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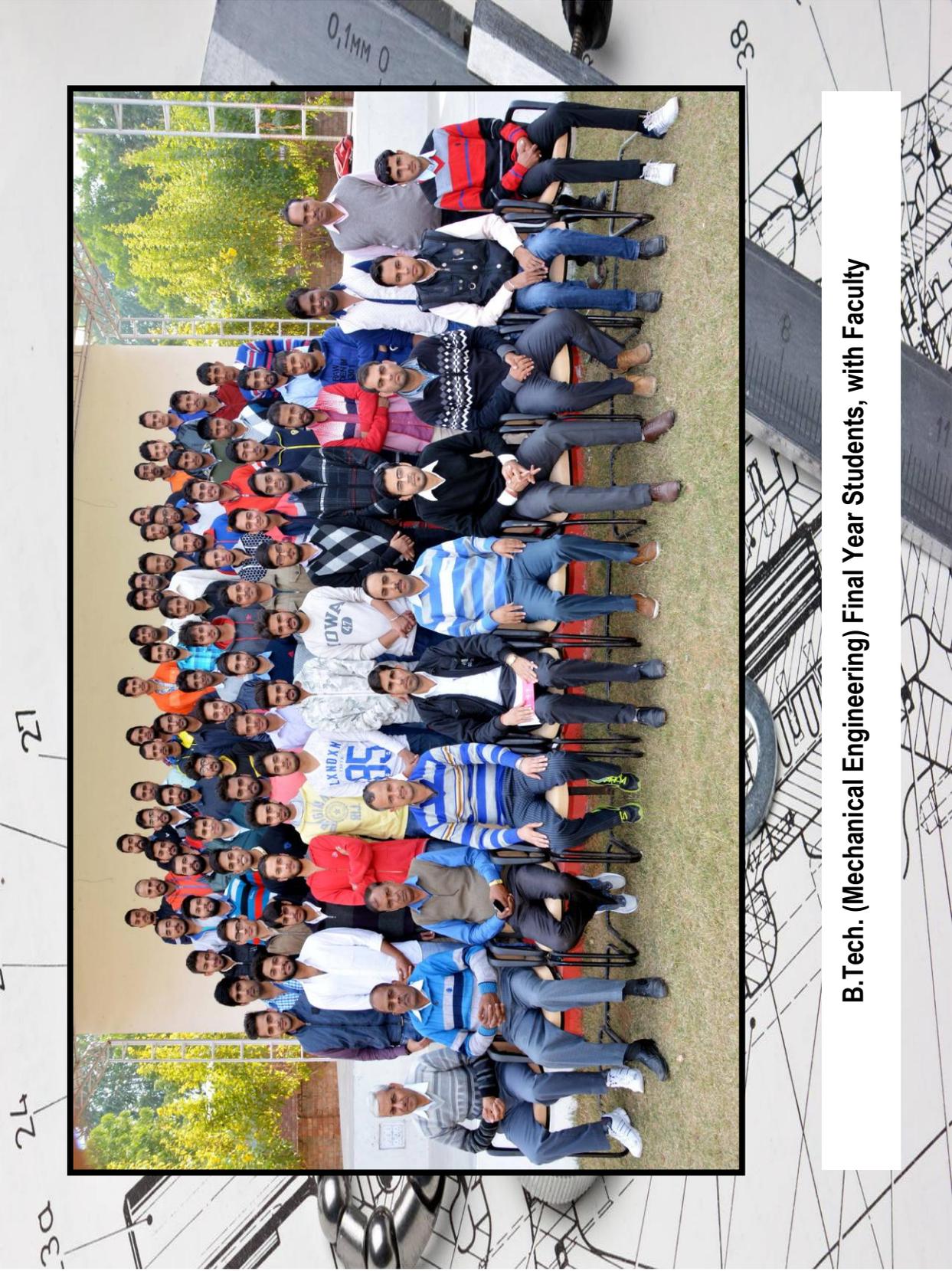
2016-2017

TECHNICAL MAGAZINE OF MECHANICAL ENGINEERING SOCIETY

DEPARTMENT OF MECHANICAL ENGINEERING

BRCM COLLEGE OF ENGINEERING & TECHNOLOGY

Bahal- 127028, Distt. - Bhiwani, Haryana



B.Tech. (Mechanical Engineering) Final Year Students, with Faculty

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ARTICLES

THERMAL COMFORT FOR ALL: SUSTAINABLE DEVELOPMENT

Dr. Sanjay Jangra, A.P., ME

While the building stock in India continues to increase at a rate faster than anywhere in the world¹, and the AC market braces for a rapid increase in penetration, right now is the critical window of opportunity to mitigate adverse societal and environmental impacts through timely policy interventions. The challenge for India is twofold: (1) With extreme heat, areas of high relative humidity, and a significant portion of the population with limited means for active space cooling, how does one provide thermal comfort to all in an affordable and sustainable fashion? (2) India is at the cusp of an exponential growth in the air conditioner (AC) market². Under a business as usual scenario, room AC penetration is expected to add approximately 150 GW to the peak demand by 2030, and 300-500 GW by 2050³.

A hierarchical approach, Lean-Mean-Green as it applies to smart and sustainable cooling strategies advocates: (1) Lean: First, reduce cooling load through incorporating better building design. (2) Mean: Next, optimize energy use through energy efficient measures and efficient performance standards for appliances. (3) Green: Finally, reduce the carbon footprint to the extent possible through use of clean energy and low-GWP technologies.

Thermal comfort is defined as the expression of an individual's satisfaction with the thermal environment and is assessed by subjective evaluation. Indoor thermal comfort affects humans psychologically and physiologically. It impacts health and productivity and improves the sense of well-being. For these reasons, *Thermal Comfort for All* should become an important goal for all developing countries like India. Ceiling fans, air coolers and air-conditioners are used constantly to combat uncomfortable ambient conditions for a large part of the year in most places in India. However, merely relying only on active cooling in commercial and residential buildings leads to increased peak demands and overall energy consumption. *Figure 1* point towards the magnitude of the cooling problem in India vis-à-vis China and the US.

Presently, demand for cooling is one of the largest drivers of power demand, as evidenced by the average daily load in Mumbai and New Delhi in summer versus winter (*Figure 2*). Considering their precarious financial situation and notwithstanding the positive impact of GOI's UDAY scheme, many Indian utilities would find it challenging to deal with peak demand induced by active cooling.

¹(Schnapp and Lausten, 2013)

²(Davis and Gertler, 2015)

³(Phadke et al. 2013, Shah et al. 2015)

In commercial buildings, heating, ventilation and air-conditioning (HVAC) systems can account for 40% to 60% of the total energy use (Singh et al., 2013), putting a heavy drain on enterprises by significantly increasing the operating cost of buildings. Although air-conditioning makes indoor thermal conditions comfortable, it is nonetheless energy-intensive. In many cases, it also currently uses refrigerants with a high global warming potential (GWP).

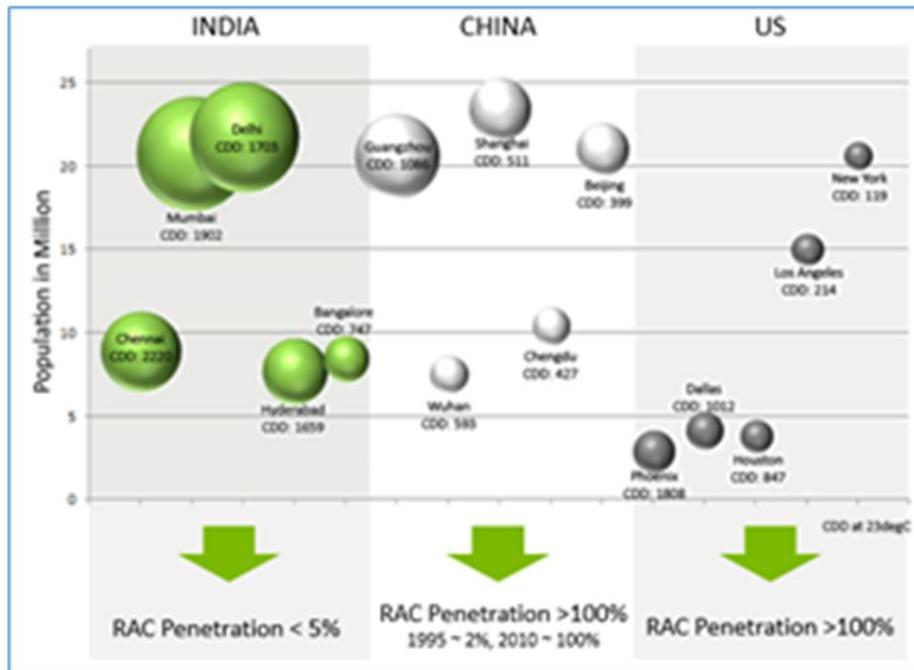


Figure 1: Cooling Demand in India, China and the US (selected cities)
(Source: AEEE)

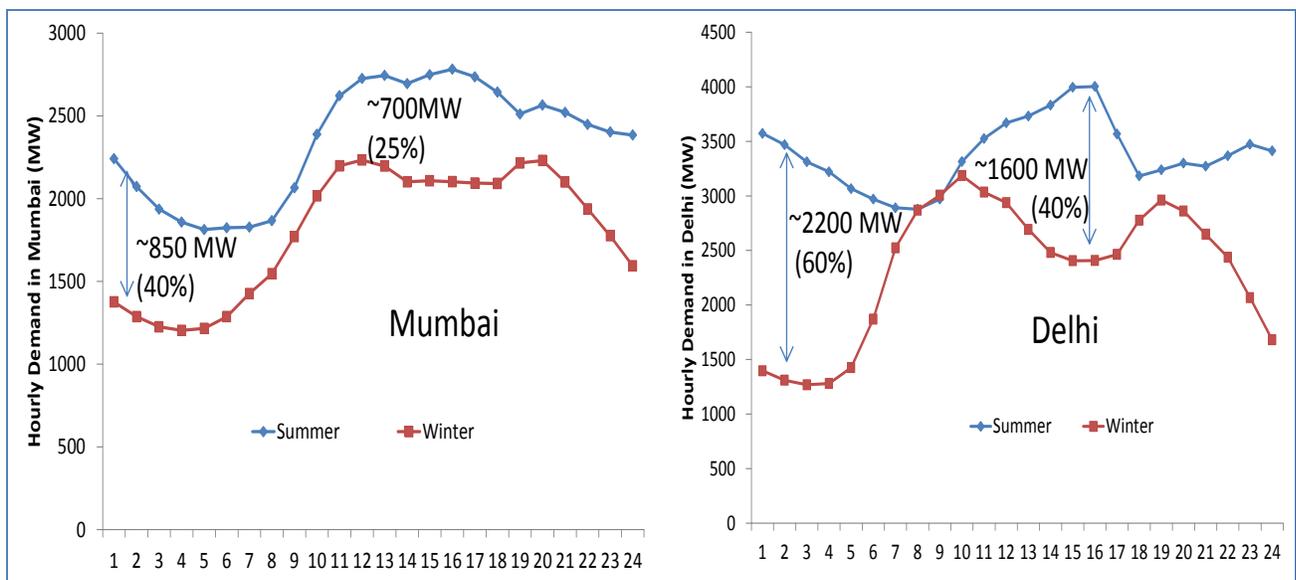


Figure 2: Average Daily Load Curves in Mumbai and Delhi for summer v/s winter
(Source: Lawrence Berkeley National Laboratory (LBNL))

THERMAL COMFORT: *STUDIES AND POTENTIAL IMPACT IN INDIA*

People in warm, tropical countries need a different range of thermal comfort conditions compared to those in temperate climates. Two independent studies in India (Manu et al, 2015) and Japan (Indraganti-et-al, 2014) indicated that close to 80% of occupants are comfortable with indoor operating temperatures of 24°C to 28°C in these countries. This thermal band becomes wider in the presence of air motion around occupants. This is much higher than the thermal comfort range defined for air conditioned buildings by American Society for Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) 55 – 2010 which is widely followed in the North American countries. The India Model for Adaptive Comfort (IMAC) developed by CEPT University indicates that Indians’ thermal comfort range is even wider for Naturally Ventilated (NV) and Mixed Mode (MM) buildings. The IMAC research findings have been incorporated in the National Building Code Sustainability Chapter (Amendment No. 1 September 2015 to National Building Codes of India 2005). Even for those already accustomed to fully air conditioned buildings, the range is warmer than the 22.5°C ± 1°C ‘Class A’ specification (ASHRAE 55, 2010) that a typical commercial air conditioned buildings in India operate at all year round.

Buildings can be designed and operated to exploit natural ventilation and mixed mode operations to meet occupants’ thermal comfort and other IEQ requirements. Even when air conditioning is used, the thermostat can be set to 24-25°C, and possibly higher when fans are deployed to provide assisted air motion. Doing so would bring down the average energy consumption per unit area due to HVAC operation, since HVAC energy use can be up to 40-60% of the total energy consumed in such buildings. The estimated reduction in EPI (kWh/m²/year) for HVAC per degree increase in thermostat setting is 5% to 6%. (Manu et al, 2015).

Challenges & Opportunities

Several proven tools and practices exist to reduce the cooling load in buildings. Their adoption is typically the easiest and most effective when incorporated right into the building design and construction stage. However higher rate of adoption continues to remain a challenge due to either lack of consumer awareness or market confusion about available options.

We see a couple of key areas of opportunity to advance the integration of lean cooling strategies into mainstream:

- Utilize market transformation strategies to drive the adoption of EE building materials
- Leverage ECBC to move the industry towards more efficient building design.

With India adding new building stock at a rate faster than anywhere else in the world, several development initiatives by the government centred on clean energy, sustainable communities and affordable housing for all, afford another important opportunity to incorporate and benefit from lean space cooling strategies. Integration into on-going government initiatives will also aid in consumer awareness about the value proposition of embracing lean strategies, as well as position the government to lead by example as a steward of sustainable practices.

THE FUTURE PROSPECTS OF INDIAN SOLAR INDUSTRY

Sunil Baloda, A.P., ME

India is a country that has tremendous solar energy potential. As the nation is facing an increasing demand - supply gap in energy, it is important to tap the solar potential to meet the energy needs. This article analyzes the Indian Solar industry, its major growth drivers, the challenges it faces and the various policy initiatives taken by the government. The article also tries to identify the various actions required to promote the growth and development of the industry, enabling India to meet the rising energy demands of the future.

India is in a state of perennial energy shortage with a demand-supply gap of almost 12% of the total energy demand. This trend is significant in the electricity segment that is heavily dependent on coal and other non-renewable sources of energy. Renewable energy (RE) sources contribute only 7.7% of the total installed power capacity of 167,077 MW in India. Among the RE sources, wind power is the dominating component while solar energy currently contributes to less than 0.1% (on-grid+ off-grid) of the total installed capacity.

Table 1 Calculation of Solar Potential in India

Total Land Area (sq km)	3287590
Number of sunny days	250 to 300
Unit potential from 1 sq. m	4 kWh/day
Conversion efficiency	15 %
1 sq. km (Million units per year)	120
0.5% of land used (in sq km)	16438
Potential units (in billions)	1972

The solar energy potential in India is immense due to its convenient location near the Equator. India receives nearly 3000 hours of sunshine every year, which is equivalent to 5000 trillion kWh of energy. As shown in Table 1, India can generate over 1,900 billion units of solar power annually, which is enough to serve the entire annual power demand even in 2030 (estimates). In India, Rajasthan and Gujarat are the regions with maximum solar energy potential. This, coupled with the availability of barren land, increases the feasibility of solar energy systems in these regions. Considering India's solar potential, the government has rolled out various policies and subsidy schemes to encourage growth of the Solar Industry, which is expected to experience exponential growth in the coming years.

Government Initiatives to Develop the Solar Energy Sector

There are three government bodies established to promote solar energy in India. The first is the Ministry of New and Renewable Energy (MNRE), which is the nodal unit for all matters relating to Renewable Energy. The second, India Renewable Energy Development Agency (IREDA), is a public limited company established in 1987 to promote, develop and extend financial assistance for Renewable Energy and energy efficiency/conservation projects. Finally, Solar Energy Centre (SEC) is a dedicated unit of the MNRE and the Government for the development of solar energy technologies and promotion of its applications through product development. Besides this, government has also rolled out various policies and subsidies to promote this sector.

India's National Action Plan on climate change (NAPCC) identifies eight critical missions to promote climate mitigation and adaptation. National Solar Mission, which has the specific goal of increasing the usage of solar thermal technologies in urban areas, industry, and commercial establishments, is one of the core components of this policy. The government also offers capital subsidies to semiconductor manufacturing plants in Special Economic Zone (SEZs) and outside SEZs through semiconductor policy launched in 2007. In 2009, MNRE launched "Jawaharlal Nehru National Solar Mission (JNNSM)" with the ambitious goal of making India a global leader in solar energy. JNNSM plans a three-phase approach with specific targets for each phase as given in Table 2. The other targets of this mission include achieving grid parity (same production cost as current electricity source) by 2022 and parity with coal based power generation in 2030.

Table 2 Jawaharlal Nehru National Solar Mission Targets

Solar Application	Target Phase I 2010-2013	Target Phase II 2013-2017	Target Phase III 2017-2022
Solar Thermal Collectors	7 Million Sq. m	15 Million Sq. m	20 Million Sq. m
Off grid solar applications	200 MW	1000 MW	2000 MW
Utility grid applications	1000-2000 MW	4000-10000 MW	20000 MW

Factors Driving the Growth of Solar Energy in India

The factors propelling the current and future growth in the solar energy segment are segregated into demand side growth drivers and supply side growth drivers. Table 3 summarizes the major growth drivers and challenges faced by this industry.

Table 3 Solar Energy: Drivers of demand and supply and major challenges

Demand Side Growth Factors	Supply Side Growth Factors	Challenges
Rising energy needs	Over dependence on coal	Lowering the cost of manufacture
Falling costs	Over dependence on oil imports	Non uniform supply across states
Persistent energy deficit	Heavy subsidies for companies	Closer industry – government cooperation
Government’s heavy subsidies	Huge rural demand	Collaborative goal drive R&D
Preference for eco-friendly technology	Abundant sun rays	Efficient financing infrastructure
		Increasing consumer awareness
		Lack of standards

Demand Side Growth Factors

India suffers persistent energy shortage with average demand-supply gap revolving around 12% of total power supply. This, coupled with rising energy needs, is a major factor driving the growth of this segment. The Power Ministry forecasts electricity consumption to increase to around 1900 kWh by 2032 from the current 660 kWh. Policy measures such as JNNSM, aimed at encouraging investment in the solar energy sector, shall help develop a market for solar energy in India, thereby driving down costs. Increasing public awareness about issues such as energy scarcity and environmental preservation shall also fuel the demand for eco-friendly power, hinting at growth opportunities for solar power.

Supply Side Growth Factors

The current power generation in India is heavily dependent on non-renewable natural resources such as coal and diesel, whose fast depletion has forced the government and the power generation companies to look into Renewable Energy sources, especially solar power. The favorable environment created by government through subsidy schemes and policies is encouraging power generation companies to invest in this sector and thus promoting growth. The other major factors driving the growth from the supply side are huge demand for electricity in rural areas lacking grid connectivity, and abundant availability of sunrays in India throughout the year.

Challenges Faced by Solar Energy Sector in India

The solar industry in India is still in its nascent stage and faces many challenges such as high costs of solar power generation. In India, cost of solar electricity produced on-grid is Rs. 18.44/unit. This high cost is mainly due to dependence on imports for silicon and solar wafers used for the manufacture of solar cells – about 80% of which comes through imports. Solar projects are capital intensive, and the lack of an effective financing infrastructure for these

projects is another major factor impeding growth in this sector. Another challenge faced today is the disparity in solar potential across states.

Currently Research and Development (R&D) in this sector is on a slow track due to lack of collaborative and goal driven efforts on this front. Technological innovations that improve the efficiency of current solar energy systems are necessary to exploit the solar energy potential in India. In order to facilitate this, government has to frame comprehensive R&D schemes and provide incentives along with the current subsidy schemes. Another major factor restricting the growth of this sector is the lack of standards, resulting in the fragmentation of the market among manufacturers and suppliers. Standardization of systems will lead to rationalization of cost as companies can invest in R&D and newer technologies to meet common specifications. Facilitating closer industry – government cooperation and increasing consumer awareness about the benefits of solar energy are some of the other main challenges currently faced by the industry. Table 3 sums up the demand and supply drivers for the solar industry, in addition to the challenges faced by the industry.

Active growth of the Indian solar energy industry calls for immediate implementation of the following steps. These measures will not only boost the growth of solar energy sector, but also reduce the usage of non-renewable sources of energy and carbon footprint.

Faster and Efficient Implementation of Renewable Energy Certificates (RECs)

RECs are interstate tradable certificates issued for every unit of renewable energy produced. Mechanisms such as these are essential to achieve NAPCC's goal of increasing the mandatory Renewable Energy usage for states from 5% today to approximately 15% in the next 10 years. Instead of producing Renewable Energy by their own, states can purchase RECs from each other to increase their Renewable Energy content in total energy. This mechanism will enable low Renewable Energy potential states to purchase RECs from high potential states, enabling them to meet NAPCC's increased demands. Moreover, these purchases will incentivize high Renewable Energy potential states to produce more Renewable Energy than required currently, enabling overall increase in Renewable Energy production.

Carbon Trading as a Source of Revenue

Solar power generation emits lesser amount of CO₂ compared to conventional sources of energy such as coal. Trading this reduction in the emissions trading market can be another source of income for the Solar Energy manufacturers. We estimate that on an average – considering the current rate of emissions trading – savings of anywhere between Rs 0.9-1.5 can be achieved per unit of electricity produced. This will partially help in offsetting the high cost of solar production.

Selective Implementation of On-Grid Application

From today's technology standpoint, solar power generation works at 15-20% efficiency. Under this scenario, large-scale on-grid applications are more feasible in areas where there is plenty of barren land and high rate of irradiance such as Gujarat and Rajasthan. It is very important to concentrate the efforts in these areas to realize solar potential there before moving onto other parts where the irradiance is low or there is scarcity of barren land. The Renewable Energy produced in these regions can be transferred to other states through RECs, enabling uniform distribution.

Large-scale on-grid applications are more feasible in areas where there is plenty of barren land and high rate of irradiance such as Gujarat and Rajasthan.

Development of Off-Grid Application

More than 80, 000 villages in India suffer major electricity supply shortages throughout the year, which provides tremendous opportunity for off-grid solar applications deployment. Some of the possible applications are lighting and electrification systems, solar powered cellular towers, irrigation pumps and street lighting. Table 4 gives an estimate of the diesel savings and carbon emission reduction possible through deployment of solar cellular towers.

Table 4 Solar cellular towers: Cost estimate of diesel savings

Total towers	250,000
Diesel/month	2008.7 Million litres
Diesel carbon emissions	5.85 pounds/litre
Total carbon emissions from towers/year	11.76 billion pounds
Cost of diesel for towers/year	Rs. 8000 Cr

Establishment of Localized Mini-Grids

Localized mini-grids based on Photo Voltaic (PV) cells can be set up in regions that lack grid connectivity due to physical or financial barriers. Electricity generated by these mini-grids can be distributed through localized low-tension networks. Central government subsidy can finance initial setup, state and local governments can fund distribution overlay, and revenue collected from sale of electricity can fund the operation and maintenance expenses. The main advantages of mini-grids are lesser initial setup costs and power tariff comparable to that of conventional grid power. The mini-grids in Sunderbans stand testimony to the success this system can achieve in India.

Summary

Solar Energy possesses tremendous potential in bridging India's energy demand-supply gap in the future. There are various challenges for this industry, including lowering cost of production, increasing R&D, consumer awareness and financing infrastructure. It is important to overcome these challenges for fast growth and mass adoption of the technology. Some of the immediate actions to enable growth are efficient implementation of renewable energy certificates, usage of carbon trading as a source of revenue, immediate implementation of grid powered energy in regions of Rajasthan and Gujarat, development of off-grid usage in various applications such as cellular towers and encouraging localized mini grids in areas that lack connectivity today. If these initiative work as planned, it is only a matter before India becomes one of the world leaders in Solar Energy.

3 - D PRINTING NEXT GENERATION

Nitesh Jain, A.P., ME

1. Introduction to 3D Printing

General explanation of 3D Printing:

A method of manufacturing known as 'Additive manufacturing', due to the fact that instead of removing material to create a part, the process adds material in successive patterns to create the desired shape.

Main areas of use:

- Prototyping.
- Specialized parts – aerospace, military, biomedical engineering, dental.
- Hobbies and home use.
- Future applications– medical (body parts), buildings and cars.

3D Printing uses software that slices the 3D model into layers (0.01mm thick or less in most cases). Each layer is then traced onto the build plate by the printer, once the pattern is completed, the build plate is lowered and the next layer is added on top of the previous one.

Typical manufacturing techniques are known as 'Subtractive Manufacturing' because the process is one of removing material from a preformed block. Processes such as Milling and Cutting are subtractive manufacturing techniques. This type of process creates a lot of waste since; the material that is cut off generally cannot be used for anything else and is simply sent out as scrap. 3D Printing eliminates such waste since the material is placed in the location that it is needed only, the rest will be left out as empty space.

Advantages and Limitations:

Layer by layer production allows for much greater flexibility and creativity in the design process. No longer do designers have to design for manufacture, but instead they can create a part that is

lighter and stronger by means of better design. Parts can be completely re-designed so that they are stronger in the areas that they need to be and lighter overall.

3D Printing significantly speeds up the design and prototyping process. There is no problem with creating one part at a time, and changing the design each time it is produced. Parts can be created within hours. Bringing the design cycle down to a matter of days or weeks compared to months. Also, since the price of 3D printers has decreased over the years, some 3D printers are now within financial reach of the ordinary consumer or small company.

The limitations of 3D printing in general include expensive hardware and expensive materials. This leads to expensive parts, thus making it hard if you were to compete with mass production. It also requires a CAD designer to create what the customer has in mind, and can be expensive if the part is very intricate. 3D Printing is not the answer to every type of production method; however its advancement is helping accelerate design and engineering more than ever before.

We are beginning to see the impact of 3D printing many industries. There have been articles saying that 3D printing will bring about the next industrial revolution, by returning a means of production back within reach of the designer or the consumer.

Table showing all available types of 3D Printers:

Type	Technology	Materials
Extrusion	Fused deposition modeling (FDM)	Thermoplastics (e.g. PLA, ABS), eutectic metals, edible materials
Granular	Direct metal laser sintering (DMLS)	Almost any metal alloy
	Electron beam melting (EBM)	Titanium alloys
	Selective heat sintering (SHS)	Thermoplastic powder
	Selective laser sintering (SLS)	Thermoplastics, metal powders, ceramic powders
	Powder bed and inkjet head 3d printing, Plaster-based 3D printing (PP)	Plaster
Laminated	Laminated object manufacturing (LOM)	Paper, metal foil, plastic film
Light polymerized	Stereo lithography (SLA)	photopolymer
	Digital Light Processing (DLP)	liquid resin

2. Designing for 3D Printing:

All the parts created using a 3D printer need to be designed using some kind of CAD software. This type of production depends mostly on the quality of the CAD design and also the precision of the printer. There are many types of CAD software available, some are free others require you to buy the software or have a subscription. Deciding what type of CAD software is good for you

will depend on the requirements of what you are designing. However for beginners, that simply want to learn CAD and create basic shapes and features, any of the free CAD software packages will do.

When designing a part to be 3D printed the following points need to be kept in mind:

- The part needs to be a solid, that is, not just a surface; it needs to have a real volume.
- Creating very small, or delicate features may not be printed properly, this depends greatly on the type of 3D printer that is going to be used.
- Parts with overhanging features will need supports to be printed properly. This should be taken into account since after the model needs to be cleaned by removing the supports. This may not be an issue unless the part is very delicate, since it might break.
- Be sure to calibrate the 3D printer before using it, it is essential to ensure that the part sticks properly to the build plate. If it does not, at some point the part may come loose and ruin the entire print job.
- Some thought should be given to the orientation of the part, since some printers are more precise on the X and Y axes, then the Z axis.

3. Current and future applications of 3D Printing:

Biomedical Engineering

In recent years scientists and engineers have already been able to use 3D printing technology to create body parts and parts of organs. The first entire organ created through 3D Printing is expected to be done in the coming years. The process of creating the organ or body part is exactly the same as if you were to create a plastic or metal part, however, instead the raw material used are biological cells created in a lab. By creating the cells specifically for a particular patient, one can be certain that the patient's body will not reject the organ.

Aerospace and Automobile Manufacturing:

High technology companies such as aerospace and automobile manufacturers have been using 3D printing as a prototyping tool for some time now. However, in recently years, with further advancement in 3D printing technology, they have been able to create functional parts that can be used for testing.

The future of 3D printing in these industries lies with creating working parts directly from a 3D printer for use in the final product, not just for testing purposes. This process is already underway for future cars and aircraft. The way in which 3D printing works (creating a part layer by layer) allows the designer to create the part exactly the way it needs to be to accomplish the task at hand. Extremely complex geometry can be easily created using a 3D printer, allowing for parts to be lighter, yet stronger than their machined counterparts.

Construction and Architecture:

Architects and city planners have been using 3D printers to create a model of the layout or shape of a building for many years. Now they are looking for ways of employing the 3D printing

concept to create entire buildings. There are already prototype printer systems that use concrete and other more specialized materials to create a structure similar to a small house. The goal is the replace many cranes and even construction workers with these printing systems. They would work by using the 3D design model created on CAD software, to create a layer by layer pattern on the building just as a normal 3D printer works today. Most of the innovation in this area will have to come from the creation of the appropriate materials.

CRYOGENICS-A NEW REVOLUTION

PRABHANSHU SINHA, 3rd Year

INTRODUCTION

Cryogenic is the study of production of very low temperatures (123K) and the behavior of properties of material at that low temperature. Cryogenics originated from two Greek words “kyros” which means cold or freezing and “genes” which means born or produced. Cryogenics is the study of very low temperatures or the production of the same. Liquefied gases like liquid nitrogen and liquid oxygen are used in many cryogenic applications.

The field of cryogenics advanced when during world war two, when metals were frozen to low temperatures showed more wear resistance. In 1966, a company was formed, called CyroTech, which experimented with the possibility of using cryogenic tempering instead of Heat Treating, for increasing the life of metal tools. The theory was based on the existing theory of heat treating, which was lowering the temperatures to room temperatures from high temperatures and supposing that further descent would allow more strength for further strength increase. Unfortunately for the newly-born industry the results were unstable as the components sometimes experienced thermal shock when cooled too fast.

Characteristic temperatures of cryogenic fluids [K]

CRYOGEN	TRIPLE POINT	NORMAL BP	CRITICAL POINT
Methane	90.7	111.6	190.5
Oxygen	54.4	90.6	154.6
Argon	83.8	87.3	150.9
Nitrogen	63.1	77.3	126.2
Neon	24.6	27.1	44.2
Hydrogen	13.8	20.4	33.2
Helium	2.2	4.2	5.2

CRYOGENIC TECHNOLOGY

A cryogenic technology is the process of involvement or including of usage of rocket propellants at a cryogenic temperature. It can be combination of liquid fuels such as: liquid Oxygen (LOX), and liquid Hydrogen (LH2) as an oxidizer and fuel in the different mixtures or proportions. The mixture of fuels offer the highest energy efficiency for the rocket engines that produces very high amount of thrust. Here, the Oxygen remains liquid only at the temperature below (-183°C) and Hydrogen below (-253°C). This is a type of rocket engine that is functionally designed to use the oxidizer which must be refrigerated in the liquid state. Sometimes, the liquid nitrogen (LN2) is used as a fuel because the exhaust is also nitrogen. Liquid oxygen is injected below critical temperature but above critical pressure. In our atmosphere nitrogen is nearly about 78%. Nitrogen is a non-pollutant gas and during exhaust no other harmful gases are produced. Hence its efficiency is very high than any other Jet engines.

HISTORY OF CRYOGENIC ROCKET ENGINE

In 1963, United States of America was the first country to develop the CRE with the use of RL-10 engines with the successful flight and it is still used on Atlas-V rocket. Other countries are like: Japan used LE5 in 1997, France used HM7 in 1979 used the respective rocket engines. Here the mixture of liquid N₂, H₂ and O₂ are used as fuels. In 1987, first CRE was launched with human in space.

COMPONENTS OF CRYOGENIC ROCKET ENGINE

1. Combustion Chamber
2. Pyrotechnic igniter
3. Fuel injector
4. Fuel cryopumps
5. Oxidizer cryopumps
6. Gas turbines
7. Cryo valves
8. Regulator
9. Fuel tank & rocket nozzle

WORKING

Cryogenic Engines are rocket motors designed for liquid fuels that have to be held at very low "cryogenic" temperatures to be liquid - they would otherwise be gas at normal temperatures. Typically Hydrogen and Oxygen are used which need to be held below 20°K (-423°F) and 90°K (-297°F) to remain liquid.

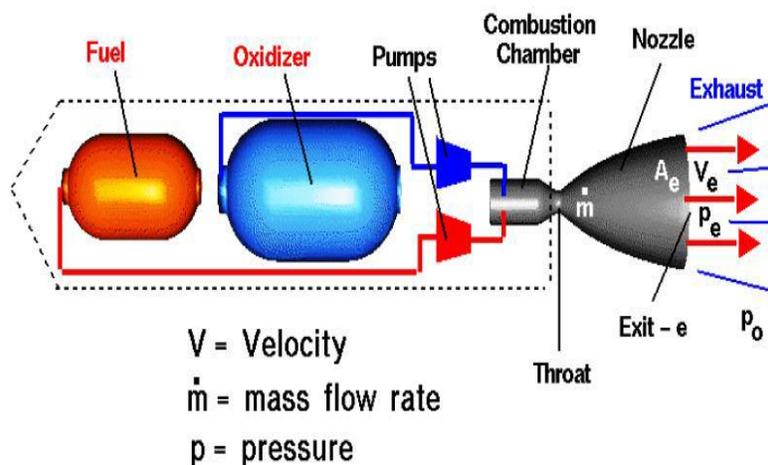
The engine components are also cooled so the fuel doesn't boil to a gas in the lines that feed the engine. The thrust comes from the rapid expansion from liquid to gas with the gas emerging from the motor at very high speed. The energy needed to heat the fuels comes from burning them, once they are gasses. Cryogenic engines are the highest performing rocket motors. One disadvantage is that the fuel tanks tend to be bulky and require heavy insulation to store the propellant. Their high fuel efficiency, however, outweighs this disadvantage.

The Space Shuttle's main engines used for liftoff are cryogenic engines. The Shuttle's smaller thrusters for orbital maneuvering use non-cryogenic hypergolic fuels, which are compact and are stored at warm temperatures. Currently, only the United States, Russia, China, France, Japan and India have mastered cryogenic rocket technology.

The cryogenic engine gets its name from the extremely cold temperature at which liquid nitrogen is stored. Air moving around the vehicle is used to heat liquid nitrogen to a boil. Once it boils, it turns to gas in the same way that heated water forms steam in a steam engine. A rocket like the Ariane 5 uses oxygen and hydrogen, both stored as a cryogenic liquid, to produce its power. The liquid nitrogen, stored at -320 degrees Fahrenheit, is vaporized by the heat exchanger. Nitrogen gas formed in the heat exchanger expands to about 700 times the volume of its liquid form. This highly pressurized gas is then fed to the expander, where the force of the nitrogen gas is converted into mechanical power.

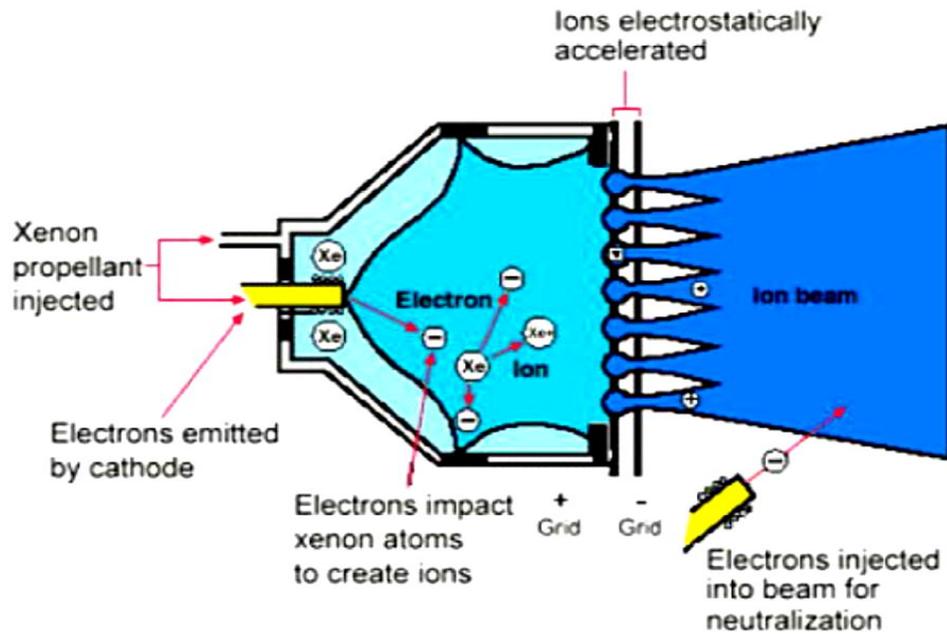
WHY HIGH EFFICIENCY?

According to Newtonian third law of mechanics, “Action and Reaction are equal and opposite in direction”. Rocket engine operates through force of its exhaust pushing it backwards. Thrust is in opposite direction and more efficient in lower atmosphere or vacuum (sometimes). It makes the use of liquid oxygen as an oxidizer and liquid hydrogen as fuel. Pure liquid oxygen as oxidizer operates significantly at hotter combustion chambers due to which extremely high heat fluxes are produced which is not available in any jet engines. In jet engines petrol, diesel, kerosene, gasoline, LPG, CNG and PNG, etc., are used having the properties of hydrocarbons.



NEXT GENERATION ROCKET ENGINE

Generally any rocket engine burns their respective fuels to generate thrust. If any other engine has capacity to generate thrust efficiently then it can be called rocket engine. Currently NASA scientists are working on ‘Xenon Ion Engine’ which accelerates the ions or atomic particles to extremely high to create thrust more effectively and efficiently by usage of electrostatic or electromagnetic force by the principle of Lorentz force or Columbian force.



APPLICATIONS

1. Cryo pumps and turbo molecular pumps are required in space as the level of vacuum required in space simulation chambers is very high.
2. Life of tools, Die casting & their dies, forging, jigs & fixtures increase when subjected to cryogenic heat treatment.
3. Cryogenic recycling-turns the scrap in raw material by subjecting it to cryogenic i.e. extremely low temperatures. This is mostly used for PVC, Rubber.
4. Cryo-surgery is a novel technique in which the harmful tissues are destroyed by freezing them to cryogenic temperature. It has shorter recovery time.
5. Preserving food at low temperature is a well-known technique

ADVANTAGES

1. High Specific Impulse
2. Non-toxic and non-corrosive propellants
3. Non-hypergolic, improved ground safety

DISADVANTAGES

1. Low density of liquid Hydrogen –more structural mass
2. Low temperature of propellants -Complex storage
3. Transfer systems and operations
4. Hazards related to cryogenics
5. Overall cost of propellants relatively high
6. Need for ignition system

CVT: INNOVATION GET GOING

Baljeet Singh, 3rd Year

INTRODUCTION

A transmission that can change seamlessly through a continuous range of gear ratios is what a CVT is all about. The flexibility factor of CVT allows the input shaft in maintaining a constant angular velocity. Literally, there is no requirement of clutch in CVT, still some vehicles make use of a centrifugal clutch to facilitate a “neutral stance”, helpful while idling or reversing into a parking lot.

The fundamental purpose of a transmission is the translation of engine performance into vehicle performance. This purpose is accomplished by providing a variety of gear ratios between the engine crankshaft and the output axle of the vehicle. Different speed profile and torque is attained at each gear ratio, while the engine operates at the same speed. Transmission aims at allowing the engine to operate within an ideal state of power production, and also, apply this power to the track by using appropriate gear ratio. Conventional transmission increases vehicle speed, simultaneously maintaining the engine operating range through the use of gear sets. The power that is transmitted from the engine crankshaft is converted into a usable power at the output shaft with the aid of a clutching mechanism. This mechanism engages specific gears that depend primarily on the vehicle speed. It is seen that with increase in gear ratio, the speed/angular velocity of the output axle increases. This increase is in relation to the angular velocity of the engine crankshaft.

Conventional 4-speed transmission experience a rise and fall in engine speed between 6000 and 11000 RPM, as gear exchange occurs and the speed of vehicle witness an increment. For an orthodox transmission, speeds fluctuation at each gear exchange is used to facilitate the fluid gear transfer. As the gears being exchanged and noticeable increment in speed, the slope of the engine speed and vehicle speed at each gear is distinct. Each gear and respective slope depicts a different ratio of gain in engine speed. Hence, because of this change in slope, each gear is made

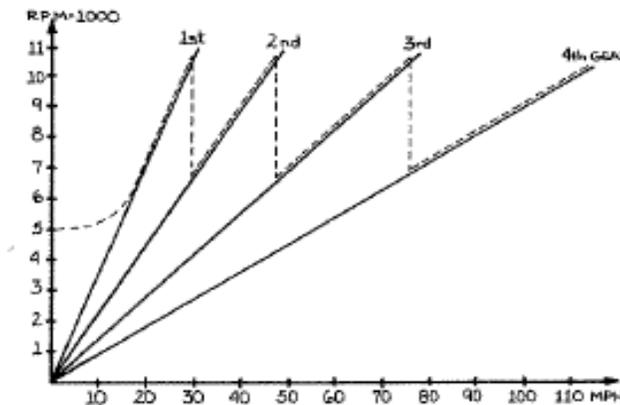


Figure 1:- Relation between Revolutions per Minute and Speed (Miles per hour)
[Dashed line represents the rise and fall of engine speed as each gear change is made.]

useful by producing a distinct range of vehicle speed and torque production. Steeper slopes, as in case of first gear, represent high torque situations in which there is a lower gear ratio and the output axle rotates slowly in comparison of the engine crankshaft. A counteracting torque produced by the same engine power, do counteract the vehicle inertia and also, vehicle accelerate quickly up to a certain specified speed. As soon the higher gears are achieved, it becomes difficult for the same engine power to propel the vehicle; hence the rate of vehicle acceleration and the application of the torque decreases, but the overall speed rise as the output axle rotate as quickly as the crankshaft does. CVT is a low weight gear reduction system that utilizes a little regulatory mechanism to achieve the same point, as an orthodox automatic transmission do achieves.

STRUCTURE OF CVT

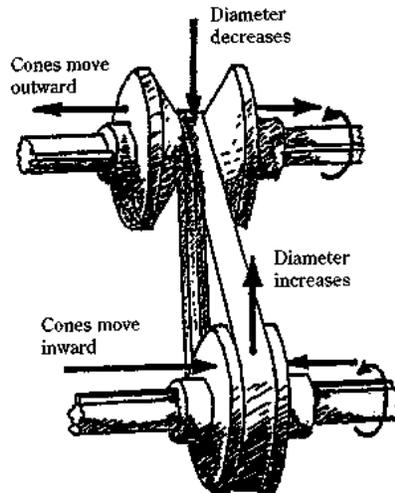
CVT makes use of two pulleys, along with a steel belt running between them. To facilitate the variation of the gear ratios, the CVT adjusts the diameter of the “driver pulley”, which transmits torque from the engine and “driven pulley” that transfers this torque to the wheels. Because of it being continuously variable, the CVT not only avoids the shift-shock and peaks and dips in the torque transmission associated with a conventional AT, but also does maintain the optimum torque for any power demand. This all makes CVT an exceptional transmission solution that delivers smooth and powerful driving experience, coupled with an excellent fuel economy.

COMPONENTS OF CVT

1. A high power/density belt.
2. A set of Cone pulleys.
3. Hydraulic Actuator.
4. Mechanical torque sensor.
5. Microprocessor.
6. Torque Converter or Multi-layered clutch (replacing conventional clutches).

WORKING PRINCIPLE OF CVT

A CVT operates by varying the diameter of the two main pulleys working in the transmission. The pulleys got V-shaped grooves on which a connecting belt is mounted. One side of the pulley is kept fixed while the other side is movable, operated with a hydraulic actuator. The hydraulic actuator can increase or decrease the spacing between the sides of the pulley. This makes the belt to ride higher or lower along the inner walls of the pulley, dependent on the driving conditions, thereby changing the gear ratio accordingly. With no steps in between, this action is purely infinitely variable. That’s why; a CVT helps the engine to be in its optimum range of RPM, which boosts the overall efficiency and mileage. Oil pressure in the actuator that responds to the position of the throttle, speed and related conditions, adjusts the pulley widths. It is sensed by the microprocessors and other sensors incorporated in the system.



(Figure 2:- Working principle of the CVT)

NISSAN'S 3RD GENERATION XTRONIC CVT

To achieve high measures of both fuel economy and acceleration was the basic approach of Nissan to power trains.

WIDER GEAR RATIO RANGE

XTRONIC CVT has the gear ratio ranges from low to high gear. Being expanded, it attains a best-in-class gear reduction ratio of about 6. All credit goes to the pulley and steel belt modifications and use of high end performer, the Automatic Transmission Fluid. It finds its use in CVT designed for use in 1.5L to 2.0 L engines. The low end of range is extended to improve the fuel economy. Also, Nissan CVT is flexibly tunable to match engine characteristics, thereby enables optimization of the balance between combustion efficiency and acceleration.

WIDE LOCKUP RANGE

Lockup of AT torque convertor enables MT-like direct transfer of engine power, also an improvement in fuel economy. A conventional AT locks up in the mid-to-high speed range, the advantage of a torque convertor in a CVT is only during the time of initial startup. Therefore, the all new XTRONIC CVT has applied precise control of ratio changes to extend this lock up operating area even further into the low speed range, boosting the fuel economy.

EFFICIENCY IMPROVEMENTS

There is a slight modification in the size of oil pump. This is the main source of the hydraulic power that is used for shifting and to assure the proper torque transmission. It has been downsized, which in turn made it way more efficient. This helps in maintaining control stability that follows, closely, the accelerator pedal action, while boosting fuel economy. A compact chain

drive, contributing to the downsizing of the transmission system as a whole, has been adopted in NISSAN's 2.0L class CVT.

CVT MODIFICATION FOR HEV APPLICATION

NISSAN CK-2 CVT was modified. It used a Van Doorne Push-belt type, commercially available in several Japanese production vehicles. Many modifications, mechanical and electrical, were made, both internal and external to the transmission. In the stock trim, there's an off-board transmission control unit that controls the torque converter lock up, CVT ratio, and the hydraulic pressure that accompanies the CVT. In its original design, the mechanical hydraulic pump is connected to the engine through the torque converter.

ADVANTAGES OF CVT

1. Comparatively better fuel consumption than a regular AT, because of the ability of CVT to keep the vehicle in its optimum power range, being regardless of the speed
2. Due to low power loss experienced, an improved acceleration.
3. An infinitely variable step less transmission.
4. Adapts very easily with the varying road conditions and power demands, to allow better driving experience.
5. Improvement in Emission control, and also there are low greenhouse emissions because of improved control of engine speed range.

GRAND CHALLENGES IN ENGINE & AUTOMOTIVE ENGINEERING

Puspender Kr. Upadhyay, 3rd Year

The grand challenge faced by engine automotive engineering researchers over the next decades will be to devise technological advances that maximize engine efficiency, minimize pollutant emissions and optimize tolerance to a wider variety of fuels in power generation and transportation system.

Oils provides 33% of the world's energy and transportation engines account for over the 60% of the 70 million barrels of crude used each day. Engine Power the world's roughly one billion passengers' vehicles, as well as trucks and heavy duty vehicles. In The USA, engines come 14 million barrels of oil per day.

The fuel Used by IC engine also has major impact on our global environment. Burning 1 kg of fuel consumes 15 kg of air, and significant energy is required to pump and out of the engine.

The history of the development of today's diesel engine technology also reveals the importance of matching the engine with its fuel, its compression ratio and controlling the air-fuel mixture. Much recent engine research has focused on improving the understanding of ignition, which is highly dependent on the fuels chemical composition, and also increasing the quality of air-fuel mixture for improved combustion efficiency. It was also discovered that different exhibited different knock tendencies. In particular, kerosene knocked worse than gasoline, and the volatile difference between fuels was thought to be the explanation.

It was also discovered that different fuels exhibited different knock tendencies. In particular kerosene knocked worse than gasoline, and the volatility difference between the fuels was thought to be explanation. To test the theory, minute amounts of a red dye added to kerosene in an attempt to make it absorbed.



WASTE TO ENERGY – SOLUTION FOR TOMORROW’S ENERGY

Deepak Kumar, 3rd Year

Waste-to-energy or **energy-from-waste** is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste. WtE is a form of energy recovery. Most WtE processes produce electricity and/or heat directly through combustion, or produce a combustible fuel commodity, such as methane, methanol, ethanol or synthetic fuels.

Each month millions of tons of waste are produced. Either they become a part of landfill or are exported to third world countries. This causes huge environmental impact in terms of wildlife, ecosystems and to human health. Keeping this in mind, many new waste treatment plants have come up and have develop new ways to generate energy from landfill waste.

History

The first incinerator or "Destructor" was built in Nottingham UK in 1874 by Man love, Alliot & Co. Ltd. to the design of Albert Fryer. The first US incinerator was built in 1885 on Governors Island in New York, New York. The first waste incinerator in Denmark was built in 1903 in Frederiksberg.

The first facility in the Czech Republic was built in 1905 in Brno. Gasification and pyrolysis processes have been known and used for centuries. Examples include pyrolysis and gasification of coal as early as the 18th century.... Development of gasification and pyrolysis technologies for processing [residual solid mixed waste] has only become a focus of attention in recent years stimulated by the search for more efficient energy recovery. (2004)

How to Produce Energy from Waste?

The most common and popular method for waste to energy generation is ‘**Incineration**’. Incineration is also a very highly debated technology, due to the concerns it raises regarding safety and environmental impact. In simple terms it stands for a type of waste treatment process, where the organics from the waste collected are burnt at high temperatures. Waste treatments that are conducted involving high temperatures are called Thermal treatment. The heat generated from this thermal temperature is then used to create energy.

Several countries in the world, especially in Europe are experimenting with Incineration as an alternate means of energy production; Sweden, Germany and Luxembourg to name a few.

AIR BEARING

Jay Kishan Sharma, 2nd Year

Air bearings (also known as **aerostatical** or **aerodynamical bearings**) are bearings that use a thin film of pressurized air to provide an exceedingly low friction load-bearing interface between surfaces. The two surfaces do not touch. As they are contact-free, air bearings avoid the traditional bearing-related problems of friction, wear, particulates, and lubricant handling, and offer distinct advantages in precision positioning, such as lacking backlash and static friction, as well as in high-speed applications.

The fluid film of the bearing is air that flows through the bearing itself to the bearing surface. The design of the air bearing is such that, although the air constantly escapes from the bearing gap, the pressure between the faces of the bearing is enough to support the working loads. Thus, there is a differentiation that has to be made between aero dynamical bearings, which establish the air cushion through their movement, and Aerostatical bearings, in which the pressure is being externally inserted. Air bearings are being mainly used in precision machinery tools (measuring and processing machines) and fast running machines (high speed spindle)

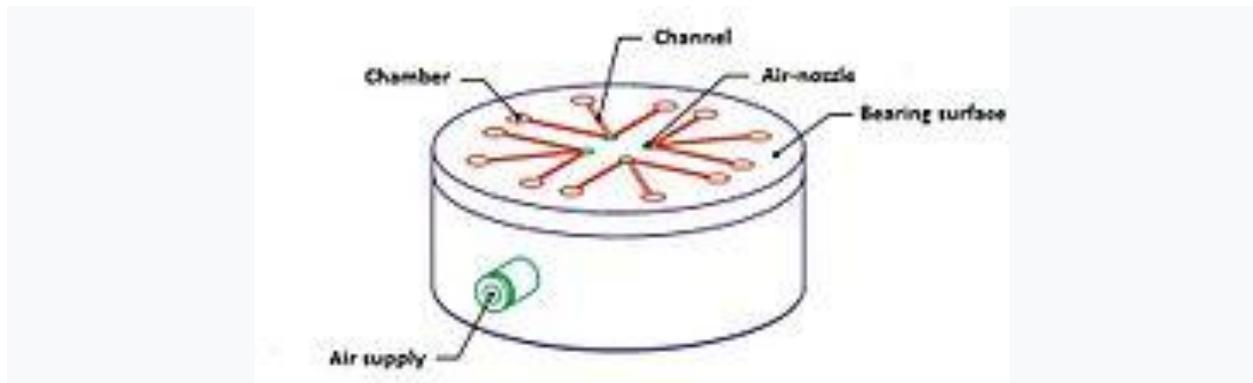
Comparison of air bearing technologies

Air bearings belong to slide bearings. Pressurized air acts as a lubricant in the gap between bearing moving parts. The air cushion carries the load without any contact between the moving parts. Normally, the compressed air is supplied by a compressor. A key goal of supplying the air pressure in the gap is that the stiffness and damping of the air cushion reaches the highest possible level. In addition, air consumption and uniformity of air supply into the gap are crucial for the behaviors of air bearings.

Conventional air bearings

With conventional single nozzle air bearings, the compressed air flows through a few relatively large nozzles (diameter 0.1 – 0.5 mm) into the bearing gap. The air consumption thus allows only some flexibility such that the bearing’s features (force, moments, bearing surface, bearing gap height and damping) can be adjusted only insufficiently. However, in order to allow a uniform air pressure even with only some nozzles, air bearing manufacturers take constructive

techniques. In doing so, these air bearings cause dead volumes (non-compressible and thus weak air volume). In effect, this dead volume is very harmful for the air bearing's dynamic and causes self-excited vibrations.



Advantages

- Wearless operation, durability
- Guiding, repeatability, and position accuracy
- Cost advantage and repeatability
- High-purity, oil-less operation
- Environmental advantages

Disadvantages

Air bearings only have a few disadvantages. The main challenging issues are the high geometrical accuracies which are required during manufacture. Another issue is the supplied pressurized air which has to be clean and dry. Fundamentally air bearings require some form of power consumption during operation to supply the high pressure air, unlike mechanical systems which may operate without any power input (except mechanical forces).

SWIMMING MICROBOTS KILL WATERBORNE PATHOGENS

Navdeep Singh, 2nd Year

One of the most serious health risks for people around the world is inadequate access to clean water. Waterborne diseases have devastating impacts on public health—for example, *E.Coli* bacteria cause an estimated 265,000 infections each year in the U.S.

Current disinfection methods depend largely on chemicals and disinfectants. However, some pathogens cannot be killed using conventional disinfectants and require a combination of methods, or higher disinfectant doses, which can leave harmful byproducts in the water.

As a result, a pressing need exists for more effective water-cleaning technologies that are also safe for the environment and human health.

Intrigued by the use of catalytic, self-propelled micro motors as an environmental tool for capturing heavy metals and other pollutants, Diana Vilela and Samuel Sánchez, scientists at Max-Planck Institute for Intelligent Systems in Stuttgart, Germany, and the Institute for Bioengineering of Catalonia in Barcelona, Spain, explored a similar concept for removing waterborne bacteria. With the help of several other collaborators, they developed a self-propelled micro robot that is highly effective in removing *E. coli* bacteria from contaminated water. They presented their results in June 2017 paper published by the American Chemical Society.

How the microbots Work?

Sánchez and Vilela developed microbots that rely on a chemical reaction to propel them through the water; they are coated with an exterior layer of silver nano particles to kill the bacteria they encounter. “The structure of the microbot relies on a magnesium microparticle as a template, which also functions as propulsion source by producing hydrogen bubbles when in contact with water,” they write. “An inner iron magnetic layer enables their remote guidance and collection. The outer silver-nanoparticle-coated gold layer facilitates bacterial adhesion and improves bactericidal properties.”

The robot is sometimes called “two-faced” or “Janus” because one side is made with magnesium, which reacts with water to produce the hydrogen bubbles. The other side is composed of alternating iron and gold layers topped by silver nanoparticles. Bacteria adhere to the gold and are killed by the silver nanoparticles.

“Fabricating mechanical microrobots is challenging,” says Sánchez. “Keeping a simple design is sufficient for motion—for example, providing an asymmetry in the chassis. Asymmetry is created by elegantly depositing thin layers [tens of nanometers] of iron and gold on one side. This is the same side that is coated with silver nanoparticles.”

Once deployed, the micro bots are autonomous—they move through the water, trapping and killing bacteria. Lab tests showed that the micro bots killed about 80 percent of *E. coli* in a contaminated water solution within 15 minutes. After the job is finished, the robots are removed from the water with a magnet, along with the captured dead bacteria.

Future Possibilities

Sánchez and Vilela have shown their magnesium-based Janus micro bot is effective at removing bacteria. It is also biocompatible, environmentally friendly, and does not produce chemical waste during and after operation.

Their approach shows great promise for rapid disinfection of water. This is good news, considering that nearly 700 million people lack clean drinking water. “We have proven the successful combination of active systems and nano materials to develop new micro motors for the cleaning of waterborne bacteria from contaminated water,” they write. “Future work will be carried out using pathogenic bacteria in contaminated drinking water. This study opens real possibilities for developing novel micro- and nano-machines for demanded energy and environmental applications.”



Figure: Microbots killing waterborne pathogens

GEARLESS POWER TRANSMISSION

Ritesh Kumar Gautam, 2nd Year

INTRODUCTION

This system demonstrates efficient gearless transmission of power at right angles. This saves gear manufacturing time and costs along with teeth matching and gear placement issues [1]. The elbow mechanism is an efficient design of gearless transmission technique and the kinematic system that allows for efficient power/motion transmission at right angles. This mechanism allows for motion transmission at 90 degree angles between the driver and the driven shafts. We use mounts to mount a DC motor with shaft coupled to it. We then use 90 degree bent rods to link driver shaft with the driven shaft [2, 3, and 4]. We use accurate drilling with relatively spaced and diameter holes to attach the connection rods with precision. We then use mounts to hold the driven rod in precise position. Now the motor can be powered using 12V supply and can be used to drive the other shaft using elbow mechanism.

METHODOLOGY

System under study Figure 1 shows the trimetric view of system under study. As the figure suggest that this mechanism is formed with 9 links and one board by assembling them together. Contact friction between bearings and shaft as well as between elbow rods and hubs are considered [6, 7]. Whole mechanism is developed for analysis with taking gravity into account. System is designed with factor of safety taken as 2.

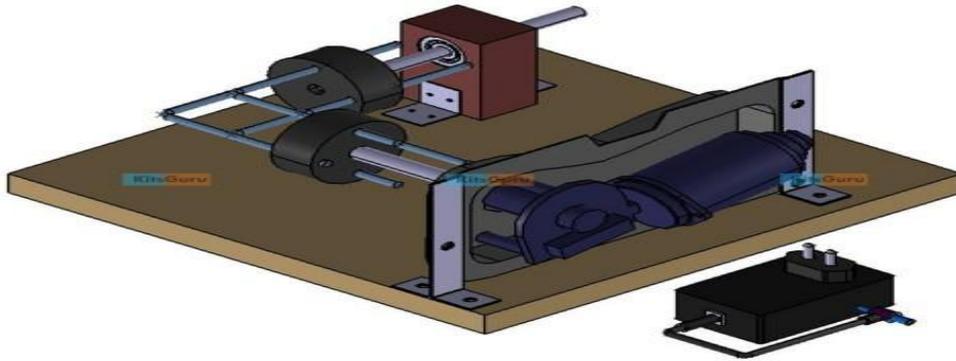


Figure: Gearless Transmission

CONSTRUCTION

1. It consists of links or rods that are bending exact at 90 degree (right angle).
2. The no. of links required would be 3 to 8.
3. The more the links, the smoother will be the operation.
4. Links are made up of bright bars as the bright bar material has good surface finish.
5. These links slides inside the through and through drilled cylinder.
6. Thus forming a sliding pair.
7. These cylinders are coupled to the input and output shaft with help of
8. Power is supplied by electric motor.

WORKING

The Gearless transmission or El-bow mechanism is a device for transmitting Motions at any fixed angle between the driving and driven shaft. The synthesis of this mechanism would reveal that it comprises of a number of links would be 3 to 8 the more the links the smoother the operation. These links slide inside hollow cylinders thus formatting a sliding pair. Our mechanism has 3 such sliding pairs. These cylinders are placed in a Hollow pipe and are fastened at 120o to each other. This whole assembly is mounted on brackets wooden table. Power is supplied by an electric motor. The working of the mechanism is understood by the diagram. An unused form of transmission of power on shaft located at an angle. Motion is transmitted from driving to the driven shaft through the roads which are bent to conform to the angles between the shafts. These roads are located at in the holes equally spaced around a circle and they are free to slide in & out as the shafts revolve. This type of drive is especially suitable where quite operation at high speed is essential but only recommended for high duty. It is essential to have the holes for a given rod located accurately in the same holes must be equally spaced in radial and circumferential directions, be parallel to each rod should be bent to at angle at which the shaft are to be located. If the holes drilled in the ends of the shafts have “blind” or closed ends, there ought to be a small vent at the bottom of each rod hole for the escape of air compressed by the pumping action of the rods.

ADVANTAGES

The mechanism is invariable used for multiple spindle drilling operation called gang drilling.

- Used for angular drilling between 0 to 90 degree position.
- Lubrication pumps for C.N.C lathe machine.
- The mechanism is very useful for reaching a drive at a clumsy location.
- Air blower for electronic and computer machine.
- The mechanism has found a very usefully use in electronic and computer technology for multiple.
- The elbow mechanism is used for movement of periscope in submarines, the year 1685 for the famous London tower clock.

RESULTS

It becomes quite clear from the analysis that hub always remain safe at all defined values of rpm. But this is not the case with elbow rod, as shown in motion study section at 140 rpm speed moment value (red) surpass the allowable moment value. Thus we found that elbow rods are safe below 140 rpm i.e. ranges between 15 to 120 rpm. Solid Works simulation helps in getting a clear picture of dynamic analysis of elbow rod, stresses value in case of 140 rpm are fairly high as compared with same at 120 rpm. Thus simulation results satisfy motion analysis results.

CONCLUSION

During working on experimental setup and after a long discussion it is observed that proposed arrangement used for any set of diameters with any profile of shafts for skew shafts of any angle but the shaft's must be having the rotational motion about his own axis, transmission of motion is very smooth and desirable and used only for the equal R.P.M. of driving shaft and driven shaft by employing links or given type of links for appropriate joints for revolute pair.

STRING THEORY

Ashish Dubey, 2nd Year

String theory is an ambitious project. It means to be an all-encompassing theory of the universe, unifying the forces of Nature, including gravity, in a single quantum mechanical framework. The premise of string theory is that, at the fundamental level, matter does not consist of point-particles but rather of tiny loops of string. From this slightly absurd beginning, the laws of physics emerge. General relativity, electromagnetism and Yang-Mills gauge theories all appear in a surprising fashion. However, they come with baggage. String theory gives rise to a host of other ingredients, most strikingly extra spatial dimensions of the universe beyond the three that we have observed. The purpose of this course is to understand these statements in detail.

String theory is speculative science. There is no experimental evidence that string theory is the correct description of our world and scant hope that hard evidence will arise in the near future. Moreover string theory is very much a work in progress and certain aspects of the theory are far from understood. Unresolved issues abound and it seems likely that the final formulation has yet

to be written. For these reasons, I'll begin this introduction by suggesting some answers to the question: Why study string theory?

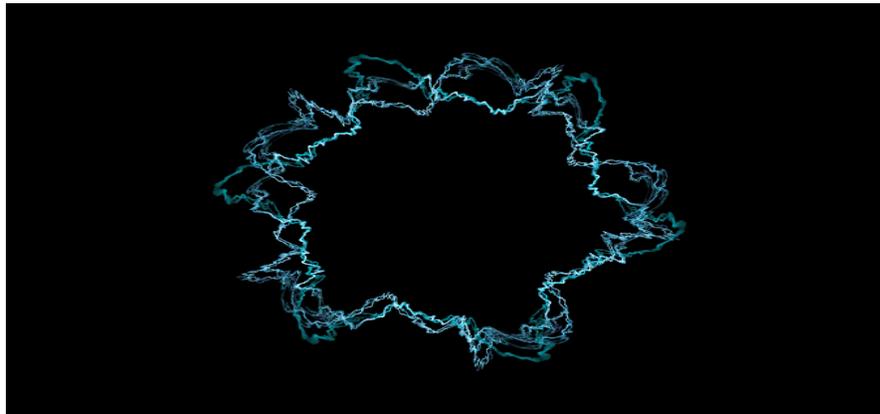


Figure: Concept of String Theory

String theory is a theory of quantum gravity

String theory unites Einstein's theory of general relativity with quantum mechanics. Moreover, it does so in a manner that retains the explicit connection with both quantum theory and the low-energy description of space and time.

String theory may be the theory of quantum gravity

With broad brush, string theory looks like an extremely good candidate to describe the real world. At low-energies it naturally gives rise to general relativity, gauge theories, scalar fields and chiral fermions.

String theory provides new perspectives on gauge theories

String theory was born from attempts to understand the strong force. Almost forty years later, this remains one of the prime motivations for the subject. String theory provides tools with which to analyze down-to-earth aspects of quantum field theory that are far removed from high-falutin ideas about gravity and black holes.

String theory provides new results in mathematics

For the past 250 years, the close relationship between mathematics and physics has been almost a one-way street: physicists borrowed many things from mathematicians but, with a few noticeable exceptions, gave little back. In recent times, that has changed. Ideas and techniques from string theory and quantum field theory have been employed to give new "proofs" and, perhaps more importantly, suggest new directions and insights in mathematics. The most well-known of these is mirror symmetry, a relationship between topologically different Calabi-Yau manifolds.

We began by trying to make sense of the quantum theory of a relativistic string moving in flat space. It is, admittedly, an odd place to start. But from then on we had no choices to make. The relativistic string leads us ineluctably to conformal field theory, to higher dimensions of space-time, to Einstein's theory of gravity at low-energies, to good UV behavior at high-energies and to Yang-Mills theories living on branes. There are few stories in theoretical physics where such meager input gives rise to such a rich structure.

There is much about string theory that remains to be understood. This is true both of the mathematical structure of the theory and of its relationship to the world that we observe. Non-perturbative completions of string theory are only known in space-times which are asymptotically anti-de Sitter, but cosmological observations suggest that our home is not among these.

In the years immediately after its birth, no one knew that string theory was a theory of strings. It seems very possible that we're currently in a similar situation. When the theory is better understood, it may have little to do with strings. We are certainly still some way from answering the simple question: what is string theory really?

M.TECH DISSERTATION (ABSTRACTS) 2014-2016

“STUDY OF PROCESS PARAMETERS OF INJECTION PLASTIC MOULDING FOR TWO DIFFERENT MATERIALS FOR SAME COMPONENT”

Rudraksha Shukla

As of the fact that most plastic products are manufactured using injection moulding process now a days, this thesis project brings to the surface the study of the underlying principle and theories of injection moulding basics and proceeds along the way with a comparison study of process parameter for injection moulding.

A detail study of plastic material classification, formation, and their properties along with basic study of objectives, designing factors and functions of injection mould including heat exchange system, venting, ejection system and alignment. It also include the study of properties of polypropylene and Nylon 6 30% GF and a comparison of process parameters such as injection pressure, cooling time, barrel zone temperatures, and cycle time.

This thesis study aims on comparison of process parameter for two different material (i.e. polypropylene and Nylon6 30% GF) for manufacturing same component. This help in understanding the variation in process parameters of two different plastic materials. In this study variation in component due to change of material is not studied such as dimensional variation, difference in part weight, and appearance as it mainly focus on the change in process parameters.

“OPTIMIZATION OF WEDM PROCESS PARAMETER FOR HDS H13 BY USING TAGUCHI ARRAY”

BHARAT BHUSHAN

Wire electrical discharge machining is extensively used in machining of conductive materials. The WEDM process has the ability to machine complex shapes and hard electrically conductive metal components precisely. The main goal of wire electrical discharge machine manufacturers and users are to achieve a better stability and high productivity of the process with desired accuracy and minimum surface damage. The main objectives of the present research are to experimentally study the effect of various process parameters like pulse on time, pulse off time, wire feed, and wire tension on the performance measures like material removal rate, surface roughness and wire wear ratio.

Experimentation was planned as per Taguchi's L'9 mixed orthogonal array various experiments were performed under different working condition by changing the values of Pulse on time, pulse off time, wire feed and wire tension.H13 Steel grade was selected as a work material to conduct the experiments. The means of mean approach is employed to optimize the wire electrical discharge machining process with multiple objectives. The study concludes that the WEDM process parameters can be adjusted to achieve better metal removal rate, wire wear ratio and good surface finish.

“REDUCTION OF CHANNEL CLEANING TIME IN KILN BY SETUP OF AUTO
CHANNEL CLEANING SYSTEM”

PARMOD KUMAR

Lime calcinations process takes place in a vertical shafts kiln. There are 2 shafts in a kiln, which are interconnected by a narrow channel. During the calcinations process, burnt gases pass through the channel from burning shaft to pre-heating shaft. Burnt gases also carry lime fines, which are settling down at the channel, this result in blockage of channel. Due to this blockage kiln pressure increased & difficult to maintain the production rate at its rated capacity. To maintain the production rate, we need to clear the channel twice in a month. During channel cleaning process, after stopping the kiln burner flange at Channel area should be opened & deposited fines on channel will be cleared by lengthy rakers. This practice required 3 hours of time. In the present research work, an experimental investigation has been carried out to reduce the channel cleaning time by auto channel cleaning system. Materials deposited in channel area of Kiln are cleared by nitrozen pressure. In auto channel cleaning system a N₂ tank is installed which is connected by N₂ line with high pressure. An actuator is installed to control the pressure of air line. The actuator is operated from MCR automatically during inversion time for 10 seconds to clean the channel of kiln.

STUDENT ACTIVITIES

MECHANICAL MEET

The annual mechanical meet of 3rd year students with 2nd year students was conducted on 29th August, 2016 and was scheduled from 2:00 PM onwards in seminar hall WS-303. The event was the first step in interaction of 2nd year students with 3rd year students. The program started with an introductory speech from 3rd year student Master Baljeet Singh. Sh. Kanwarpal Singh, HOD ME Department welcomed the 2nd year students and appreciated the effort of 3rd students for arranging this event. Thereafter, the students of 2nd year were asked to introduce themselves to the seniors and faculty members, followed by some healthy tasks. At the end, Faculty Advisor, MES, Sh. Sunil Baloda congratulated 3rd year students for the event and motivated the 2nd year students to participate in various events and come up to grab the opportunities.



TEACHERS' DAY CELEBRATION

The Mechanical Engineering Society paying a tribute to the complete faculty of the college celebrated “Teachers’ Day” on 5th September. The event started with an inaugural speech of Master Baljeet Singh 3rd year ME, sharing the importance of this day and its significance. Thereafter, HOD ME Sh. Kanwarpal Singh and faculty members were invited to commence the lamp lighting ceremony, as a tribute to Maa Saraswati, Goddess of knowledge. Thereafter, Master Sumit, and Master Sushil, from Mechanical Department handled the stage and invited teachers by giving clues related to the personality of faculty members and songs dedicated to the teacher was played in background. The complete event was boosted by the music and cheers, faculty members shared their funny experiences and memorable moments of their life. Faculty members were given some healthy task to perform. Also the faculty members were presented a gift as a tribute from the Mechanical Engineering Society. Faculty advisor Sh. Sunil Baloda congratulated the students for arranging such an enjoyable event and appreciated the efforts of the students.



EXPERT LECTURE ON CAREER AND PERSONALITY DEVELOPMENT

The Department of Mechanical Engineering organized an expert lecture on “**Career and Personality Development**” for the students of Mechanical Engineering. This invited lecture was delivered by Dr. S. K. Mishra (Principal GDC Memorial College) on 08/09/2016. In his lecture Dr. Mishra emphasized on the importance of 7 C’s i.e. Command, Control, Communication, Commitment, Character, Courage and Common-Sense for success in life. Dr. Mishra also highlighted the importance of self-confidence, hard work and positive thinking in life. All in attendance were benefited by motivational words of Dr. Mishra.



EUREKA

POWERPOINT PRESENTATION CONTEST

Mechanical Engineering Society organized a Power-point Presentation competition “EUREKA” on 12th September, 2016. Participants presented their views on the topic "Skill Development in Young Engineers to Reform Core Sectors: Vision 2025" given by Institution of Engineers (India) for the occasion of 49TH Engineers’ Day Celebration. The Event was adjudicated by Mr. Sanjay Kaushik, Professor (AS&H department) BRCM-CET, Mr. Amit Kumar Assistant Professor (M.E. Department) and Mr. Basant Sah (Assistant Professor, C.S.E Department).

The event was scheduled from 2:00 PM onwards in M-107. The event was conducted in single session in which 15 participants presented their views on the topic. Two students from the Mechanical Department Master Sumit Sharma, 4TH year and Master Mayank Dwivedi, 3RD year were selected for representing the Department on Engineers’ day celebration. Participants from first year were awarded with appreciation certificates by Sh. Kanwarpal Singh, HOD Mechanical Department.



VISHWAKARMA DAY CELEBRATION

Vishwakarma Day also known as Vishwakarma Jayanti or Vishwakarma Puja is a day of celebration for Vishwakarma, a Hindu god, the divine architect and one of the fourteen precious things born of the Samudra manthan. Since Vishwakarma is the divine engineer of the world, as a mark of reverence, he is not only worshiped by the engineering and architectural community but also by all professionals. It is customary for craftsmen to worship their tools in his name. Modern electronic servers are also worshipped for their smooth functioning.

The Mechanical Engineering Department annually celebrates Vishwakarma Day on 17th September, 2016 as a mark of reverence towards Vishwakarma, a Hindu deity. On the holy occasion of Vishwakarma Day whole Mechanical Engineering faculty along with students gathered in workshop, performed holy “Havan” and prayed for a better future, safe working conditions, and success in their respective fields and for the smooth functioning of various machines. After commencing the holy prayers and “Havan”, sweets were distributed among the faculty members and the students.



EXPERT LECTURE ON CAREER OPPORTUNITIES

Department of Mechanical Engineering organized an expert lecture on “**Career Opportunities**” for the students of Mechanical Engineering. This invited lecture was delivered by Mr. Pardeep Kundu PhD Research Scholar IIT Delhi, on September 26th, 2016. On 26th September there was an interaction program of final year students with Alumni, Mr. Pradeep Kundu. Mr. Kundu guided the students about the various career options after graduation and various opportunities with GATE (Gratitude Aptitude Test in Engineering). During the interaction students were exposed to various projects going on in IIT’s and how to participate in those projects.





CRICKET TOURNAMENT

Mechanical Engineering Society and Society of Civil Engineering Collaboratively organized a cricket tournament from 3rd October to 7th October, 2016. All matches of the tournament were played on central cricket ground. Four teams participated in the tournament, three from BRCM-CET and one from GDC Memorial College, Bahal. Six league matches were played in the tournament. Top two teams qualified for the final match.

The tournament was inaugurated on the 3rd October in presence of HOD ME Department Shri Kanwarpal Singh, HOD EEE Department Shri Vivek Kumar and head of Department of Physical Education Shri Azad Singh. An inauguration match was played between the BRCM Spartans and BRCM Tigers in which later team was dominating and made its way after winning the match.

On the second day there were two matches between the BRCM Spartans and the GDC Warriors and BRCM Warriors Vs BRCM Tigers. After two consecutive wins BRCM Tigers made their way to final and with back to back defeats BRCM Warriors was knocked out of the tournament.

On 3rd day it was a tough match between GDC Warriors and BRCM Spartans; the later won the match and made its way towards the final to play against the Tigers.

Final match between BRCM Tigers and BRCM Spartans was a real crunch game. BRCM Spartans set a total of 63 runs on board in 8 overs. After a neck to neck match Tigers won the match with eight wickets and clinched the wining trophy. Well played to BRCM Tigers and better luck to BRCM Spartans for next time.



Final ceremony was held at the end of final match in which Dr. Arabinda Sharma; Principal BRCM-CET presented the Winners cup to BRCM Tigers. Master Sumesh from 2nd Year who played with batting average of 57 was awarded as “Man of the Tournament”. Indeed it was a successful tournament for MES in collaboration with Society of Civil Engineering and an entertaining event for its participants.



EXPERT LECTURE

The Department of Mechanical Engineering organized an expert lecture on “**Career Opportunities in Power Plant Designing**” for the students of Mechanical Engineering. This invited lecture was delivered by Sh. Dinesh Singh (Engineer - Piping & Stress, Simon India Ltd.) and Sh. Amit Bansal (Engineer - Piping & Stress, Procon India Pvt. Ltd.) on 15/10/2016. In his lecture Mr. Singh emphasized on the importance of basic design courses used in power plant and pipe designing like CAESAR –II 7.0, CAE PIPE, and PDMS 12.0. He also discussed the scope of power plant designer in India as well as in foreign countries. Mr. Bansal highlighted the importance of software knowledge in industries especially in power plant and automobile sector. Both of the invited speakers are BRCM CET Alumni (ME-2012 pass out).





ACME October 2016

Mechanical Engineering Society organized its annual tech fest "ACME-2016" on 20th and 21st October, 2016. This was the 5th time MES organized "ACME" and celebrated its glory.

The fest was inaugurated on 20th October at 10:00 AM in seminar hall, in the auspicious presence of Chief guest Sh. Sudhir Dhanda, Sub-inspector in CBI and Alumni BRCM-CET, Guest of honor Sh. S.S. Beniwal, financial advisor PNB, Bahal, Dr. Arabinda Sharma, Principal BRCM-CET, Sh. Kanwarpal Singh, Head of Mechanical Engineering Department, Faculty members and students of BRCM-CET. The ceremony was inaugurated by lamp lighting remembering Goddess Saraswati and an introductory speech by Master Sumit Sharma, Secretary MES. This was followed by address speech of Principal, Dr. Arabinda Sharma. Guest of honor Sh. S.S. Beniwal motivated the students and shared his experience. HOD Mechanical Engineering Department Sh. Kanwarpal Singh and faculty advisor MES Sh. Sunil Baloda, addressed the audience and expressed their warm wishes to the students for upcoming events in ACME. After the inaugural ceremony, the events Technical Paper Presentation and Talent Hunt were organized.

After inaugural ceremony various technical and fun events like Quiz, CAD Race, Treasure hunt and Shooting were organized on the very first day, where students showed their technical and cultural skills. MES achieved milestone with over 240 participants in aptitude test and over 350 participants in ACME-2016.

The second day started with C-Skill test and was followed by other events like GD & Brain storming, Machine operation, cyber game Mini- militia and Logo Quiz.

On 21st Oct in the second session closing ceremony was held from 2:30 PM onwards and winners of various events were awarded with trophies and medals. The closing ceremony was concluded in presence of Sh. Manish Khatri, chief finance officer BRHD trust, Dr. Arabinda Sharma Principal BRCM-CET, Sh. Kanwarpal Singh, Head of Mechanical Engineering Department, Heads of various Departments and faculty & staff members.

Sh. Kanwarpal Singh appreciated the efforts of coordinators and managing team of ACME-2016. Sh. Sunil Baloda, Faculty advisor of MES proposed vote of thanks and announced the name of position holders of Mechanical Engineering Society for coming session and motivated the MES executives to achieve greater heights.



APTITUDE, GD, BRAINSTORMING

APTITUDE ROUND was conducted on 19th October 2016, in which around 300 students of various departments participated. Out of all the participating students, 18 were shortlisted for GD round, on 21st October 2016 in seminar hall (WS-303).

The topics of GD were as follows:

- Should Pakistani artists be banned?
- Present scenario of Indian Education system.
- Winning is what matters, whatever may be the cost?

From these participants 9 were shortlisted for final round i.e., “BRAIN STORMING”, which comprised of 2 phases.

Phase 1:- Free Writing

Phase 2:- Questioning

The topics for BRAIN STORMING were

- Rules are made to be broken.
- Role of an engineer in war.

Top 3 positions were grabbed by following participants

1. Pardeep Bhardwaj (ME, 4th Year) Secured 1st position.
2. Happy Kumar (EEE 3rd Year) Secured 2nd position.
3. Tushar Gandhi (ME 4th Year) Secured 3rd position.

The event was judged by Shri Jitendra Gaur (HOD AS&H), Shri Vikrant Verma (AP, EEE), Shri Mukesh Kiroriwal (AP, ME), Shri Mahesh Juneja (AP, ME), Shri Nitesh Jain (AP, ME), Shri Kanwarpal Singh (HOD, ME), Shri Sunil Baloda (AP, ME).

The event was coordinated by

1. Master Prabhanshu Sinha, 3rd Year ME
2. Master Prateek Jain, 3rd Year ME
3. Master Manish Kumar, 3rd Year ME





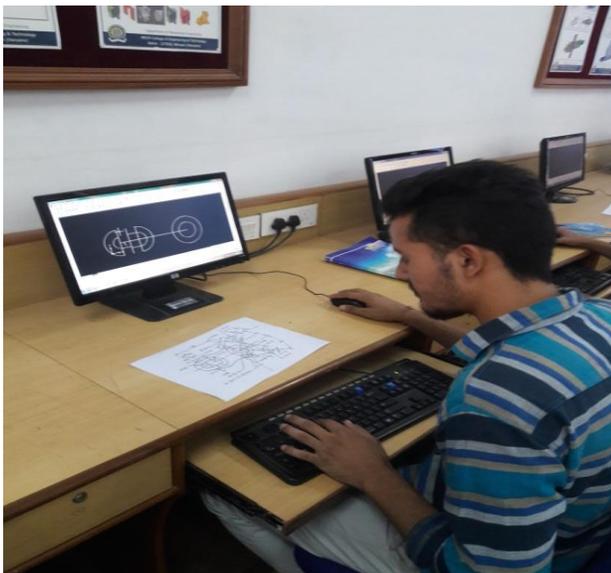
AUTOCAD RACE

AUTOCAD RACE event was organized on 20th OCTOBER at 3:00 PM in the CAD Lab. There were around 20 participants, who showed their skills of designing. Participants showcased their designing attributes by designing multiple drawings in AutoCAD in limited period of time. The participant who designed the drawing first was declared the winner. The event was under the guidance of Mr. Mukesh Kiroriwal (A.P., ME Department).

The top three positions were grabbed by following students:-

- 1st position was grabbed by Ravi (ME) 2nd year
- 2nd position was grabbed by Manjeet (ME) 4th year
- 3rd position was grabbed by Sunil Berwal (ME) 3rd year

Event Coordinators- Rajnish Bishnoi, Vineet Thapan



C SKILLS

“C PROGRAMMING SKILL” Test was organized on 21ST OCTOBER at 9:15 AM in M-107. A total of 65 students took part in this event. Test was carried out in single stage, comprising of 50 questions, and the duration of the test was 45 minutes. The event was judged on the basis of marks achieved and was under the guidance of Mr. Basant Sah (A.P., CSE). The student who secured maximum marks was declared the winner.

The top three positions in C Programming Test were grabbed by following students:-

- 1st position was grabbed by Vikas (CSE)3rd year
- 2nd position was grabbed by Sunil (CSE) 2nd year
- 3rd position was grabbed by Govinda (CSE)3rd year

Event Coordinators- Sudeep Kadyan, Karan, Yogesh

LOGO QUIZ

Logo quiz was organized on 21ST October 2016 from 2:00 PM onwards in the Seminar Hall M-107. In this event, 64 students took part. The participants were divided into teams of two members each and they were shown the logos of various brands and companies. The event was wrapped up in three rounds. Each team was shown three logos in each round and there was negative marking for each wrong answer and a bonus marking for the teams which answered the question passed to them. 12 teams made their way to the second round, and for the final round, there were 5 teams. Out of these 5 teams, the highest scoring team was declared the winner and was awarded with medals and certificates.

WINNER TEAM:

Bhavesh Ojha (3RD YEAR ME) & Sahajdeep (3RD YEAR ME)

Event Coordinators: Chander Kant Parashar (3RD YEAR), Deepak Bhardwaj (3RD YEAR)

MACHINE OPERATION

“MACHINE OPERATION” was organized on 21ST October 2016 from 11:00 AM in the Machine Shop WS-105. Participants were divided into teams of two students each. Each team was given a work-piece on which they had to perform Step turning using Lathe Machine. The teams were then invited for the questioning round. A total of 19 teams took part in this event. The event was judged by Mr. Vishwas Yadav (A.P., ME Department) and Mr. Pradeep (Lab Technician, ME Department). The following teams grabbed top 3 positions:

1ST POSITION: Virender (ME 4TH Year) & Vijender (ME 4TH Year)

2ND POSITION: Naveen (ME 4TH Year) & Gagan (ME 4TH Year)

3RD POSITION: Rajnish (ME 3RD Year) & Vineet Kumar (ME 3RD Year)

Event Coordinators: Sushil Kumar (3RD Year), Sonu (3RD year), Vikas (3RD Year)



MINI MILITIA

A Smartphone game based event “MINI MILITIA” was organized on 21ST October 2016 from 12:00 PM onwards in the Seminar Hall M-107. A total of 110 students took part in this event. The participants were initially divided into groups of 6-7 students each. The members had to play this game and the best scorers of each group had faced each other in the final game. The highest scorer of the final round was awarded with a shield and was crowned as the “MINI MILITIA CHAMP”.

WINNER:

CHANDER KANT PARASHAR (ME 3RD YEAR)

Event Coordinators: Sahajdeep (3RD YEAR), Shubham (3RD YEAR), Sumit (3RD YEAR)



QUIZ

A “QUIZ” event was organized on 20th October 2016, from 2:00 PM onwards in the Seminar Hall M-107. About 25 teams, each consisting of 4 students took part in this event. The event was wrapped up in three rounds. In the first round each team was asked 3 questions of GK and General Awareness. The teams which answered at least 2 questions or the tie breaker questions (marked as **) were allowed to sit in the next round. In the second round, each team was shown a picture and the team has to guess it. There was bonus marking for the team which guesses the question passed to them. In the final round, there were 5 teams. The questions from general science were asked. Out of the 5 final teams, top 3 teams were selected:

1ST POSITION: Anshul Garg (CSE 2ND Year)

Vivek (CE 2ND Year)

Dhruv (CSE 2ND Year)

Sahil (CE 2ND Year)

2ND POSITION: Happy Kumar (EEE 3RD Year)

Anita (CSE 3RD Year)

Pratik Jain (ME 3RD Year)

Puspendra Kr. Upadhyay (ME 3RD Year)

3RD POSITION: Vishal Mittal (CSE 2ND Year)

Komal Mittal (CSE 2ND Year)

Sakshi Priyadarshi (EEE 2ND Year)

Gagan (CSE 1ST Year)

Vritti Malhotra (CSE 1ST Year)



Event Coordinators: Baljeet Singh (3RD Year), Prabhanshu Sinha (3rd Year), Sushil Kumar (3RD Year)



SHOOTING

A “SHOOTING” event was organized on 20TH October 2016 from 3:30 PM onwards in the Central Lawn of the college. A total of 60 students took part in this event and showed off their shooting skills. The participants were given three shoots to fire on the target and the top notch shooter was awarded with a gift pack. The event was conducted under the guidance of Mr. Vishwash Yadav (A.P., ME Department) and Mr. Ajay Mahendru (A.P., ME Department).

WINNER:
SHOURYA (EEE 1ST YEAR)

Event Coordinator: MOHD. Shariq (3RD Year), Pankaj yadav (3RD Year)

TALENT HUNT

Talent Hunt event was organized in seminar hall on 20th October at 10:30 AM. The event started right after the inauguration ceremony of the Annual Technical Fest ACME-2K16. In this event around 20 students showed their skills in various cultural activities like dancing, singing and skit performances. The event was judged by the Mr. Nishant Bhardwaj (A.P., CE), Mrs. Urmil Yadav (A.P., CE), Mr. Pramod Saharan (A.P., CE).

- **Winners :**

1st Position Baljeet Singh & his colleagues (3RD year students) {SKIT}

2nd Position Rohan Taneja (3rd year CSE) {DANCE}

3rd Position Sonu shah (4th year ME) {SINGINIG}

Event Coordinators : Sudeep Kadyan (3rd Year ME) & Anil Kalirawana (3rd Year ME)



TECHNICAL POWERPOINT PRESENTATION

A Technical PowerPoint Presentation event was organized on 20TH October at 12:00 PM in the Seminar Hall WS-303. It was judged by Mr. Shelej Khera (HOD ECE), Mr Vivek Kumar (HOD EEE), Mr. Sunil Baloda (A.P., ME Department), Mr. Sudhir Dhanda (ALUMNI, SI CBI) and Mr. Sanjay Kaushik (A.P., AS&H Department). The event TPP was held for the holistic development of students. Participants presented various topics, based on theme “ADVANCE ENGINEERING TOPICS”.

The top three positions were grabbed by following students respectively:-

1. Ravi Singh from ME 3RD Year, (Presentation on Stealth Aircraft).
2. Sudeep Kadyan from ME 3RD Year, (Presentation on Ballistic and Antiballistic Missiles).
3. Sakshi Priyadarshi from EEE 2ND Year, (Presentation on Blue Brain).

Event Coordinator-Sudeep Kadyan, Anil Kalirawana



TREASURE HUNT

An event “TREASURE HUNT” was organized on 20TH October 2016 from 3:45 PM onwards in the Central Lawn. A total of 120 students (24 teams) took part in this event. The teams were supposed to find out the treasure by making the use of clues, hidden in the campus at various sites. The team which found the treasure was awarded with a gift hamper. The whole event was coordinated under the guidance of Mr. Vishwash Yadav (A.P. ME Department) and Mr. Ajay Mahendru (A.P., ME Department).

WINNER TEAM:

SR. NO.	NAME	BRANCH	YEAR
1	AMAN	MECHANICAL	4 TH YEAR
2	VIVEK	CIVIL	2 ND YEAR
3	ANSHUL	CSE	2 ND YEAR
4	ROHIT JAIN	CSE	2 ND YEAR
5	SAHIL DEEP	CIVIL	2 ND YEAR
6	DHRUV	CSE	2 ND YEAR

Event Coordinators: Ravi Singh (3rd Year), Dharmender (3rd Year), Bhupender (3rd Year), Mohit Sharma (3rd Year)

INDUSTRIAL VISIT

NATIONAL SMALL INDUSTRIES CORPORATION (NSIC)

OKHLA INDUSTRIAL ESTATE, DELHI-110020

A visit to NATIONAL SMALL INDUSTRIES CORPORATION (NSIC) was organized on 24TH November, 2016. Almost 50 students of ME and EEE departments visited NSIC. Faculty coordinators Sh. Sunil Baloda (A.P., ME Department) and Sh. Vikrant Verma (A.P., EEE Department) accompanied the students to the site.

NSIC is an ISO 9001-2008 certified Government of India Enterprise under the Ministry of Micro, Small and Medium Enterprises (MSME). It was established in 1955 to promote and develop small scale industries and enterprises in the country. It was originally founded as a Government of India agency later made into a fully owned government corporation.

The visit started by a presentation of Mr. Jitendra Vashisht (Head TPO, BRCMCET) giving a brief introduction of the site. One of the officials of Industry told the students about the importance of entrepreneurship and also told how the future entrepreneurs are created. Moving

on, a visit was made to their incubation centre and workshops, comprising of all latest machineries and equipments. The students were explained the working and all related aspects of the equipments. The officials also mentioned that the trainees here are given a hands-on experience on the working projects and machineries so as to improve their skills.

In the end, Mr. Vashisht motivated the students to take up any one of the available training programs and become an entrepreneur. Faculty members Sh. Sunil Baloda and Sh. Vikrant Verma extended their thanks to the officials of NSIC for providing their valuable time.



NATIONAL CONFERENCE (SEPMWET-2017)

A Two-day National Conference on “Sustainable Engineering Practices in Material, Water and Energy Technologies” (SEPMWET-2017) was organized by Civil Engineering Department in association with Mechanical Engineering Department and ISTE New Delhi on **18th and 19th March, 2017**. Dr Arabinda Sharma was the Convener of the Conference and Mr Mahesh Juneja was the Secretary of the Conference. The Conference received overwhelming response in terms of the number of papers and registered participants. Altogether, 61 full length papers were received in this conference and published as **Conference Proceeding (ISBN No: 978-93-84922-36-8)**.

The conference had four technical sessions excluding the Inaugural, Plenary and Valedictory sessions. In Inaugural session, **Dr Kuldip Sangwan, Professor of Mechanical Engineering, BITS Pilani** was the Chief Guest, **Mr. Ashok Sharma, Senior Consultant (Electrical), Entura Hydro Tasmania India Pvt. Ltd.** and **Dr. Arvind Kumar Gupta, Professor of Mechanical Engineering, YMCA University of Science and Technology, Faridabad** were **Guests of Honor**. In addition to Guest of inaugural functions, **Dr. Amitanshu Pattnaik, Senior Scientist, DTRL, DRDO, New Delhi** also delivered a keynote speech in plenary sessions,. The technical sessions were chaired by **Dr. S.N. Patel, Asst. Professor of Civil Engineering, BITS Pilani, Dr Bahurudeen A, Asst. Professor of Civil Engineering, BITS Pilani, Dr. N.K. Rana, Retd.**

INDUSTRIAL VISIT SHEELA FOAM LIMITED

UDYOG VIHAR, GREATER NOIDA, Uttar Pradesh 201306

A visit to Sheela Foam Limited was organized on 22nd April, 2017. Almost 40 students of ME department visited the industry. Faculty coordinators Sh. Mahesh Juneja (A.P., ME Department) and Sh. Mandeep Kumar (Instructor, ME Department) accompanied the students to the site.

A leader in Polyurethane (PU) Foam, Sheela Group is a multi-billion rupee entity. It has a nationwide presence in manufacturing PU Foam with a global marketing perspective and an impeccable track record, since 1971. Sheela Group is committed to a one-point programme that of bringing comfort, convenience and luxury to enhance the lifestyle of a modern man. The winning brands of Sheela Group include

- SLEEPWELL - The flagship brand for mattresses and comfort accessories
- FEATHER FOAM - A Pure PU Foam
- LAMIFLEX - A superior quality POLYETHER/POLYESTER foam for lamination

These are ranked as the largest selling PU Foam in the country. Today, Sheela Group leads with more than 35% market share in the Flexible PU Foam market in India as well as Australia.

The visit started by a presentation of Mr. Jitendra Vashisht (Head TPO, BRCM CET) giving a brief introduction of the site. A visit was made to their various sections like raw material storage section, foaming section, curing section, store area, cutting department and packaging section. Officials of the industry told the students about polymerization process and how they use it to manufacture foam. Students were shown the latest machinery used in this industry. Furthermore, they said that Sheela Foam has been a leading exporter of foam from a long time.

In the end, Mr. Vashisht motivated the students to join this leading edge company. Faculty members Sh. Mahesh Juneja and Sh. Mandeep Kumar extended their thanks to the officials of Sheela Foam Limited for providing their valuable time.



Faculty Mechanical Engineering Department

Name	Designation	Qualification
Mr. Kanwar Pal	Asstt. Prof.	B.E.(ME), M.Tech.(MT&A) (Ph.D Pursuing)
Mr. Sunil	Asstt. Prof.	B.Tech.(ME), M.Tech.(Thermal Engg.) (Ph.D Pursuing)
Dr. Sanjay Kumar	Asstt. Prof.	B.Tech (ME), M.Tech (Thermal), Ph.D
Mr. Vishwas Yadav	Asstt. Prof.	B.Tech.(ME), M.Tech.(I&P)
Mr. Nitesh Jain	Asstt. Prof	B.Tech (ME), M.Tech (M&A)
Mr. Amit Kumar	Asstt. Prof.	B.Tech.(ME), M.Tech.(ME)
Mr. Ankit Panghal	Asstt. Prof.	B.Tech (ME), M.Tech (Renewable Energy)

Supporting Staff Mechanical Engineering Department

Name	Designation	Qualification
Mr. Arvind Godara	Instructor (Sr. Scale)	Diploma (ME)
Mr. Pardeep Kumar	Instructor (Machine Shop)	ITI (Turner), CTI, BA
Mr. Narender Singh	Instructor	Graduate from Indian Army in ME
Mr. Mandeep	Instructor (Trainee)	Diploma (ME), B.Tech. (ME)
Mr. Ladhu Ram	Technician (Welding)	ITI (Welder)
Mr. Sanjay Kumar	Carpenter (Workshop)	ITI

Faculty Publications/ Conferences (Int. National and National)/Seminar and Workshops attended

Nitesh Jain

- Convective heat transfer coefficient for indoor forced convection drying of vermicelli, IOSR Journal of Engineering June. 2012, Vol. 2(6) pp: 1282-1290.
- Effect and Comparison of Open Sun and Indoor Forced Convection on Heat Transfer Coefficients for Drying of Vermicelli, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp.136-144, BRCM CET, Bahal (Haryana).
- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal.

Amit Kumar

- Evaluation of Convective Heat Transfer Coefficient for Sensible Heating of Sugarcane Juice by Copper Immersion Rod, Proceedings of National Conference NEIET-2012, April 28, 2012, BITS, Bhiwani (Haryana).
- Thermal Performance of Copper and Brass Immersion Rods for the Evaporation of Sugarcane Juice, S-JPSET: ISSN: 2229-7111, 2012, Vol. 4, Issue 1.
- An overview of optimization techniques used in solar drying, Asian Journal of Science and Applied Technology (AJSAT) Vol1.No.1 2013 pp 5-11.
- An overview of heating process used in Jaggery making, Proceeding of National Conference RTME-2013, October 4-5, 2013, pp.76-81, BRCM CET, Bahal (Haryana).
- Effect and Comparison of Open Sun and Indoor Forced Convection on Heat Transfer Coefficients for Drying of Vermicelli, Proceeding of National Conference RTME-2013, October 4-5, 2013, pp.136-144, BRCM CET, Bahal (Haryana).
- Career prospects for Mechanical engineers, Technical journal of Mechanical Engineering Society (MES), June, 2013, p. 5, BRCM CET, Bahal (Haryana)
- I attended one week TEQIP sponsored short term course on "Fundamentals of Tribology" organized by Department of Mechanical Engineering, National Institute of Technology Hamirpur, (H.P.) from May 26-30, 2014.
- I attended one week TEQIP sponsored short term course on "Recent Advances in Utilization of Hydrogen in Internal Combustion Engines" organized by Centre for Energy Studies, Indian Institute of Technology Delhi from July 7-11, 2014
- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal.

Kanwarpal

- “An Analysis of Sintering Mechanism”, Proceedings of National Conference on Recent developments in Mechanical Engineering , 19-20 February, 2010, pp 272-275, BRCM-CET, Bahal, Haryana.
- “Powder Metallurgy (PM) of Aluminum Alloy”, Proceedings of National Conference on Recent developments in Mechanical Engineering , 19-20 February, 2010, pp 208-211, BRCM-CET, Bahal, Haryana.
- “Cogeneration of Energy”, Proceedings of National Conference on Industrial Electronics, Drives and Embedded Systems, March 7-8, 2009, BRCM CET Bahal, Haryana.
- “Sintering Technology: An Analytical Overview”, Proceedings of NCTI, October 11-12, 2008, pp 418-423, BRCM CET Bahal, Haryana.
- “An Analysis of Surface Roughness and Machinability of Al-Fe-Si Alloys”, Proceeding of National Conference TAME-2012, October 19-20, 2012, YMCAUST, Faridabad (Haryana).
- “Numerical simulation of finer particles at higher concentration for pipeline flow” Proceedings of National Conference on Recent Trends and Innovation Civil Engineering held at BRCM CET, Bahal during 15th-16th November, 2013.
- “CFD Modeling For Slurry Pipeline Flow: A Literature Review” Proceeding of National Conference on Recent Trends and Innovation Civil Engineering held at BRCM CET, Bahal during 15th-16th November, 2013.
- “Effect of process parameters on hear affected zone using gas metal arc welding” Proceeding of National Conference on Recent Trends and materials engineering held at BRCM CET, Bahal during 4th-5th October, 2013.
- “Optimization of parameters in welding of MS plates” Proceeding of National Conference on Recent Trends and materials engineering held at BRCM CET, Bahal during 4th-5th October, 2013.
- “Optimization of parameters in powder metallurgy of Al-based alloys” Proceeding of National Conference on Recent Trends and materials engineering held at BRCM CET, Bahal during 4th-5th October, 2013.
- “CFD modeling of slurry transportation in pipeline for Concentration Distribution using different models “communicated for national conference on recent advances in mechanical and civil engineering (RAMCE-2014), Ghaziabad during 4th-5th April, 2014.
- “Simulation of Thermal Power Plants”, Proceedings of International Conference on Innovative Technologies, p-662, June 18-19, 2009, PDM Bahadurgarh (Haryana).
- “Modern World Class Manufacturing Scenario”, Proceedings of International Conference on Innovative Technologies, p-681, June 18-19, 2009, PDM Bahadurgarh (Haryana).
- “Development of Robot Technology” Proceedings of International Conference on Innovative Technologies, p-660, June 18-19, 2009, PDM Bahadurgarh (Haryana).
- “Simulated Study of Feasibility and Design of 10 KWp STV” Proceedings of 2nd International Conference on ESTEEM-2013, March 3-4, 2013, PPIMT Hisar (Haryana).

- QIP short term course on “Challenges in Measurements of Single and Two Phase Flow – Recent Trends” held during June 24-28, 2013, organized by MIED at IITR, Roorkee (U.K.).
- Attended two days National Seminar on “Applications of Graph Theory A Novel Technique for Research” at YMCA-UST.
- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal

Sunil

- Water-Energy Nexus; a Thematic Approach for Sustainable Future, Proceedings of National Conference RACEE-2015, Nov. 28-29, 2015, pp. 108-113, BRCM CET, Bahal (Haryana).
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- Solid waste a concern of metro cities, Proceedings of National Conference on Recent Developments in Mechanical Engineering, February 19-20, 2010, BRCM-CET, Bahal, Haryana, pp. 337-340.
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- Syngas Produced In Biomass Gasification System- A Practical Approach, First National Conference on Advances in Mechanical Engineering (NCAME-2011), 20th - 21st May 2011, UIET, Panjab University, Chandigarh, pp. 19-22.
- CFD modeling of particulate flow (2-phase flow) in pipelines using fluent software, Proceedings of National Conference on Recent Trends in Materials Engineering, October 4-5, 2013, BRCM-CET, Bahal, Haryana, pp. 386-397.
- Applications of Nano-materials and Nanotechnology in Construction Industry- A Review, Proceedings of National Conference on Recent Trends and Innovation in Civil Engineering,

November 15-16, 2013, BRCM-CET, Bahal, Haryana, pp. 48-52.

- Career prospects for Mechanical engineers, Technical journal of Mechanical Engineering Society (MES), June, 2013, p. 5, BRCM CET, Bahal (Haryana)
- Attended one week QIP sponsored Short Term Course on "Recent Advances in Utilization of Hydrogen in Internal Combustion Engines" organized by Centre for Energy Studies, Indian Institute of Technology Delhi from July 7-11, 2014.
- Attended two week ISTE Workshop sponsored by MHRD on "Control Systems" organized by IIT Kharagpur from Dec. 02 – Dec. 12, 2014.
- Participated in Workshop on, 'MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal

Vishwas Yadav

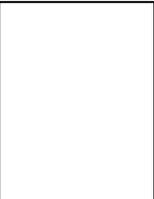
- Presented a paper entitled, "Applying Total Productive Maintenance in Auto- Sector: A case study with Sandhar Gurgaon, Proceeding of national conference on Recent Trends in Mechanical Engineering ,October 4-5,2013, BRCM-CET, Bahal, Haryana, PP.409-415.
- Presented a paper entitled, "Effects of Total Productive Maintenance : A case study with Sandhar Automotive Gurgaon, Proceeding of national conference on Emerging Trends in Mechanical Engineering(NCTEM-2014), Organized by Gate Way Institute of engineering and Technology, Sonapat.
- Presented a paper entitled," Anaysis of Magneto Rheological fluid, Proceeding of national conference on Emerging Trends in Mechanical Engineering (NCTEM-2014), Organized by Gate Way Institute of engineering and Technology, Sonapat.
- Presented a paper entitled, " Different techniques used for drying agriculture products in current scenario, Proceeding of national conference on Emerging Trends in Mechanical Engineering(NCTEM-2014), Organized by Gate Way Institute of engineering and Technology, Sonapat.
- Participated in Seminar on, Design Technology Interface, on 28th August, 2012 held at NIT Kurukshetra and sponsored by national institute of design, Ahmedabad.
- Attended two week ISTE Workshop sponsored by MHRD on "Control Systems" organized by IIT Kharagpur from Dec. 02 – Dec. 12, 2014.
- Participated in Workshop on DERC, 2-3 March, 2015 held at BRCM-CET, Bahal
- Participated in Workshop on MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal

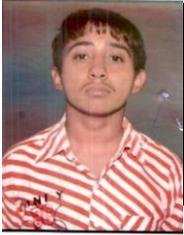
Ankit Panghal

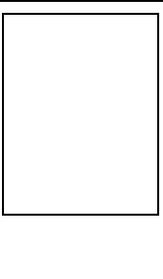
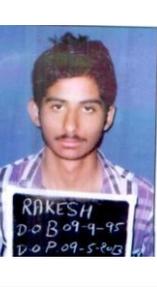
- Ankit Panghal, Gulshan Sachdeva "Analysis of ejector refrigeration system of fixed ejector geometry "International Conference on "Sustainable Development through Research in Engineering and Management ("SDREM 2016"), at YMCA University of Science and Technology on 26-27 Dec.2016.

- Ankit Panghal, “Experimental investigation of passive cooling in buildings with insulation and thermal energy storage system” 2nd International Conference on Research Trends in Engineering, Applied Science and Management (ICRTESSM-2017), National Institute of Technical Teachers Training & Research (NITTTR), Ministry of MHRD, Govt. of India, Sec-26, Chandigarh.
- Ankit Panghal, Gulshan Sachdeva “Analysis of ejector refrigeration system of fixed ejector geometry” National Conference on Recent Advances in Mechanical Engineering. June 02-03, 2017, at NIT Kurukshetra.

B.TECH MECHANICAL ENGINEERING STUDENTS (2013-2017 BATCH)

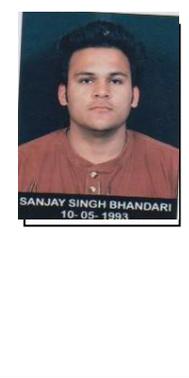
<p>College Roll No.:-13-ME-1901 Name:- Abhishek D.O.B.:-02/10/1996 P.A.:- Bhansi Pana, Lohar Bazar, Bhiwani E-mail ID:-abhishekchauhan516@gmail.com Life at BRCM:-A great experience I'll always remember:- Playing cards in Hostel P.J.:-</p>		<p>College Roll No.:-13-ME-1902 Name:- Abhishek Kumar D.O.B.:- 09/01/1996 P.A.:-VPO- Bounsi, Pathak Toal E-mail ID:- abhishekpathak231@gmail.com Life at BRCM:- Awesome I'll always remember:- Dinner of mess P.J.:-</p>	
<p>College Roll No.:-13-ME-1903 Name:- Amit D.O.B.:-15/01/1996 P.A.:-VPO Bhungarka Teh. Narnaul E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1904 Name:- Amit Kumar D.O.B.:-08/07/1995 P.A.:-Village Jant V.P.O. Lawan Distt. Mahendargarh E-mail ID:- as164266@gmail.com Life at BRCM:- Good I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1905 Name:- Anil Kumar Sharma D.O.B.:-14th Apr,1994 P.A.:-H.No. 415, Near Manav Kalyan Hospital, VPO Bahal, Teh. Loharu E-mail ID:-anil.sharma77150@yahoo.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1906 Name:- Ananjay D.O.B.:-05th Apr,1995 P.A.:-Choti Kalyani, Modern Chuhi E-mail ID:-ananjaykundra54@gmail.com Life at BRCM:- Fantastic I'll always remember:-Everything P.J.:-</p>	
<p>College Roll No.:-13-ME-1907 Name:- Ankit Kumar D.O.B.:-27th Oct,1994 P.A.:-VPO- Charkhi, Teh. Charkhi Dadri E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1908 Name:- Ashish Yadav D.O.B.:- 4th Oct, 1994 P.A.:-H.No. 46, Labour Colony, BTM Road E-mail ID:-yadav.bless@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1909 Name:- Bajrang D.O.B.:- 1st Sept., 1996 P.A.:-Vil Jant PO Lawan E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1913 Name:- Dhruv Pundir D.O.B.:- 19th Jan.,1996 P.A.:-BRCM CET, Bahal E-mail ID:-dhruv.singhpundir@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1914 Name:- Dinesh Garg D.O.B.:-1st Feb.,1996 P.A.:-Shop No. 88-A, Ramla Sushil Kumar, Anaj Mandi, Bhattu, Fatehabad E-mail ID:- dineshgarg010296@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1915 Name:- Dinesh Saini D.O.B.:- 10th Sept.,1995 P.A.:-H.No. 564-21, Mandi Sainian, near Pam Lila Ground, Hisar E-mail ID:- dhaiya9510@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	

<p>College Roll No.:-13-ME-1916 Name:- Gagan Tayal D.O.B.:-27th Nov.,1995 P.A.:-Tayal Niwas, Baba Khan Das ki Galli, Ptaram Gate, Bhiwani E-mail ID:-gagantayal123@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1917 Name:- Gobind D.O.B.:- 12th Mar., 1995 P.A.:-Village Allampur, PO-Hilor, Teh.Tosham Bhiwani E-mail ID:- gobindchauhan999@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1918 Name:- Hiten Sangwan D.O.B.:- 23th June.,1994 P.A.:-09, Meham Road, Vidya Nagar, Bhiwani E-mail ID:-hiteshsangwan99@yahoo.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1919 Name:- Ishaan Sharma D.O.B.:- 29th May, 1995 P.A.:- 34, Tower Enclave, Hisar E-mail ID:-vats.ishaan88@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1920 Name:- Jogender Singh D.O.B.:-22nd Oct.,1993 P.A.:-VPO- Bapora, Teh. & Distt. Bhiwani E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1922 Name:- Karan Sharma D.O.B.:-3rd June, 1994 P.A.:-#152, Sec-6, HUDA, Hansi E-mail ID:- krsharma94@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1923 Name:- Krishan Verma D.O.B.:- 9th Jan.,1994 P.A.:-Dadri Gate, Ram gang mohalla, Bhiwani E-mail ID:-krishankumarbhiwani@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1924 Name:- Manish Phogat D.O.B.:- 5th Jul.,1995 P.A.:-VPO- Makrana, Teh. Charkhi Dadri, Bhiwani E-mail ID:- manishphogat.786@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1925 Name:- Manjeet D.O.B.:-15th April, 1995 P.A.:-VPO- Dohar Kalan, Teh. Narnaul E-mail ID:-manjeetyadav2012@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1926 Name:- Manjeet D.O.B.:- 3rd Mar.,1997 P.A.:-Village Bhakran, PO Ragha Choti, Teh Rajgarh E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1927 Name:- Nikhil D.O.B.:-4th May,1995 P.A.:- H.No. 1302, Sector16-17 Hisar E-mail ID:-nikhildhindwal@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1928 Name:- Nishikant Mishra D.O.B.:- 3rd Feb.,1997 P.A.:-AT+PO-Batsar, Banka, Bihar E-mail ID:-nm07431.nm@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	

<p>College Roll No.:-13-ME-1929 Name:- Padam D.O.B.:- 1st Nov.,1994 P.A.:-H.No 1765/2402, Galli no.2, Rampura Mohalla, Hisar E-mail ID:- padamb0@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1930 Name:- Pardeep Kumar D.O.B.:- 8th Aug.,1995 P.A.:-Unites cloth house, Charkhi dadri, Bhiwani E-mail ID:-bhardwaj0808@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1932 Name:- Rahul Batra D.O.B.:- 24th Sept.,1995 P.A.:-Gali swami kirpa ram, Halu bazaar, Bhiwani E-mail ID:- rahulbatra291@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1934 Name:- Rahul Kumar D.O.B.:- 10th Oct.,1996 P.A.:-Village Majholia, PO Chandan Party Muzaffarpur, Bihar E-mail ID:-rahuljaiswalrjpriyanka@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1936 Name:- Rahul Sharma D.O.B.:-2nd Sept.,1993 P.A.:-H.no.1346/32, Chandni Chowk, Hisar E-mail ID:-rahulsharma0136@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1938 Name:- Rakesh Boora D.O.B.:- 9th Sept.,1995 P.A.:-H.no. 9,Devilal Colony, Hansi Road, Bhiwani E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1939 Name:- Ranjay Kumar Yadav D.O.B.:- 20th Feb.,1995 P.A.:-AT Paro, PO Barhat, Bihar E-mail ID:-ranjayyadav512@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1940 Name:- Ravi Bhardwaj D.O.B.:- 20th Nov.,1994 P.A.:-1340/92, Ganesh pura, Tri nagar, Delhi E-mail ID:-ravibhardwaj300@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1941 Name:- Rohit Kumar D.O.B.:- 9th Feb.,1995 P.A.:-VPO- Barsana, Teh. Ch.Dadri, Bhiwani E-mail ID:-rohityadav9295@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1943 Name:- Sachin Phogat D.O.B.:- 30th Aug.,1995 P.A.:-VPO-Samaspur, Teh.Ch Dadri, Bhiwani E-mail ID:-sachinphogat8@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1944 Name:- Sachin Yadav D.O.B.:-28th March,1996 P.A.:-H.no. 2414, Sec-13, HUDA, Bhiwani E-mail ID:-sachinyad03@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1945 Name:- Sandeep Goyal D.O.B.:- 5th Nov.,1993 P.A.:-Ward no.7, Near Shubam Hospital, Siwani Bhiwani E-mail ID:- sandeep.goyal1945@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	

<p>College Roll No.:-13-ME-1946 Name:- Sandeep Kumar D.O.B.:-30th Jan.,1994 P.A.:-Village Banthu, PO Satpura, Vaishali, Bihar E-mail ID:- sandeepkr2012@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1947 Name:- Sharma Sumit Narsingh D.O.B.:- 7th Dec.,1995 P.A.:- CF-104, Sai Vihar Society, Koprali Road, Ahemdabad, Gujarat E-mail ID:-sumitshm65@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1948 Name:- Sonu Kumar D.O.B.:- 9th Sept.,1995 P.A.:-Kirti Nagar, Near Gopiwali Kui, Bhiwani E-mail ID:- sonuk3087@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1949 Name:- Sonu Kumar Sah D.O.B.:- 1st June,1995 P.A.:-Mithila Gift House, Main Bazar, Katra J&K E-mail ID:-sonu57501@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1950 Name:- Sorabh D.O.B.:- 21st Oct.,1995 P.A.:-VPO- Nahar, Rewari E-mail ID:- sorabhrohila007@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1951 Name:- Shubham Mittal D.O.B.:- 26th Jan., 1996 P.A.:- Shubham Emporium, Tosham Mod, Siwani, Bhiwani E-mail ID:- shubhammittal454@yahoo.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1953 Name:- Tanuj Kumar D.O.B.:- 31st Oct., 1995 P.A.:- 82, New anaj mandi, Mandi adampur Hisar E-mail ID:- tanujgarg71@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1954 Name:- Tushar Gandhi D.O.B.:- 12th Feb., 1996 P.A.:-Flat. No. AD 13, BRCM campus Vidyagram Bahal, Bhiwani E-mail ID:-tushar.gandhi1996@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1955 Name:- Vicky Kumar D.O.B.:-17th Sept.,1995 P.A.:- Village Chausima, PO SIHO, Muzaffarpur Bihar E-mail ID:- vickykumarvicky728@gmail Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-13-ME-1956 Name:- Vivek Tanwar D.O.B.:- 9th Feb., 1995 P.A.:- H.no 238, Near Sadar Thana, Bhiwani E-mail ID:- vtjhony@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>	
<p>College Roll No.:-13-ME-1957 Name:- Yoginder Singh D.O.B.:- 19th Dec.,1996 P.A.:-H.No. 535,VPO-Daroli, Teh.Mandi Adampur, Hisar E-mail ID:-yoginersingh0001@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p>		<p>College Roll No.:-14-ME-1958 Name:- Ajit Kumar D.O.B.:-1st Feb., 1996 P.A.:-VPO- Hariyawas, Tehsil Loharu E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p>	

<p>College Roll No.:-14-ME-1959 Name:- Aman D.O.B.:- 18th Jul., 1995 P.A.:-H.No. 196, Indra Colony, VPO-Uklana Mandi, Hisar E-mail ID:- amanchhabra5@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 	<p>College Roll No.:-14-ME-1960 Name:- Amit Kumar D.O.B.:- 24th Dec., 1995 P.A.:-VPO- Asalwas Dubia, Teh-Bhiwani E-mail ID:- Life at BRCM:- I'll always remember:- P.J.:-</p> 
<p>College Roll No.:-14-ME-1961 Name:- Ankur Shaeoran D.O.B.:- 6th Aug.,1994 P.A.:-H.No. 2230/1, Shiv Nagar, Bhiwani Road Rohtak E-mail ID:- ankursheoran87@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 	<p>College Roll No.:-14-ME-1962 Name:- Ashwani D.O.B.:- 20th Mar., 1995 P.A.:-VPO-Aun (Baund Kalan), Teh- Ch. Dadri, Bhiwani E-mail ID:- ashwanisheoran79@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 
<p>College Roll No.:-14-ME-1963 Name:- Bharat Chaturvedi D.O.B.:- 24th Jun., 1994 P.A.:-Pandit Nekram Road, Near gali Dhagyan, Halu Bazaar E-mail ID:-bharatchaturvedi007@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 	<p>College Roll No.:-14-ME-1966 Name:- Gaurav Jhamb D.O.B.:- 17th Jun., 1995 P.A.:-VPO- Saniyana, Tehsil Tohana, Fatehabad E-mail ID:- gauravjhamb8@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 
<p>College Roll No.:-14-ME-1967 Name:- Gurumender Singh D.O.B.:- 1st June,1995 P.A.:-VPO- Matnai, Tehsil Siwani, Bhiwani E-mail ID:-singhgurumender@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 	<p>College Roll No.:-14-ME-1970 Name:- Kuldeep D.O.B.:- 6th Apr., 1996 P.A.:-Jindal Stainless LTD(R-DIV), opp Jindal Marg, Hisar E-mail ID:- kuldeep.tanwar20064@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 
<p>College Roll No.:-14-ME-1972 Name:- Manjeet Singh D.O.B.:- 24th Dec., 1995 P.A.:-VPO- Prem Nagar, Bhiwani E-mail ID:-manjeetdhanda38@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 	<p>College Roll No.:-14-ME-1973 Name:- Mohit D.O.B.:- 29th Jul.,1993 P.A.:-H.No.- 195, GF Housing Board Colony Dadri Gate, Bhiwani E-mail ID:- mehta.mohit@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 
<p>College Roll No.:-14-ME-1974 Name:- Naman Sharma D.O.B.:- 11th Mar., 1996 P.A.:-Halu bazaar, Pujario wali gali, Bhiwani E-mail ID:- naman11@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 	<p>College Roll No.:-14-ME-1975 Name:- Narender D.O.B.:- 23rd Oct., 1993 P.A.:-H.no.- 9-C, New Rishi Nagar, Hisar E-mail ID:-narenderjangu95@gmail.com Life at BRCM:- I'll always remember:- P.J.:-</p> 

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Departmental activities at a glance.....



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