

Energy is not consumed while the vehicle is stationary, unlike internal combustion engines which consume fuel while idling.

**HEATING OF EVS:**

In cold climates, considerable energy is needed to heat the interior of a vehicle and to defrost the windows. With internal combustion engines, this heat already exists as waste combustion heat diverted from the engine cooling circuit. This process offsets the greenhouse gases' external costs. If this is done with battery EVs, the interior heating requires extra energy from the vehicles' batteries. Although some heat could be harvested from the motor(s) and battery, their greater efficiency means there is not as much waste heat available as from a combustion engine.

**ENERGY SOURCES :**

Although EVs have few direct emissions, all rely on energy created through electricity generation, and will usually emit pollution and generate waste, unless it is generated by renewable source power plants. Since EVs use whatever electricity is delivered by their electrical utility/grid operator, EVs can be made more or less efficient, polluting and expensive to run, by modifying the electrical generating stations. This would

be done by an electrical utility under a government energy policy, in a timescale negotiated between utilities and government.

Fossil fuel vehicle efficiency and pollution standards take years to filter through a nation's fleet of vehicles. New efficiency and pollution standards rely on the purchase of new vehicles, often as the current vehicles already on the road reach their end-of-life.

**VEHICLE TYPES :**

- Plug-in electric vehicle

- Hybrid EVs
- On- and off-road EVs
- Airborne EVs
- Railborne EVs

- Seaborne EVs

**SCOPE :**

The ever increasing prices of petroleum products and serious environmental pollution problems have accelerated the development of non-polluting electric and hybrid vehicles during last few decades. The new technology of battery operated electric vehicles is likely to replace conventional IC engine automobile technology soon.. In this situation the industry-institute interaction will play a key role and part of R&D and testing activities can get diverted to educational institution with adequate infrastructure. This paper emphasizes basic details regarding characteristics of various motors and controllers used for battery operated electric vehicles. Comparative study of various motors used for electric vehicle applications is presented. The role of local transport authorities in promoting electric vehicles for cities like Pune is also presented.

# PROGRAMMABLE NANO MATERIALS

**J. R. THAKSHAAYENE (112048), III Year– C Section**

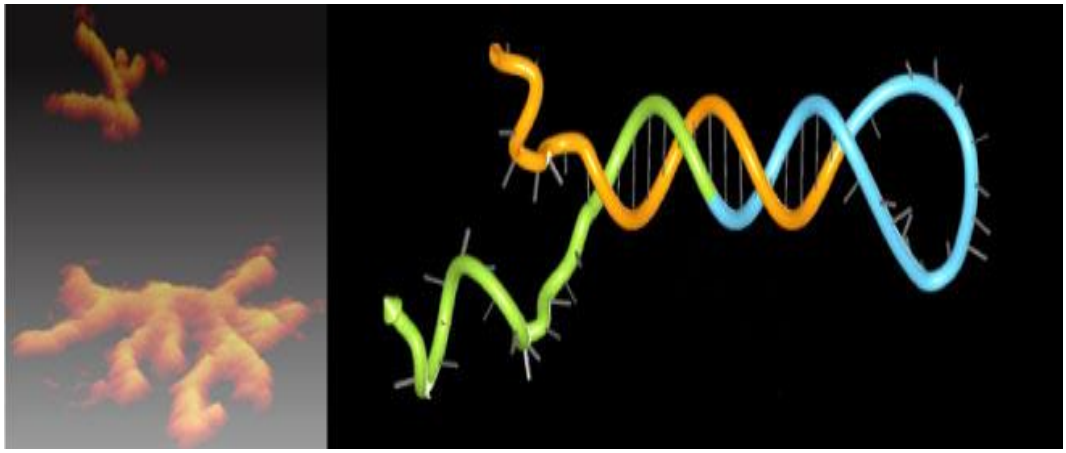
The **Programmable Nanomaterials Platform** emulates the natural process of molecular self-assembly to create materials that can seek out injury sites, deliver drugs, and promote tissue repair. Platform scientists also work to engineer medical devices that can be controlled remotely, such as heart pacemakers triggered by magnets instead of wires, hormone production spurred by flashes of light, or limb regeneration stimulated by electric fields.

The materials designed are much more like our tissues and organs, which form through a process of self-assembly.Herenanoscalemolecules come together with cells to form specialized structures.

Aim :To capture the best of Nature's resilient engineering strategies, and to remotely control these new materials using light, magnetic forces, ultrasound, or electric fields.

Applications:

Current applications include aerosols that deliver drugs to the lungs, vaccines that regulate immune cells, and injectable nanoparticles made from DNA that "know" to travel to an injury site and trigger tissue regeneration by harnessing the body's own power to heal. They also include new generations of nanofabrics that could be used as scaffolds to promote wound healing, and advanced materials made from novel inks using an elite technique for three-dimensional printing that may revolutionize energy harvesting and storage.



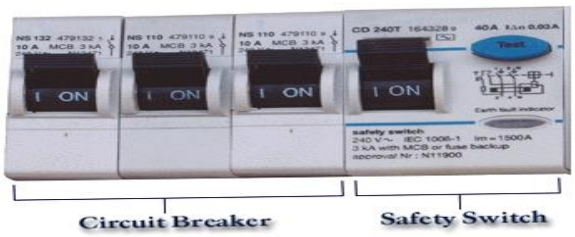
# CIRCUIT BREAKERS


## B. D. SAKTHI MAI (122003), II Year – A section


**INTRODUCTION:**

A circuit breaker is an electronic device which is used for the safe and reliable operation of the circuit. Its basic operating principle is that it keeps track of the flow of current in the path of the circuits it is installed, and when the value of the passing current exceeds the required value, it instantly breaks the contact and prevents the external wiring and circuitry from damaging due to excessive current.

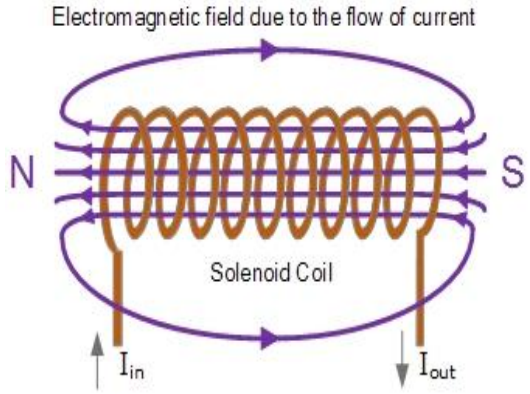
This thing is important as now-a-days the equipment used and the circuitry designed are such that they utilize a very large amount of current which adds an increasing factor to the sensitivity of the circuit, thus placing the equipment and electrical components at a risk. Any value larger than the limiting value of current can be disastrous and can produce extremely dangerous effects. This thing ultimately produces a risk for the expensive equipment which are being operated through that circuitry, or the expensive electrical components which lie further ahead in the circuit and can be damaged by the excessive current passing through the circuit. Moreover even if cost is manageable and is not of much concern, still the damaging of these things can cause an unmanageable reinstallation of the circuitry which is obviously not preferable.




**Working of a Magnetic Circuit breakers**

Coming to the working principle of magnetic circuit breakers, we first see that what is different about them that outstands them from the other breakers.

So the difference lies in the actuating signal. The actuating signal is the signal which actuates or stimulates the contacts of the breaker, giving them the notion to maintain or break their contacts depending on the value of the current flowing through the circuit. So in case of a magnetic circuit breaker, a solenoid or an electromagnet is attached to the trip unit. The function of the solenoid or the trip unit is to generate a magnetic field. This is done when the current passes through the solenoid, magnetism develops in it due to changing magnetic flux, and a magnetic field is created around the solenoid.




As the strength of this magnetic field is directly proportional to the amount of current applied, so when the current through the circuit increases, the magnetic field around the solenoid or the electromagnet also becomes strong. In case an excessively large amount of current is trying to pass due to some fault occurring in the circuit, the magnetic field becomes so strong that it pulls the bimetallic contact strip so that the contact breaks and the circuit opens and no current can pass any further.

When the original amount of the current is stored, i.e. the current is in the safe limits now the magnetic field also weakens a bit. This weak magnetic field does not have enough strength to keep the contact open or pulled towards itself, and hence the contact is restored and immediately the current starts passing through the circuit as before. In this way the circuit breaker operates.

Circuit breakers have been classified into a number of types, based on different categories they have been subdivided into. It should be noted here that there is no specific criteria of classifying the circuit breakers, but instead there are a number of ways in which we can categorize them for our easier understanding and knowledge of the operating conditions of the device. These different categorizes can be according to the medium in which the circuit breaker operates, the actuating signal on which its works, the different types of constructing and working principles etc.

Three important circuit breakers :

- Magnetic Circuit Breakers
- Thermal Circuit Breakers
- Hybrid Circuit Breakers

**ADVANTAGES OF CIRCUIT BREAKERS**

Another importance of an automatic circuit breaker is that no attaching and reattaching of the contacts is required manually, due to which no human monitoring of efforts is required time and again, and the circuit can operate in the safest manner on its own. The advantages are not only limited to this step, but also it automatically retains its connections and the circuit starts to operate again. Another advantage is that it does not need any replacement unlike a fuse or any other safety device.

# THERMOCHEMICAL TECHNOLOGY IN THE FIELD OF ELECTRICAL ENERGY

## T.S.KESAVA PRASAD (122117), II Year – B section

**INTRODUCTION:**

MIT researchers are hopeful of capturing and releasing energy with the help of thermo-chemical technology. Scientists were already working on this technology during 70's but, later this project was aborted due to its expensiveness and termed as too impractical to achieve. But MIT researchers are now gearing up to take this thermo-chemical technology that is supposed to convert solar energy into electrical energy.

**THERMO-CHEMICAL TECHNOLOGY :**

Currently we depend on the photovoltaic cells that transform light energy into electricity. Thermo-chemical technology is a bit different. It traps the solar energy and stores it in the form of heat in molecules of chemicals. This heat energy can be converted and utilized by humans whenever the need arises. What happens in a conventional solar system is that , heat gets leached away over time but when, heat is stored using the thermo-chemical fuel it remains stable.

Jeffrey grossman is the associate professor of power engineering in the department of materials science and engineering. According to him this chemical-electrical process makes it possible to produce a "rechargeable heat battery" that can repeatedly store and release heat gathered from sunlight or other sources. In principle Grossman said, when fuel made from fulvalenediruthenium is stored, heat is released, and it "can get as hot as 200 degrees c, plenty hot enough to heat your home, or even to run an engine to produce electricity".

**DRAWBACK :**

One of the major drawbacks of this project is they were depending on a chemical ruthenium. This is a rare element and the cost is effectively is out of question. But the MIT team is still hopeful and they are saying that they have found the exact working mechanism of ruthenium and soon they will find out another chemical element that will not be expensive andwill be available easily in nature.

**ALTERNATIVE :**

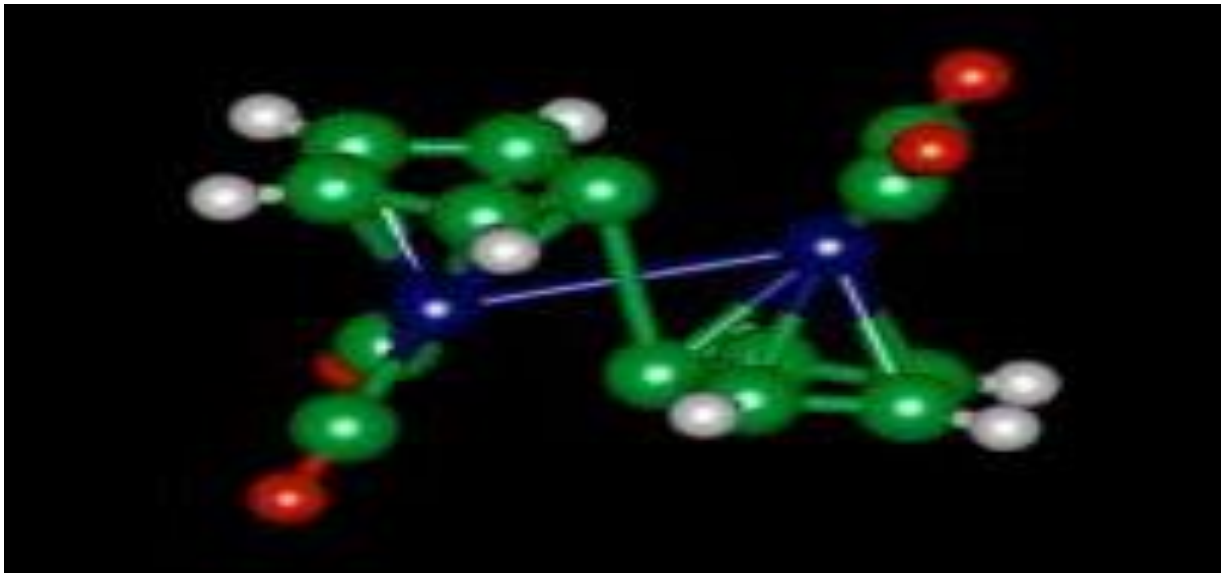
Jeffrey grossman explains the fulvalenediruthenium shows the potential to replace ruthenium. Fulvalenediruthenium can absorb solar energy. After trapping solar energy it can achieve a higher-energy state where it can remain stable ad infinitum .If a stimulus can be given in the form of heat or a catalyst, it reverts to its unique shape, releasing heat in the process.

**BENEFIT :**

Professor grossman states, "It takes many of the advantages of solar-thermal energy, but stores the heat in the form of a fuel. It's reversible, and it's stable over a long term. You can use it where you want, in

demand. You could put the fuel in the sun, charge it up, then use the heat, and place the same fuel back in the sun to recharge."

But the path to clean and green energy is not so easy. The MIT team has to tackle the challenges lying ahead. First they have to find out an easy way to synthesize the material in the laboratory that can absorb and trap heat inside it and secondly they have to search for a good catalyst that can release the trapped heat energy without much fuss.



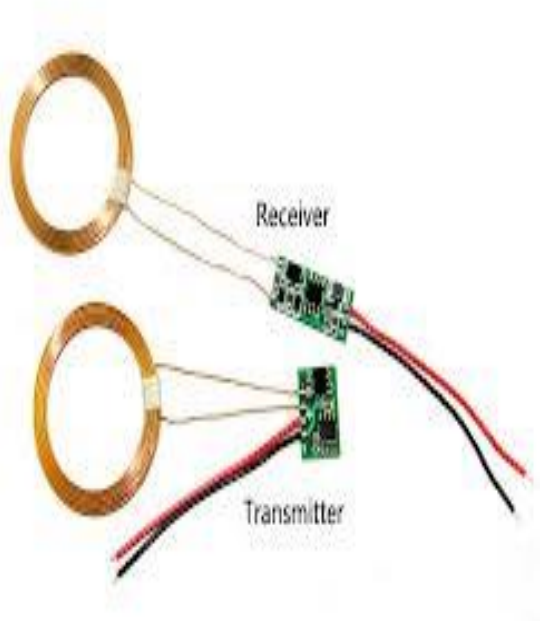
# WIRELESS CHARGING

**AKSHATHAGANESAN(122301) , S.BHARANI (122039) II$^{Yr}$-A Section**

**INTRODUCTION :**

With the great progress in science and technology, we have devices like mobile phones, tabs, iPhone. And now, mobile phones in our hands means tiny world in our tiny hands.You can see videos. Download music, videoconferencing and emailing and what not. But everything requires battery or charge in your device otherwise it is like a dumb machine**.**

**USAGE :** What happens if you don't have your charger or u don't have power supply near you?




So here is the technique of charging the devices without using wire or inductive coupling .It just consist of an induction coil which creates a magnetic field and induces a voltage in the secondary winding inside a smartphone, tablet, notebook, PC or any other device receives and converts back into the electric current to charge the battery. This type of power charging often uses a charging pad driven by dc port or ac adapter.

**INTEGRATED DEVICE TECHNOLOGY:**

Integrated device technology is a leader wireless power transmitter and receiver solutions for wireless charger applications. This technology is especially useful in cases where wires are hazardous, impossible to connect or simply irrelevant.

Even though it has advantages like highly durable, protected connections and safer to use medical equipment. But it has lower efficiency, takes a lot of time for charging.

The idea of using wireless power transfer to charge batteries has been around for many years. While some smartphones have such charging capability this technology has been waiting on the threshold of wider adoption.

# FACTS TO REMEMBER

# FACTS ABOUT ELECTRICITY

**G. KATHIRAVAN(122041),II year – B section**

- **Fact 1** - Definition: Electricity is the flow of electrical power or charge. A phenomena resulting from the presence and flow of electric charge. Associated with stationary or moving electrons and protons. The directional movement of electrons, due to some imbalance of force, is what is known as electricity.
- **Fact 2** - Electricity is also referred to as an energy carrier. We get electricity from the conversion of other sources of energy, such as coal, nuclear, solar energy.
- **Fact 3** - An electron is an elementary particle with a negative charge. A Proton is an elementary particle with a positive charge
- **Fact 4** - An electric charge originates in the atom, in which its most familiar carriers are the electron and proton
- **Fact 5** - An electric charge may be transferred either by direct contact or by passing along a conducting material, such as a wire
- **Fact 6** - Electric current is measured in amperes, and is defined as the rate at which electric charge travels through a conductor
- **Fact 7** - Static electricity and electric current are two separate phenomena, both involving electric charge, and may occur simultaneously in the same object
- **Fact 8** - force that causes the electrons to move in an electrical circuit is called the electromotive force, or EMF
- **Fact 9** - There are many sources of EMF, the most common being batteries and electrical generators.
- **Fact 10** - The word 'electricity' is derived from 'electron', the Greek word for amber, a yellow transparent substance, remarkable for its electrical power when rubbed
- **Fact 11** - Electricity itself is neither renewable or non-renewable but the energy sources we use to make electricity can be renewable or non-renewable.
- **Fact 12** - Benjamin Franklin demonstrated that lightning is electricity. He tied a key to a kite string during a thunderstorm, and proved that static electricity and lightning were the same thing.

# INTERESTING FACTS

## M. A. ARUL FLAWRENCE (122904), III year A- Section

**Did you know….?**

- **Calorimeter** measures the quantities of heat.
- **Electroscope** is an instrument for detecting the presence of electric charge.
- **Hydroscope** is an optical instrument used for seeing objects below the water.
- **Hydrophone** is used for measuring the sound under water.
- **Lactometer** is an instrument used for measuring the relative density of milk.
- **Manometer** is used to measure the pressure of gases.
- **Magnetometer** is an instrument for carrying sound to long distance.
- **Megaphone** carries sound to long distance.
- **Photometer** compares the luminous intensity of the sources of light.
- **Radio Micrometer** is an instrument used for measuring heat radiations.
- **Rain Gauge** measures rainfall.
- **Seismometer** is used for recording the intensity and origin of earth quake shocks.
- **Thermometer** is an instrument used for measure the temperature.
- **Viscometer** measures the viscosity of a fluid.

**THE GREAT INVENTIONS…..**

| INVENTION | INVENTOR | YEAR | COUNTRY |
|---|---|---|---|
| Transformers | Michael Faraday | 1831 | Britain |
| Electric motor(DC) | GinobGramy | 1873 | Belgium |
| Electric motor(AC) | Nichola Tesla | 1888 | USA |
| Galvanometer | Andre Marie Ampere. | 1834 | France. |
| Telephone | Alexander Graham Bell | 1876 | USA |
| Radar | A.H.Taylor, LeoYoung | 1922 | USA |
| Lift | Elisha Gotis | 1852 | USA |
| ATM | John Shepherd Barron | 1967 | North scotland |
| Fountain pen | Louis E.Waterman | 1884 | USA |
| Pendulum clock | Christen Huygens | 1696 | Netherland |
| Atom Bomb | Robert Openhirmer | 1945 | USA |

# SOME THINGS TO REMEMBER

## M. DEEPIKA (112313), III Year A- Section

### UPSC

| Post Date | Exam Name | Last Date |
|---|---|---|
| 08/02/2014 | IES/ISS Exam 2014 | 10/03/2014 |
| 15/02/2014 | Geologists Exam 2014 | 17/03/2014 |
| 15/03/2014 | Engineering Services Exam 2014 | 14/04/2014 |
| 22/03/2014 | Combined Medical Services Exam 2014 | 21/04/2014 |
| 04/04/2014 | CPF (AC) Exam 2014 | 05/05/2014 |
| 17/05/2014 | Civil Services (Preliminary) Exam 2014 | 16/06/2014 |
| 17/05/2014 | Indian Forest Services (Preliminary) Exam 2014 | 16/06/2014 |
| 21/06/2014 | NDA & NA Exam (II) 2014 | 21/07/2014 |
| 19/07/2014 | CDS Exam(II) 2014 | 18/08/2014 |

### SSC

| Post Date | Exam Name | Last Date |
|---|---|---|
| 18/01/2014 | Combined Graduate Level (Tier-I) Exam 2014 | 14/02/2014 |
| 22/02/2014 | Junior Engineer (Civil & Electrical) Exam 2014 | 21/03/2014 |
| 15/03/2014 | SI in CAPFS, ASI in CISF & SI in Delhi Police Exam 2014 | 11/04/2014 |
| 22/03/2014 | Junior Hindi Translator in Subordinate Offices Exam 2014 | 18/04/2014 |
| 24/05/2014 | Stenographer (Gr C&D) Exam 2014 | 20/06/2014 |
| 19/07/2014 | Combined Higher Secondary (10+2) Exam 2014 | 15/08/2014 |
| 09/08/2014 | Junior Translator (CSOLS)/Jr Hindi Translator Exam 2014 | 05/09/2014 |

**EEE related core companies**

- Ashok Leyland Ltd.
- Bharat Heavy Electricals Ltd, Tiruchirapalli
- Chennai Petroleum Corp Ltd.
- Ford India Pvt. Ltd.
- Heavy Ordinance Factory, Avadi
- Hindustan Motors Ltd.
- Hyundai Motor India Ltd.
- Integral Coach Factory, Perambur

- Madras Fertilizers Ltd.
- MRF Ltd.
- Neyveli Lignite Corp. Ltd.
- Nokia India
- Tanfac Industries Ltd.
- TI Cycles Ltd.
- TVS Motors Ltd.
- GVK Power & Infrastructure ltd
- LancoInfratech Ltd.
- NTPC Bharat Heavy Electricals ltd
- Crompton Greaves
- GMR Infrastructure
- Neyveli Lignite corporation
- Power Grid Corporation
- Reliance Infrastructure
- Reliance Power Limited
- Siemens Ltd.
- Suzlon Energy Ltd.
- Tata Power Co.
- Torrent Power Ltd.

***USEFUL WEBSITES FOR UPSC PREPARATION.***

1. http://www.civilserviceindia.com
2. http://iasexams.facts.co/
3. http://www.ias100.in/toppers_more.php
4. http://textbooksonline.tn.nic.in/Std5.htm
5. http://www.upscportal.com/civilservices/
6. http://www.jeywin.com/
7. http://www.wiziq.com/online-classes/radian-ias-academy
8. http://www.upscportal.com/civilservices/Road-Map-for-IAS-Pre-Exam
9. http://www.saidaiduraisamysmanidhaneyam.com/PlanOfExamination.aspx
10. http://www.tnpsc.examsavvy.com/
11. http://topexamkeys.blogspot.in/2011/09/tnpsc-gr2-exam-2011.html
12. http://educationplusindia.blogspot.in/p/study-material-for-history-of-india.html
13. http://www.careerquizonline.com/
14. http://www.upscportal.com/civilservices/online-course
15. http://www.tcyonline.com/exam-preparation-free-online-upsc-preparation-test-and-study-material/100242/civil-services-csat/latest

# RECRUITMENT QUERIES

# TECHNICAL INTERVIEW QUESTIONS FOR EEE STUDENTS

## G.DAVID(122019) , II Year - A section

### INTERVIEW QUESTIONS :

**Q1 : What is meant by regenerative braking?**

**A**:When the supply is cut off for a running motor, it still continue running due to inertia. In order to stop it quickly we place a load(resistor) across the armature winding and the motor should have maintained continuous field supply. so that back e.m.f voltage is made to apply across the resistor and due to load the motor stops quickly. This type of breaking is called as "Regenerative Breaking".

. **Q2 : What are the advantages of star-delta starter with induction motor?**

**A** : 1. The main advantage of using the star delta starter is reduction of current during the starting of the motor. Starting current is reduced to 3-4 times Of current of Direct online starting. 2. Hence the starting current is reduced , the voltage drops during the starting of motor in systems are reduced.

**Q3 : Why Delta Star Transformers are used for Lighting Loads?**

A : For lighting loads, neutral conductor is must and hence the secondary must be star winding. and this lighting load is always unbalanced in all three phases. To minimize the current unbalance in the primary we use delta winding in the primary. So delta / star transformer is used for lighting loads.

**Q4 : Why in a three pin plug the earth pin is thicker and longer than the other pins?**

**A** : It depends upon R=rho l/a where area(a) is inversely proportional to resistance (R), so if (a) increases, R decreases & if R is less the leakage current will take low resistance path so the earth pin should be thicker. It is longer because the first to make the connection and Last to disconnect should be earth Pin. This assures Safety for the person who uses the electrical instrument.

**Q5 : Why series motor cannot be started on no-load?**

A : motor cannot be started without load because of high starting torque. Series motor are used in Trains, Crane etc.

**Q6 : Why ELCB can't work if N input of ELCB do not connect to ground?**

**A** : ELCB is used to detect earth leakage fault. Once the phase and neutral are connected in an ELCB, the current will flow through phase and that much current will have to return neutral so resultant current is zero. Once there is a ground fault in the load side, current from phase will directly pass through earth and it will not return through neutral through ELCB. That means once side current is going and not returning and hence because of this difference

in current ELCB will trip and it will safe guard the other circuits from faulty loads. If the neutral is not grounded, fault current will definitely high and that full fault current will come back through ELCB, and there will be no difference in current.

**Q7 : What is the difference between MCB & MCCB, Where it can be used?**

**A**:MCB is miniature circuit breaker which is thermal operated and use for short circuit protection in small current rating circuit. MCCB mould case circuit breaker and is thermal operated for over load current and magnetic operation for instant trip in short circuit condition. Under voltage and under frequency may be inbuilt. Normally it is used where normal current is more than 100A.

**Q8 : Where should the lighting arrestor be placed in distribution lines?**

**A** : Near distribution transformers and out going feeders of 11kv and incoming feeder of 33kv and near power transformers in sub-stations.

**Q9: Define IDMT relay?**

**A**:It is an inverse definite minimum time relay .In IDMT relay its operating is inversely proportional and also a characteristic of minimum time after which this relay operates .It is inverse in the sense ,the tripping time will decrease as the magnitude of fault current increase.

**Q10** :**What are the transformer losses?**

A : Transformer losses – Transformer losses have two sources-copper loss and magnetic loss. Copper losses are caused by the resistance of the wire (I2R). Magnetic losses are caused by eddy currents and hysteresis in the core. Copper loss is a constant after the coil has been wound and therefore a measureable loss. Hysteresis loss is constant for a particular voltage and current. Eddy-current loss, however, is different for each frequency passed through the transformer.

**Q11 : What is the difference between Isolator and Circuit Breaker?**

**A**:Isolator is a off load device which is used for isolating the downstream circuits from upstream circuits for the reason of any maintenance on downstream circuits. it is manually operated and does not contain any solenoid unlike circuit breaker. it should not be operated while it is having load. first the load on it must be made zero and then it can safely operated. its specification only rated current is given. But circuit breaker is on load automatic device used for breaking the circuit in case of abnormal conditions like short circuit, overload etc., it is having three specification 1 is rated current and 2 is short circuit breaking capacity and 3 is instantaneous tripping current.

**Q12 : There are a Transformer and an induction machine. Those two have the same supply. For which device the load current will be maximum? And why?**

**A** : The motor has max load current compare to that of transformer because the motor consumes real power.. and the transformer is only producing the working flux and its not consuming.. hence the load current in the transformer is because of core loss so it is minimum.

# TCS Technical Interview Questions

## V. KARTHICKKESAVAN (122306), IIYear – A Section

**1. Differences between C and Java?**

- C is a low-level language while JAVA is a high-level language.
- Exception Handling in JAVA and the errors & crashes in C.

**2. In header files whether functions are declared or defined?**

Functions are declared within header file. That is function prototypes exist in a header file, not function bodies. They are defined in library (lib).

**3. What are the different storage classes in C?** There are four types of storage classes in C. They are extern, register, auto and static.

**4. How do you print an address?**

Use %p in printf to print the address.

**5. What is an object?**

Object is a software bundle of variables and related methods. Objects have state and behavior

**6. What is a class?**

Class is a user-defined data type in C++. It can be created to solve a particular kind of problem. After creation the user need not know the specifics of the working of a class.

**7. What is pointer?**

**Pointer**is a variable in a program is something with a name, the value of which can vary.

**8. What is the difference between null and void pointer?**

A Null pointer has the value 0. void pointer is a generic pointer introduced by ANSI. Generic pointer can hold the address of any data type.

**9. What is friend function?**

**A friend function** for a class is used in object-oriented programming to allow access to public, private, or protected data in the class from the outside.

**10. What do you mean by inline function?**

The idea behind inline functions is to insert the code of a called function at the point where the function is called inline function.

**11. What is the difference between an array and a list?**

Array is collection of homogeneous elements. List is collection of heterogeneous elements. For Array memory allocated is static and continuous. For List memory allocated is dynamic and random.

**12. What are the differences between structures and arrays?**

Arrays is a group of similar data types but Structures can be group of different data types

**13. What is data structure?**

A data structure is a way of organizing data that considers not only the items stored, but also their relationship to each other.

**14. Can you list out the areas in which data structures are applied extensively?**

- Compiler Design,
- Operating System,
- Database Management System,
- Statistical analysis package,

**15. Advantages of a macro over a function?**

Macro gets to see the Compilation environment, so it can expand #defines. It is expanded by the preprocessor.

**16. What are the different storage classes in C?**

Auto, register, static, extern

**17.What is cache memory ?**

Cache Memory is used by the central processing unit of a computer to reduce the average time to access memory.

**18. What is debugger?**

A debugger or debugging tool is a computer program that is used to test and debug other programs

**19. What is Memory Alignment?**

Data structure alignment is the way data is arranged and accessed in computer memory. It consists of two separate but related issues: data alignment and data structure padding.

**20.Differentiate between Complier and Interpreter?**

An interpreter reads one instruction at a time and carries out the actions implied by that instruction. It does not perform any translation. But a compiler translates the entire instructions

**21. What is scope of a variable?**

Scope refers to the visibility of variables. It is very useful to be able to limit a variable's scope to a single function. In other words, the variable will have a limited scope.

**22. What is an interrupt?**

Interrupt is an asynchronous signal informing a program that an event has occurred. When a program receives an interrupt signal, it takes a specified action.

**23. What is user defined exception in Java?**

The keywords used in java application are try, catch and finally are used in implementing used-defined exceptions. This Exception class inherits all the method from throw able class.

**24. What is java Applet?**

Applet is java program that can be embedded into HTML pages. Java applets runs on the java enables all web browsers. Applet is designed to run remotely on the client browser.

**25. What do you know about the garbage collector?**

Garbage collection is the systematic recovery of pooled computer storage that is being used by a program when that program no longer needs the storage.

**26. What are enumerations?**

An enumeration is a data type, used to declare variable that store list of names.

**27. What is Cryptography?**

Cryptography is the science of enabling secure communications between a sender and one or more recipients.

**28. What is encryption?**

Encryption is the transformation of information from readable form into some unreadable form.

**29. What is decryption?**

Decryption is the reverse of encryption; it's the transformation of encrypted data back into some intelligible form.

**30. What exactly is a digital signature?**

Just as a handwritten signature is affixed to a printed letter for verification that the letter originated from its purported sender, digital signature performs the same task for an electronic message.

# BHARAT SANCHAR NIGAM

**S.R.AKSHAY SRINIVAS(122108),II year – A section**

**Bharat Sanchar Nigam Limited** (abbreviated **BSNL**) is an Indian state-ownedtelecommunications company headquartered in New Delhi, India. It was incorporated on 15 September 2000. It took over the business of providing of telecom services and network management from the erstwhile Central Government Departments of Telecom Services (DTS) and Telecom Operations (DTO), with effect from 1 October 2000 on going concern basis. It is the largest provider of fixed telephony and fourth largest mobile telephony provider in India, and is also a provider of broadband services. However, in recent years the company's revenue and market share plunged into heavy losses due to intense competition in the Indian telecommunications sector.

BSNL is India's oldest and largest communication service provider (CSP). It had a customer base of 117 million as of Jan 2014. It has footprints throughout India except for the metropolitan cities of Mumbai and New Delhi, which are managed by Mahanagar Telephone Nigam (MTNL).

## Services

BSNL provides almost every telecom service in India. Following are the main telecom services provided by BSNL:

- **Market Share** : As of 30 November 2013, BSNL had 12.9% marketshare in India and stands as 5th Telecom Operator in India and 67% market share in **ADSL** Services.

- **Managed Network Services** : BSNL is providing complete Telecom Services Solution to the Enterprise Customers i.e. **MPLS Connectivity**, **Point to Point Leased Lines** and **Internet Leased Lines** .

- **Universal Telecom Services** : Fixed wireline services and landline in local loop (WLL) using CDMA Technology called **bfone** and **Tarang** respectively. As of 30 June 2010, BSNL had 75% marketshare of fixed lines.

- **Cellular Mobile Telephone Services**: BSNL is major provider of Cellular Mobile Telephone services using GSM platform under the brand name Cellone & Excel (BSNL Mobile). As of 30 June 2010 BSNL has 13.50% share of mobile telephony in the country. It has 95.54million customers using BSNL mobile.

- **Internet**: BSNL provides Internet access services through dial-up connection (as Sancharnet through 2009) as Prepaid, NetOne as Postpaid and ADSL broadband as BSNL Broadband BSNL held 55.76% of the market share with reported subscriber base of 9.19 million Internet subscribers with 7.79% of growth at the end of March 2010. Top 12 Dial-up Service

providers, based on the subscriber base, It Also Provides Online Games via its Games on Demand (GOD)

- **Intelligent Network (IN)**: BSNL offers value-added services, such as Free Phone Service (FPH), India Telephone Card (Prepaid card), Account Card Calling (ACC), Virtual Private Network (VPN), Tele-voting, Premium Rae Service (PRM), Universal Access Number (UAN).

- **3G**:BSNL offers the '3G' or the'3rd Generation' services which includes facilities like video calling, mobile broadband, live TV, 3G Video portal, streaming services like online full length movies and video on demand etc.

- **IPTV**:BSNL also offers the 'Internet Protocol Television' facility which enables customers to watch television through internet.

- **FTTH**:Fibre To The Home facility that offers a higher bandwidth for data transfer. This idea was proposed on post-December 2009

- **Helpdesk**: BSNL's Helpdesk (Helpdesk) provide help desk support to their customers for their services.

- **VVoIP**: BSNL, along with Sai Infosystem - an Information and Communication Technologies (ICTs) provider - has launched Voice and Video Over Internet Protocol (VVoIP). This will allow to make audio as well as video calls to any landline, mobile, or IP phone anywhere in the world, provided that the requisite video phone equipment is available at both ends.

- **WiMax**: BSNL has introduced India's first 4th Generation High-Speed Wireless Broadband Access Technology with the minimum speed of 256kbit/s. The focus of this service is mainly rural customer where the wired broadband facility is not available.

# Challenges

During the financial year 2008–09 (from 1 April 2008 to 31 March 2009) BSNL has added 8.1 million new customers in various telephone services taking its customer base to 75.9 million. BSNL's nearest competitor Bharti Airtel is standing at a customer base of 62.3 million. However, despite impressive growth shown by BSNL in recent times, the Fixed line customer base of BSNL is declining. In order to woo back its fixed-line customers BSNL has brought down long distance calling rate under OneIndia plan, however, the success of the scheme is not known and BSNL faces bleak fiscal 2009-2010 as users flee.

BSNL has started 3G services in 290 cities and acquired more than 600,000 customers. It has planned to roll out 3G services in 760 cities across the country in 2010-11. according to users and big sources BSNL's 3G data speed is much higher than other operator and also it is competitively cheap.

Broadband services: The shift in demand from voice to data has revolutionized the very nature of the network. BSNL is poised to cash on this opportunity and has planned for extensive expansion of the Broadband services. The Broadband customer base of 3.56 Million customer in March'2009 is planned to be increased to 16.00 million by March 2014. On 13 June 2012, BSNL employees participated called off an earlier planned nationwide strike against discriminatory policies of BSNL management upon promise by Management to resolve the Demands of the protesting unions. In March 2013, BSNL was also (according to one study) a major transit point for internet spam

# BSNL - MTNL Merger Plans:-

# 3G

While it did not participate in the 3G auction, BSNL paid the Indian government Rs. 101.87 billion for 3G spectrum in all 20 circles it operates in. State-owned MTNL provides 3G services in the other 2 circles - Delhi and Mumbai. Both these state-owned operators were given a head start by the government in the 3G space by allotting the required 3G spectrum, on the condition that each will have to pay an amount which will be equivalent to the highest bid in the respective service areas as and when the 3G auctions take place. BSNL recently launched a 3G wireless pocket router named Winknet Mf50 for 5800/- Indian rupees. It was released in collaboration with another telecom service provider Shyam networks. Winknet Mf50 enables you to connect multiple devices to the internet using a single sim card.

# Recognitions

The Brand Trust Report published by Trust Research Advisory ranked BSNL in the 65th position of the list of Most Trusted brands.

# Competitors

BSNL competes with 14 other mobile operators throughout India. They are Aircel, Airtel, Idea, Loop Mobile, MTNL, MTS, Reliance Communications, Tata DoCoMo, Uninor, Videocon, Virgin Mobile and Vodafone.

# Quality of Service

BSNL goes by the motto "Connecting India, faster" and displays the same at their homepage. BSNL offers seamless coverage in almost all urban and rural areas of India.

# Censorship

BSNL enforces censorship of online content as per orders of Indian Department of Telecom.

# STUDENTS ACHIEVEMENTS

## 1. STUDENTS TECHNICAL ASSOCIATIONS / PARTICIPATION ELSEWHERE:

| NAME | YEAR | TITLE OF EVENT | LOCATION |
|---|---|---|---|
| 1. T.E.Bhagat Singh | IV 'A' Sec. | Seminar on Energy From Waste | Vivekanandha institute of Engg & Tech for women, Tiruchengode, Namakkal. 17th & 18th July 2013. |
| 2. L.R.C Ashok kumar | III 'A' Sec | Blood donation | Christian mission hospital, Madurai. 8th August 2013. |
| 3. D.Muthu Rakesh<br>4. M.Poomanirajan | M.E., II | National Workshop on Computational intelligent tech & application. | Kongu Engineering college, Erode.30th & 31st Aug 2013. |
| 5. V.Karel marx<br>6. R.Vigneshram | M.E., II | Solar PV design consideration for industry & domestic application. | P.S.G. college of technology, Coimbatore.30th & 31st Aug 2013. |
| 7. N.S.Praveen Kumar | IV 'B' Sec | Project Presentation<br>Differential tearing control for autonomous robot. | A.C. College of Engineering & Tech. Karaikudi.4th & 5th Sep 2013. |
| 8. J.Micheal mathan<br>9. S.V.Balaji | IV 'A' | Symposium<br>Paper Presentation | K.L.N.C.I.T Pottapalayam<br>Madurai.17th Sep 2013 |
| 10. P.Diwan mohideen Ashik | III 'A' | Workshop<br>SLATE-Skyfi lab | K.L.N.C.E Pottapalayam<br>Madurai.21st Sep 2013 |
| 11. J.Kavitha | III 'B' | Workshop<br>SLATE-Skyfi lab | K.L.N.C.E Pottapalayam<br>Madurai.21st Sep 2013 |
| 12. J.Kavitha | III 'B' | Miniproject | K.L.N.C.E Pottapalayam<br>Madurai.5th Sep 2013 |
| 13. M.Deepika | III 'A' | | |

| NAME | YEAR | TITLE OF EVENT | LOCATION |
|---|---|---|---|
| 14. J.Kavitha | III 'B' | Workshop on medium level robot | K.L.N.C.E Pottapalayam<br>Madurai.21st Sep 2013 |
| 15. M.Deepika | III 'A' | | |
| 16. G.SatheshKumar | III 'A' | Exhibition on Innovation & inventions- GRD | P.S.G. college of Technology, Coimbatore.<br>27th – 29th Sep 201 |
| 17. M.Deepika | III 'A' | Workshop in the Concept of OOPS | K.L.N.C.E Pottapalayam<br>Madurai.21st Sep 2013 |
| 18. J.K.Karthick<br>19. N.Suganyadevi | IV 'B' | Technical Symposium – Paper Presentation | K.L.N.C.I.T Pottapalayam<br>Madurai.1st OCT 2013 |
| 20. T.C.Aravind Venkatesh | IV 'A | Workshop on ENTRAIN-Animation | Mepco Schlenk Engg College<br>Sivakasi.5th OCT 2013 |
| 21. Deepak prasanna<br>22. K.J.Balaji | III 'A | Workshop on object tracking robot using image processing | Madras Institute of Technology, Chennai.<br>5th & 6th OCT 2013 |
| 23. N.Venkatesh<br>24. G.Manikandan<br>25. K.P.Ramprasath | ME II | Seminar on current trends of renewable energy | Sri Sairam Engineering college, Chennai.<br>8th &9th OCT 2013 |
| 26. C.Monisha<br>27. M.John Baptista | IV 'A' | National level Techno fest – Project demo | Cape Institute of Technology, Nagercoil.8th & 9th OCT'13 |
| 28. M.Poomaniarajan<br>29. B.Kumarasamy<br>30. N.E.Ganaga<br>31. P.Pon Ragothama priya<br>32. S.Suriya<br>33. A.Nachammai<br>34. R.Andalpriyathatshini | ME II | International Conference – ICPES'13 | Velammal College of Engineering & Technology, Madurai,<br>20th DEC 2013. |

## 2. STUDENTS ACHIEVEMENTS / AWARD WON

| NAME | YEAR | TITLE OF EVENT | LOCATION | PRIZE WON |
|---|---|---|---|---|
| G.Kathiravan | II 'A' | Cultural Fest – Makkal Arangam | Mepco Schelenk Engineering College, Sivakasi<br>07th Sep 2013 | 2nd Prize |
| R.S.Muralikrishna | III 'B' | Technical Symposium CYBORG 2K13 - ILLUMNA | K.L.N.C.I.T Pottapalayam<br>Madurai. 4th OCT 2013 | 2nd Prize |
| K.R. Murali Sreenivasan | IV 'A' | Technical Symposium CYBORG 2K13 – Techno Buzz | K.L.N.C.I.T Pottapalayam<br>Madurai.4th OCT 2013 | 2nd Prize |
| K.R. Murali Sreenivasan | IV 'A' | Technical Symposium CYBORG 2K13 – INTERMEDIA | K.L.N.C.I.T Pottapalayam<br>Madurai.4th OCT 2013 | 2nd Prize |
| P.Dineshkumar<br>S.Hariharan | IV 'A' | Technical Symposium – Project presentation | Kamaraj college of Engineering & technology, Virudhunagar.<br>1st OCT 2013 | 3rd Prize |

- Institute of Engineers(India) Sanctioned ₹80,000/ to **E.Jeyasri** ME Power System Engineering for the PG Project "Design and Implementation of Hybrid filter for converter System".
- Institute of Engineers(India) Sanctioned ₹50,000/ to **S.Raghunandhan, M.Shanmugavelrajan, S.Prakash, M.Sivasankara Subramanian**, of Final Year EEE for the UG

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