



# *Mechanica*

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Technical Magazine of Mechanical Engineering Society (MES)

Department of Mechanical Engineering

**BRCM College of Engineering & Technology**  
Bahal - 127028, Distt.- Bhiwani, Haryana



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

<b>Sr.No.</b>	<b>Contents</b>	<b>Page No.</b>
1	Effect of vibration during solidification of metals, D.B.Goel	7
2	Solar- the centre stage of renewable energy, Kanwarpal Singh, A.P. and HOD, ME	11
3	Prospects of hydrogen as a fuel of future, Sunil Baloda A.P.,ME	13
4	Challenges in Engineering, Mahesh Juneja, A.P., ME	16
5	Agriculture robot: a tool for mitigating the toil of peasants, Mahender Singh Kaswan A.P., ME	18
6	Role of maintenance in Indian industries, Vinod Kumar A.P., ME	21
7	What is adaptive cruise control and how does it work, Vishwas Yadav, A.P., ME	24
8	Future aspects of nuclear energy in India, Nitesh Jain A.P., ME	26
9	Small scale industry: Role and importance in India, Amit Kumar AP, ME	29
10	Latest technology for wind turbine, Sanjay Kumar, 3 <sup>rd</sup> Year, ME	31
11	New battery shuts down at high temperatures, restarts when it cools, Devender Shekhawat, 3 <sup>rd</sup> Year, ME	32
12	Supercharger kit for small diesel engines with the displacement of 200cc to 1,200cc, Love Swami, 3 <sup>rd</sup> Year, ME	34
13	Laser headlight technology, Love Swami, 3 <sup>rd</sup> Year, ME	35
14	Blast furnance and its process, Rishav, 3 <sup>rd</sup> Year, ME	36
15	M.Tech. Dissertation (Abstracts) 2013-2015 Batch	41
16	M.Tech. (Mechanical Engineering) Dissertation topics (2014-2016 Batch)	43
17	National workshop MF-2015	44
18	Industrial visit of Mechanical Engg. Students to Star Wire Ltd., Ballabgarh, Faridabad	46
19	List of Technical Lectures held during last year (2015-16)	46
20	Interaction Program	46
21	Pre-celebration of Teacher's day	48
22	Vishwakarma Day Celebration	49
23	MECHAFEST – A Technical Event	49
24	Cricket Battle	51
25	ROBOCON-2016	53
26	ACME-2016	54
27	Faculty Mechanical Engineering Department	61
28	Supporting Staff Mechanical Engineering Department	62
29	Faculty Publications/ Conferences (Int. National and National)/Seminar and Workshops attended	62
30	B.Tech. Mechanical Engineering Students (2012-2016 Batch)	71

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- ❖ Farewell of outgoing faculty members.
- ❖ Invited lectures of outside and inside experts.
- ❖ Group discussion and Debate competition.
- ❖ Cultural/Picnic/Sports activities.
- ❖ Publication of departmental magazine “MECHANICA”.

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- ❖ Financial support from Management
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**Sky Rider Activity under MES**

# ARTICLES

## EFFECT OF VIBRATION DURING SOLIDIFICATION OF METALS

**D.B.Goel**

**Emeritus Professor, BRCM College of Engineering & Technology, Bahal**

**dbgoel@brcm.edu.in**

### **Introduction**

Fluid flow is always present during solidification of castings under normal situations. This fluid flow affects to a large extent the nature of solidification and the resultant macro and micro structures leading to variations in mechanical properties. The fluid motion can be altered by application of external force fields on the solidifying melt. The effects of external force fields are relatively far more predictable, and refinement of the cast structure can be controlled at will. The main objective behind applying such force fields has been to exercise control over the quality of cast structures. There are three principal methods of applying external force fields during solidification. These are: application of magnetic field, rotation or oscillation of the mould about its vertical axis and application of vibration to the solidifying melt.

### **Transmission of vibration to the solidifying melt**

For effective transmission of vibration to the solidifying melt three methods are normally used:

- (i) **Rigid coupling method:** In this case the mould containing the molten metal is rigidly clamped to the vibrating table of the exciter. This method is used in conjunction with mechanical, electromagnetic and electrodynamic vibrators.
- (ii) **Dip probe method:** In this method a probe actuated by the vibrator, and made of a high melting point material, preferably of ceramic, is inserted into the liquid metal. Although this method has the attractive feature of not requiring the acceleration of a large metallic mass, it suffers from an inherent disadvantage that once the solidification starts, intensity of vibration varies across the mould. Taking out of the probe from the mould before it gets embedded into the solidified metal presents another problem. Effective transmission of vibration to a large volume of melt is difficult with this method. This method is commonly used with ultrasonic vibration generators.
- (iii) **Elastic wave method:** In this method the mould/molten metal system as a whole is not mechanically vibrated, but the vibration energy is introduced into the molten metal in the form of a pure elastic wave through the mould walls; usually through mould bottom. It is used with

ultrasonic vibration generators. This method has not been well represented largely due to two reasons:

- (i) Power limitations of the source of elastic vibrations; and
- (ii) Difficulty of effective introduction of elastic vibrations into the molten metal.

### **Effect of vibration on metallographic structure**

Application of both ultrasonic and sonic vibrations during solidification has led to the discovery of several physical effects. It can affect the course of a variety of metallurgical processes. The influence of vibration on solidifying melts can be affected by several parameters. These include the amplitude of vibration, the amount of superheat of the metal when poured, the temperature of the mould, the rate of cooling in the mould and the presence of grain refiners or inoculants in the melt. Vibration influences the cast structure only when it is applied during the period of solidification. It does not condition the liquid in any sense. Since it has been observed that vibration affects the metallographic structure in a variety of ways.

**Effect on Shape and Size of Grains:** Ultrasonic vibrations when applied during solidification of pure metals cause in general considerable grain refinement of the as cast structure. Using frequencies of 50Hz, 9 kHz and 20 kHz it has been concluded that grain refinement is more marked as the intensity of vibration is increased and frequency has virtually no effect. Ultrasonic vibrations when applied during solidification of steel ingots result in disappearance of columnar crystals and a decrease in linear grain size.

Low frequency vibrations also almost equally occupied the attention of various investigators. On the basis of their work it is observed that neither frequency and nor the amplitude is a singular variable, but rather the frequency-amplitude product is a vital factor. The conclusion drawn by them on the basis of their modified investigations are important and are reproduced below:

- (1) Grain refinement is most effective when the rate of solidification is slow.
- (2) Grain refinement seems to occur only in those alloys which are predominantly solid solutions in structure.
- (3) In a given alloy system, grain refinement is most effective at low alloy contents.
- (4) Grain refinement is not critically dependent on frequency in the range 0-1000Hz but rather on the product of frequency and amplitude of vibration.
- (5) The grain refinement remains proportional to vibrational intensity (frequency-amplitude product) up to a certain critical value, beyond which little additional grain refinement is achieved.

(6) The comparative benefits of vibration (in terms of grain refinement and defect free castings) in case of small cross-section ingots is less pronounced as compared to large cross-section ingots.

Some investigators have obtained a smaller and more equiaxed grain structure by applying 48Hz and 23Hz vibrations to gas turbine blade castings during solidification. According to them although both amplitude and frequency are contributory factors, frequency is more important. As far as grain refinement is concerned they attach maximum importance to the amplitude of vibration and not to the frequency.

The amount of grain refinement obtained due to vibration has also been found to be dependent on the amount of contraction during solidification. In the medium frequency range if a vibrating probe was dipped into the solidifying melt for transmission of vibration, the grain refinement was observed only in the vicinity of the probe giving rise to a heterogeneous structure. This is specially true for low intensities of vibration. Addition of grain refiners to the Aluminium-4.5 Copper alloy has been found to greatly reduce the effect of vibration as far as further grain refinement is concerned.

It is also now well established that vibration helps in the suppression of columnar growth and formation of small equiaxed grains. The amount of grain refinement however, has been reported to vary considerably at different frequencies and amplitudes of vibration for different metals and alloys. There is considerable disagreement on the influence of vibration parameter and the method of introducing the vibrational energy on grain refinement. A number of explanations have been put forward and theories of grains refinement have been suggested based on such explanations.

Vibration affects the basic crystallization process and enhances the nucleation rate due to occurrence of cavitation. Cavitation affects the structural refinement by varying the crystallization parameters and dispersion of growing crystals into the melt. During cavitation, the cavity collapse occurs on the positive pressure part of the vibration cycle and large local pressures are generated in the melt resulting into a decrease of the critical size of stable nuclei. Cavitation has been found to occur in solidifying melt both at ultrasonic and sonic frequencies. Besides cavitation, grain refinement also occurs as a result of dendrite remelting. Remelting of dendrites resulting due to stirring lowers the actual temperature at some distance ahead of the solidification front. This enables the survival and subsequent growth of the partially remelted fragments.

**Effect on shape and distribution of micro constituents:** In spite of the success achieved in the grain refinement of pure metals and solid solution alloys there is some evidence that secondary precipitating phases, such as graphite flakes in grey cast Iron and Silicon in the Aluminum-Silicon eutectic, suffer from a coarsening effect when forming under the influence of vibration. This also appears to be the case with intermetallic compounds.

The effect of vibration on the solidification of an eutectic alloy is considerably different from that of a pure metal or a solid solution type of alloy. The vibrated Aluminum-Silicon Alloy exhibit a finer eutectic cell structure, but coarser eutectic constituents than the unvibrated one.

The observations in case of modified Aluminum-Silicon eutectic have been reported to be altogether different. The eutectic Silicon particles in this alloy are refined with increasing duration of vibration. Low frequency vibrations applied during solidification produce refinement of primary austenite dendrites in steel and refinement of primary carbides in white cast iron. It has also been observed that particles of intermetallic compound  $Ce_2Pb$  formed in the Cast Iron melt as a result of simultaneous addition of Cerium and Lead can act as centres of graphite nucleation under the action of vibration. The microstructure of Al-33Cu alloy solidified under the influence of low frequency vibration exhibit colony type growth. The colony formation is attributed to the breakdown of the planar solid/liquid interface into a cellular one due to rejection of impurities by the solidified metal.

### **Effect on Porosity**

The incidence of gas porosity has been affected by vibration. Without vibrational treatment this porosity is dispersed in the form of small 'pinhole' cavities. The effect of vibrational treatment is often to enlarge and coagulate the gas pores, forming voids of a size that could not be permitted in castings. However, if the vibration applied is of sufficiently large intensity, the melt may in effect be degassed. The use of sonic and ultrasonic vibrations for the degassing of metallic melts has been mentioned in literature. Porosity values show decreasing trend as the amplitude of vibration is increased for the case of Aluminium alloys.

It is expected that similar effect would be observed in all other metals that show grain refinement due to vibration. The pores generally take the form of randomly distributed round cavities. In some ingots these have been found to be located towards the top centre of the ingot which is suggestive of shrinkage cavities; however, it is difficult to distinguish clearly whether these are shrinkage or gas pores.

### **Effect on mechanical properties**

It has been seen in previous sections that application of vibration produces invariably a fine grained structure, suppresses columnar growth and eliminates dendritic grain geometries. On the basis of these observations one would expect a corresponding increase in mechanical properties also. It is known that structural changes produce corresponding property changes, but fine grains may not always lead to enhancement in mechanical properties. This is especially true in case of Aluminum Alloys. Macro structural control is related to the overall thermal and constitutional environment and is thus closely allied to micro segregation leading especially to porosity and second phase distributions. Some of the relevant important factors which lower the mechanical properties of cast Aluminum Alloys are mentioned below:

- (i) Interdendritic porosity resulting from hydrogen evolution during solidification.
- (ii) Interdendritic porosity resulting from shrinkage during ‘mushy’ type solidification.
- (iii) Weak or brittle material present at grain boundaries (intermetallic compound or dross).

Gas porosity has often been designated as the chief cause of low mechanical properties of cast Aluminum alloys. The high solubility of hydrogen in molten Aluminum and very low solubility in solid Aluminum causes gas evolution during solidification. The high thermal conductivity and wide temperature range of solidification in Aluminium Alloys result in a mushy type solidification. Any technique which will reduce the mushy zone during solidification will benefit mechanical properties. One of the conditions for achieving this is a high temperature gradient during solidification.

It has been mentioned that ultrasonic vibrations applied during solidification of steel ingots result in improvement of mechanical properties. Low and medium frequency vibrations are also believed to have beneficial effect on ferrous as well as non-ferrous alloys. Evidence contrary to the above finding is also available in literature.

### **Other Effects**

Vibration not only suppresses columnar structure and produces equiaxed grains but several other effects are also produced. Examples of hot tearing and inferior cast surfaces due to vibration have been cited while it has been reported that there is surface finish, reproduction of thin sections, and dispersion of porosity and oxides during the die casting of an Aluminium Alloy. There is evidence of dispersed macro-shrinkage in pure Aluminium at low and medium frequencies, but appears to become more evenly distributed until, at high vibration frequency, complete elimination is achieved.

It is suggested that pipe formation tendency is eliminated during the mushy stage of solidification by vibration. During this period, the ‘mush’ is composed of an aggregate of solid grains surrounded by liquid network. The vibration acts to segregate liquid from solid by packing the solid down and displacing the liquid up. In this way, unidirectional solidification from the bottom is simulated and pipe formation is suppressed.

## **SOLAR- THE CENTRE STAGE OF RENEWABLE ENERGY**

**Kanwarpal Singh, A.P. and HOD ME**

The radiant heat and light energy from the Sun is called as solar energy. This is the most readily and abundantly available source of energy. Since ancient times this energy has been harnessed by humans using a range of innovations and ever-evolving technologies. The earth receives more energy in just one hour from the sun than what is consumed in the whole world for one year. This

energy comes from within the sun itself through process called nuclear fusion reaction. In this reaction four atoms of hydrogen combine to form one helium atom with loss of matter. This matter is emitted as radiant energy.

India is a tropical country with sunshine in plenty and long days. About 301 clear sunny days are available in a year. Theoretically, India receives solar power of about 5000 trillion kWh/yr (600 TW approx.) on its land area. On an average, daily solar energy incident over India ranges from 4 to 7 kWh/m<sup>2</sup>. Depending on the location sunshine hours varies from 2,300–3,200 hours in a year. This is far more than current total energy consumption. For instance, assuming conversion efficiency of 10% for PV modules, it will still be thousand times greater than the likely electricity demand in India by the year 2015.

This energy from the sun is used as solar thermal and solar power applications. Solar thermal energy, through various technologies, is utilized for various purposes which includes Heating, Drying, Cooking, seasoning of timber, water treatment (Distillation and disinfection), Cooling (Refrigeration and Cold storage), High temperature process heat for industrial purposes.

## **Grid interactive system -The future of solar energy**

Solar energy is not only about present but it also about future. The unlimited potential of Solar is visible in its varied applications of energy generation. One such power of solar can be seen today with homes being energized by solar panels. This energy accelerates cost saving as electricity bill is reduced to about 30% with incorporation of solar power.

Buildings are the largest consumers of electricity using over 40% of the world electricity. The developers, consultants, architects, investors and contractors are opting for alternative forms of energy without damaging the environment as we incline towards passive energy buildings. Solar technology in form of solar Photovoltaic is a proving to be a reliable solution for electricity generation.

Photovoltaic literally stands for 'electricity from light'. A photovoltaic cell, also called as PV cell, is a special semiconductor diode that converts visible light into DC (direct current). Certain PV cells are able to transform infrared (IR) or ultraviolet (UV) rays into DC power. Solar powered toys, calculators and telephone call boxes are some common application of solar electricity. Photovoltaic cell forms an integral part of solar-electric energy systems, which presently are finding increasingly important place as an alternative utility power source.

The PV technology in use today is not very complex. Photovoltaic cell comprises of thin layers

(two or more) of semi-conducting material, usually silicon. When this silicon is exposed to light it generates electrical charges and with the use of metal contacts this can be conducted away as direct current (DC). A single cell has small electrical output, so multiple cells are combined together and encapsulated to form a PV module (also called "panel"). This module is the principle and basic building block of entire PV system and numerous modules can be put together to give the desired electrical output. Contemporary PV cells are able to convert 10 to 20 percent of radiant energy into electrical energy. In years to come, this efficiency will be improved to produce even better results.

The different types of PV systems are multi-crystalline Silicon Cells, Mono-crystalline Silicon Cells, Amorphous Silicon, Thick-Film Silicon, Other Thin films. Today the grid connect PV systems are the main area of interest. As these systems are connected to the local electricity network, the electricity produced during the day time can either be used immediately or can be sold to the utility. Also as the sun goes down, power can be bought back from the network. Thus the grid is acting as system for energy storage, i.e. the battery storage need not be included in the PV systems. Stand-alone photovoltaic systems are used where grid power supplies are difficult to connect or unavailable. Applications are in monitoring stations, radio repeater stations and street lighting.

PV technology is most widely used in the developing world. The system finds itself the best place where the problems of remote locations and fact of unreliable or non-existent electricity grids are dominant. Here, PV power supply serves as the most economic option.

## **PROSPECTS OF HYDROGEN AS A FUEL OF FUTURE**

**Sunil Baloda A.P., ME**

Hydrogen is commonly defined today as the energy carrier, but not energy source. The main task of any energy carrier is to transport it from one place to another. The most familiar example of energy carrier is electricity, which is a primary energy carrier in the world. Just like electricity, hydrogen can also be used to carry energy from its source to the place where it is required.

Hydrogen, being the most abundant substance in the Universe, is practically unavailable in its pure form on Earth. That is why we cannot use it as direct energy source, like oil, gas, or coal. However, hydrogen still occurs widely in multiple chemical structures, the most common of which are water and hydrocarbons. That is why, in order to use hydrogen as energy source, we should first get hydrogen.

Hydrogen is currently widely discussed by scientists as the fuel of future. First of all, this is because **hydrogen is the most widely occurring element in the Universe**. While all the major common energy sources, such as oil, gas, and coal are not renewable and their amounts on Earth are being exhausted rapidly, hydrogen is readily available in abundance, so it looks very promising and tempting.

## Hydrogen Production

The only thing we need is to find a cost-effective and reliable method of producing pure hydrogen. Another strong point of this gas as energy source is that it represents an absolutely green form of energy. When hydrogen is mixed with oxygen, electricity is generated, and the only by-product of this energy generation is water. Hydrogen can be produced from several different methods, with only a couple being environmentally beneficial. Electrolysis of water requires electricity, which can be provided by clean and renewable energy sources. Table 1 provides a summary of the various ways to produce hydrogen.

**Table 1 - Various Methods to Produce Hydrogen**

Method	Process	Implementation	Advantages	Disadvantages
Steam reforming of methane gas	In presence of nickel catalyst & at 700 – 1100 °C: $\text{CH}_{4(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{(g)} + 3\text{H}_{2(g)}$ Next reaction at lower temperature: $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{2(g)} + \text{H}_{2(g)}$	Current major source of hydrogen	65–75% efficiency Economical (least expensive method) Established infrastructure	Nonrenewable resource Produces CO <sub>2</sub> emissions
Hydrogen from coal (Gasification)	At high temperature and pressure: $\text{Coal} + \text{H}_2\text{O}_{(g)} + \text{O}_{2(g)} \rightarrow \text{syngas}$ Syngas = H <sub>2</sub> + CO + CO <sub>2</sub> + CH <sub>4</sub>	Current method of mass hydrogen production	Large supplies of coal (Inexpensive resource)	Produces CO <sub>2</sub> emission
Electrolysis of water	Electric current passed through water: $2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{H}_{2(g)} + \text{O}_{2(g)}$	Not in widespread use due to cost of electricity	Depend on electricity source	Input into production may require more energy than released Produces CO <sub>2</sub> emissions if coal is energy source
Solar – Hydrogen System	Electric current passed through water: $2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{H}_{2(g)} + \text{O}_{2(g)}$	Not in widespread use due to cost of renewable energy sources	No emissions 65% efficiency	Expensive

## Hydrogen Storage

Hydrogen storage and transport is a critical issue involving intense research. The problem is the low density of hydrogen gas. Three possible solutions have been proposed. These potential hydrogen delivery systems include compressed tube trailers, liquid storage tank trucks, and compressed gas pipelines. One major disadvantage of each system is the high capital costs. Different storage forms in which hydrogen can be stored are listed in Table 2.

**Table 2 – Possible storage forms for hydrogen**

<b>Storage Form</b>	<b>Advantages</b>	<b>Disadvantages</b>
Compressed Gas	Reliable Indefinite storage time Easy to use	Higher capital & operating costs Heat can cause container rupture
Liquid	High density at low pressure	High cost Low temperatures needed Escape can cause fire or asphyxiation
Metal Hydride	High volume efficiencies Easy recovery Very safe	Expensive materials Heavy storage tanks

The use of metal hydrides is the most promising storage material currently. The advantages are high volume efficiencies, easy recovery, and advanced safety.

## Applications of Hydrogen

Nowadays, **hydrogen as fuel is primarily used at spaceships and space shuttles**. It is the hydrogen, which lifts them into the space and supplies electricity to all the systems during the flight. Thanks to rapid development of technologies, hydrogen fuel cells have already migrated from space shuttles into ordinary road vehicles, cars and buses, making them much cleaner and environmentally friendly.

Of course, modern hydrogen-fueled vehicles are still rare on roads; because their cost is still much higher than the cost of conventional cars (it is still very and very expensive to build compact hydrogen fuel cells). Currently, a lot of car manufacturers have already presented the models powered by hydrogen fuel cells. Among them are Jeep Treo-Fuel Cell, Mercedes F-CELL, Fiat Phyllis, GM Sequel, Honda FCX Clarity, Peugeot Quark and others.

Humans have harnessed hydrogen for a variety of applications, from blasting rockets into space to making common household products like toothpaste. Now, after decades of development, hydrogen is about to find its way into the family car.

Hydrogen can be used as the primary fuel in an internal combustion engine or in a fuel cell. Vehicles running on hydrogen can be refueled in less than five minutes and boast a 300-mile

driving range. For these reasons, several governments and car companies are betting on hydrogen as the clean transportation fuel of the future and one that will ultimately win consumers' favor. The advantages and disadvantages of hydrogen as a transportation fuel are listed in Table 3.

<b>Table 3 – Use of Hydrogen as a Transportation Fuel</b>	
<b>Advantages</b>	<b>Disadvantages</b>
<b>High energy yield (122 kJ/g)</b>	<b>Low density (large storage areas)</b>
<b>Most abundant element</b>	<b>Not found free in nature</b>
<b>Produced from many primary energy sources</b>	<b>Low ignition energy (similar to gasoline)</b>
<b>Wide flammability range (hydrogen engines operated on lean mixtures)</b>	<b>Currently expensive</b>
<b>High diffusivity</b>	
<b>Water vapor is major oxidation product</b>	
<b>Most versatile fuel</b>	

### **Summary**

To sum up the story on hydrogen energy, it is worthy to summarize the benefits and drawbacks of this alternative source of energy. So, the obvious advantages of hydrogen are its environmentally favorable profile and availability of multiple sources to produce hydrogen, such as water, methane, gasoline or coal.

On the other hand, the most significant drawback of hydrogen energy is its high cost in comparison with traditional sources of energy. Hopefully, future innovations in technology and chemistry will help humans solve this dilemma and make hydrogen energy not only environmentally friendly, but also a cost-effective source of energy.

## **CHALLENGES IN ENGINEERING**

**Mahesh Juneja, A.P., ME**

Engineering is the application of scientific, economic, social, and practical knowledge in order to design, build, and maintain structures, machines, devices, systems, materials and processes. Engineers create that which never was. In doing so, engineers resort to the application of science to the optimum conversion of natural resources to be used by mankind.

The unintended outcomes of past engineering solutions to the problems have adversely affected environment. The challenges relate to energy and the environment, health and medical sciences, education and information technology, infrastructure and security. Through creativity and commitment these engineering challenges can be realistically met. Some of the challenges are:

- Make solar energy affordable.
- Provide access to clean water.
- Restore and improve urban infrastructure.
- Advance health informatics.
- Engineer better medicines.
- Prevent nuclear terror.
- Secure cyberspace.
- Advance personalized learning.
- Engineer the tools for scientific discovery.

Meeting these challenges would be game changing. Success with any of them could dramatically improve life for everyone. However, the future solutions might depend on lowering the cost of doing things and use of less energy overall on life cycle basis.

The technological challenges before India at present include the following:

- In energy area - alternative/advanced electricity generation technologies need to be made viable. There is the move to hydrogen economy. There is need of expanding energy availability with access globally, while minimizing the adverse environmental and social impacts.
- In medicine, there will continue to be new medical testing and treatment equipment, such as prosthesis integration with the human neural system and medical application of nanotechnology to limit invasive treatments.
- In the environmental area, there is the challenge of limiting or reversing the adverse impact due to human existence at comfortable level and yet in an economically viable way.

As far as health, education and "terrorism" are concerned, we should think of focusing on a more equitable, corruption-free and fair society instead of depending on only engineering solutions.

Mechanical engineers can play an important role to meet these challenges. For that to happen proper education in mechanical engineering is necessary. The existing curricula as well pedagogy need transformation. Making universities and engineering schools exciting, creative, adventurous, rigorous, demanding are more important than specifying curricular details. While developing the concept of a new curriculum and new pedagogy and try to attract and interest students in nano scale science, large complex systems, product development, sustainability, and business realities. Simultaneously, the humanities, arts, and social sciences are essential to the creative, explorative, open-minded environment and spirit necessary to educate the future engineer. Engineers of today and tomorrow must be prepared to conceive and direct projects of enormous complexity that require a highly integrative view of engineering systems.

# AGRICULTURE ROBOT: A TOOL FOR MITIGATING THE TOIL OF PEASANTS

**Mahender Singh Kaswan A.P., ME**

Agribot is a robot designed for agricultural purposes. As one of the trends of development on automation and intelligence of agricultural machinery in the 21st century, all kinds of agricultural robots have been researched and developed to implement a number of agricultural productions in many countries. This Bot can perform basic elementary functions like picking, harvesting, weeding, pruning, planting, grafting.

In agriculture, the opportunities for robot-enhanced productivity are immense and the robots are appearing on farms in various guises and in increasing numbers. We can expect the robots performing agriculture operations autonomously such as spraying and mechanical weed control, fruit picking, watching the farms day and night for an effective report. Agribot is a robot designed for agricultural purposes. It is designed to minimize the labour of farmers in addition to increasing the speed and accuracy of the work. It performs the elementary functions involved in farming i.e. harvesting, spraying, seeding and removing the weeds and they gradually appear advantages in agricultural production to increase productivity, improve application accuracy and enhance handling safety.

The main feature of the Robot is the **Ability to find the grass in the field using Image processing**. For this we are using a special purpose Web cam which will take photos inside the field and if the grass is found then he will inform the robot to cut the grass in the crop field and also he will pick the grass which has been cut by the robot. We will also use image processing for analyzing the height of the plant. If the height of the crop is larger than the reference height then the cutting mechanism will be used by the robot to cut the crop. Robot which has several motors is activated by using the relays. Relays are nothing but electromagnetic switch which ON/OFF according to the control given by the microcontroller unit. A vision-based row guidance method is presented to guide the Robot platform driven along crops planted in row. And the offset and heading angle of the platform is calculated by detecting the guidance row in real time in order to guide and control the platform. Vision-based row guidance is to use camera to detect and identify crop plants and then to find accurate and stable navigation information from the binary image.

The captured image are then processed by using image processing technique, the processed are then converted into voltage levels through MAX 232 level converter and given it to the microcontroller unit. In the microcontroller unit, C-language coding is predefined, according to this coding the robot which connected to it was controlled. Webcam will continuously monitor the health of the plant as well as the height of the plant. We will keep the maximum and minimum limit of plant growth. As soon as it crosses the maximum height of the plant then we will use cutting mechanism to cut the plant. Figure 1 shows block diagram of the whole bot.

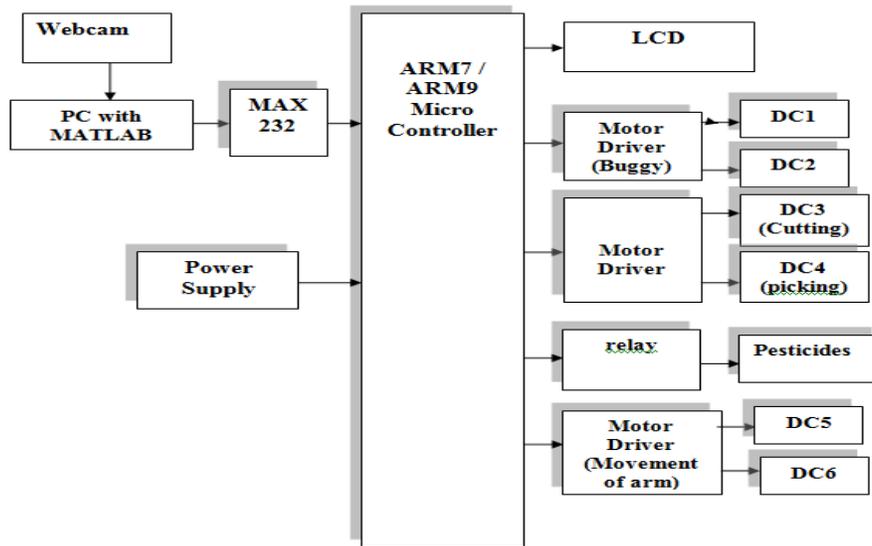


Fig. 1: Agribot block diagram

#### A. ARM 7:

This generation introduced the Thumb 16-bit instruction set providing improved code density compared to previous designs. The most widely used ARM7 designs implement the ARMv4T architecture, but some implement ARMv3 or ARMv5TEJ. All these designs use Von Neumann architecture, thus the few versions comprising a cache do not separate data and instruction caches.

It is a versatile processor designed for mobile devices and other low power electronics. This processor architecture is capable of up to 130 MIPS on a typical 0.13  $\mu\text{m}$  process. The ARM7TDMI processor core implements ARM architecture v4T. The processor supports both 32-bit and 16-bit instructions via the ARM and Thumb instruction sets.

The ARM7TDMI (ARM7+16 bit Thumb+J tag Debug+fast Multiplier+enhanced ICE) processor is a 32-bit RISC CPU designed by ARM, and licensed for Manufacturer by an array of semiconductor companies. In 2009 it remains one of the most widely used ARM cores, and is found in numerous deeply embedded system designs. The ARM7TDMI-S variant is the synthesizable core.

#### B. LIQUID CRYSTAL DISPLAY:

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. LCD can also be used in a project to check the output of

different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

#### C. CAMERA:

The Rs232 standard is used to interface the computer with the microcontroller. The computer is connected by the web camera for recognition. The matlab software window is used. Below figure 2 depicts the image of web camera.

#### D. PC:

We already know about the facility of the mobile, so after receiving data from the webcam we can copy or use the same data in our PC. The PC and RF receiver can be interfaced with the help of the data cable DKU-50. We are using the MATLAB software in our PC for the user interface with the system. With the help of this MATLAB software any user can easily make the use of the system. This MATLAB software provides the notice typing and editing facility. Also we can copy the same content as received through mobile in the editing window and call it as a notice. Hence the PC/MATLAB software provides the typing, editing and formatting options to the user.

#### E. RS 232:

RS 232 is a serial communication cable used in the system. Here, the RS 232 provides the serial communication between the microcontroller and the outside world such as display, PC or Mobile etc. So it is a media used to communicate between microcontroller and the PC.

In our project the RS232 serves the function to transfer the edited notice (or data) from PC (MATLAB software) to the microcontroller, for the further operation of the system.

#### DC MOTOR:

DC motors are used to physically drive the application as per the requirement provided in software. The dc motor works on 12v. To drive a dc motor, we need a dc motor driver called L293D. This dc motor driver is capable of driving 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit. We can also provide the back EMF protection suit by connecting 4 diode configurations across each dc motor.

#### F. DC MOTOR DRIVER (L293D):

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoides,

DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

Working:

It has a camera which will give a live vision of the field so while it performs its basic operations we can monitor everything. For large farms a GPS based module can be installed depending on which we can fix a specific land to be harvested in which pattern or way. After harvesting or cutting, it will pick up the crops and place it in a vessel which is beside the robot. A further spraying mechanism is also present in the robot which will spray the pesticides on the crops.

## **ROLE OF MAINTENANCE IN INDIAN INDUSTRIES**

**Vinod Kumar A.P., ME**

Maintenance is one of the most crucial areas governing organizations. This is particularly true of an industry. Yet it is the most neglected aspect. In most industries in India, owing to a number of reasons, the capacity utilization is less than 60%. Maintenance when neglected, leads to frequent breakdowns, leading to costly repairs and faster deterioration of valuable equipment besides causing incalculable loss of production. The frequent power cuts throughout the country are in most cases, caused by breakdowns of generating plant and their equipment. But the failure to deliver the goods could also be due to breakdowns taking place anywhere along the interconnected chain-links. Maintenance is one of the most important ingredients for achieving higher industrial productivity and consequent higher returns on investment, yet the maintenance personnel are more often blamed than praised for their job. Being a low profile, repetitive and low accolade job, maintenance needs to be handled with a great degree of sensitivity and perception if a climate for its systematic development is to be cultivated. So, it can be said with assurance that there can be no systematic development of this exacting profession or any fruitful growth of this vital function, unless the top management in industry develops the requisite understanding and enthusiasm for the work done by the maintenance personnel.

Maintenance is an increasing portion of operational costs, it is seen as the last opportunity for major operational improvement. Most organizations continually search for any means (program, process, concept or approach) by which to improve their maintenance function. They strive to assure that each maintenance dollar is well spent (labor productivity) while

achieving equipment reliability (asset productivity). Organizations must be successful in this quest, if they are to survive and thrive. Maintenance organizations everywhere have the responsibility to assure optimum use of the capacity of the enterprise. The entire organization becomes maintenance conscious whenever the maintenance job is not properly or efficiently performed: unsafe operations, production downtime, quality problems and the loss of heat, light and other utilities do not go unnoticed. It may help if reactive maintenance is visualized as falling into a deep, dark, dank, slimy pit of deferred maintenance. The fall doesn't end before hitting rock bottom, which equates to bankruptcy, outsourcing or possibly privatization. Before positive progress can be made, one must first climb out of the pit. Preventive/Predictive Maintenance (PPM) is not conceived to put equipment in proper condition, but to maintain it in that condition from the time of acquisition or restoration.

Maintenance is needed to protect the investment in machinery, plant and buildings for their long life, prevent waste of spares, tools and materials, control and direct the maintenance labour force, safeguard the return on investment by maximizing plant utilization with minimum down time, maximize the utilization of labour and other resources, ensure adequate technical information for maintenance, record expenditure and estimate the costs of the work, assist in future budgeting and to evaluate plant performance as a guide to future forecast.

### **New practices in Maintenance engineering used in Indian Industries**

#### **Terotechnology**

The complexity of the modern plant equipment, their phenomenal initial cost and higher rate of production necessitates trouble free service over a long period of time, requiring minimum stoppage for maintenance. So that the cost of lost production is kept at the minimum possible. This brings out the need of designing out maintenance which is the central theme of 'Terotechnology' practice. The Terotechnology may be defined as 'A combination of management, financial, engineering and other practices applied to physical asserts in pursuit of economic life cycle costs'. Its practice is concerned with the specification and design for reliability and maintainability of plant, machinery, equipment, buildings and structures with their installation and replacement and with the feedback of information on design, performance and costs.

#### **Total Productive Maintenance (TPM)**

TPM is known in Japanese Industry as productive maintenance, with all employees participating through small groups. The basic concept of TPM is change the attitude and improve the skill of all personnel by using quality equipment. Earlier, as usual, the job of the operator and that of maintainer were separate, each was divided into groups of operators and maintainers. The operators had thus no interest in the maintenance. Changing this attitude on the part of all employees was the first major task of TPM i.e. the operators maintain the equipment they use.

### **Condition Based Maintenance (CBM)**

Recently Condition Based Maintenance has become one of the most important maintenance system because of development of good and cheap condition monitoring equipment which detect the fault generation very early, development of superior monitoring techniques and acceptance by common maintenance personnel and to reduce the heavy cost of equipment downtime because of breakdown or preventive maintenance. The benefits of condition based maintenance in industry is to increase the operation life of replacement items, reduction in maintenance manpower and reduction in spare inventory.

### **Reliability Centered Maintenance (RCM)**

It is a process to ensure that assets continue to do what their users require in their present operating context. It is generally used to achieve improvements in fields such as the establishment of safe minimum levels of maintenance, changes to operating procedures and strategies and the establishment of capital maintenance regimes and plans. Successful implementation of RCM will lead to increase in cost effectiveness, machine uptime, and a greater understanding of the level of risk that the organization is presently managing.

### **Computerized Maintenance Management System (CMMS)**

Computerized Maintenance Management System (CMMS) is not any new system of maintenance but it is simply application of computers for quickly and efficiently deciding, planning and organizing various jobs for effecting systematic plant maintenance, because of the vast quantity of technical and economical data involved in maintenance management, computer support is very desirable. CMMS software package maintains a computer database of information about an organization's maintenance operations.

### **Computerized Maintenance Management Information System (CMMIS)**

In these days of high technology and rapid economical data communication, job preparation is accomplished far more efficiently with support of a sound Computerized Maintenance Management Information System (CMMIS). The "I" is inserted into the CMMIS acronym to emphasize that a computerized support system is only an informational tool. Fast, flexible access to reliable, current and comprehensive information is vital if planners and managers are to control the maintenance function on the basis of knowledge rather than intuition. Simply put, it is no longer an economically sound decision to manage a function as critical as maintenance without an efficient and reliable informational support.

# WHAT IS ADAPTIVE CRUISE CONTROL AND HOW DOES IT WORK

Vishwas Yadav AP, ME

Here at ExtremeTech we see automobiles as much more than just four wheels, an engine, and a few seats. We view automobiles as being the ultimate mobile technology platform and something as worthy of our attention as the latest CPU or Smartphone. With that in mind, we'll be releasing a series of introductory auto tech articles, providing readers with in-depth explanations of today's important technologies. First up for the series: adaptive cruise control.

## Adaptive cruise control basics

Adaptive cruise control (ACC) is an intelligent form of cruise control that slows down and speeds up automatically to keep pace with the car in front of you. The driver sets the maximum speed — just as with cruise control — then a radar sensor watches for traffic ahead, locks on to the car in a lane, and instructs the car to stay 2, 3 or 4 seconds behind the person car ahead of it (the driver sets the follow distance, within reason). ACC is now almost always paired with a pre-crash system that alerts you and often begins braking.



ACC is ideal for stop-and-go traffic and rush hour commuting that swings from 60 mph to a standstill. Adaptive cruise control as of 2013 ranges from \$2,500 at the high end to as little as \$500. Less costly “partial ACC” only works at speeds of 20 or 25 mph and up, but it’s markedly cheaper.

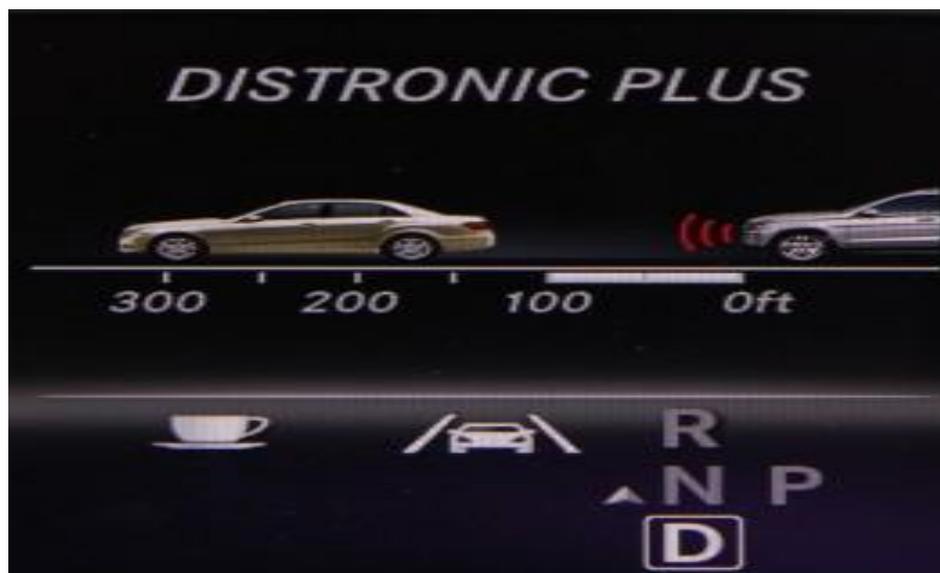
Adaptive cruise control is also called active cruise control, autonomous cruise control, intelligent cruise control, or radar cruise control. This is the case because distance is measured by a small radar unit behind the front grille or under the bumper. Some units employ a laser, while Subaru

uses an optical system based on stereoscopic cameras. Regardless of the technology, ACC works day and night, but its abilities are hampered by heavy rain, fog, or snow.

ACC is a crucial part of the self-driving cars of the near future. On an autonomous driving car, ACC needs to track the car in front but also cars in adjacent lanes in case a lane change becomes necessary.



Adaptive cruise control is typically paired with forward collision warning that functions even if you don't have ACC engaged. When ACC is engaged, the car will typically slow under ACC braking at up to half its maximum braking potential. (Beyond that, driver and passenger discomfort with automated braking sets in.) Red lights flash at the driver (as with the Ford Taurus pictured above), the words "Brake!" or "Brake Now!" show on the instrument panel or head-up display, and a loud chime sounds. When ACC isn't engaged, it's still tracking traffic in front and intervenes with the warnings if it senses a potential accident.



To use adaptive cruise control, you start the same as you would with standard cruise control. The driver turns ACC on, accelerates to the desired speed, then presses the “Set” button. It’s then possible to tweak the “+” and “-” buttons to raise or lower the speed, typically by in 1 or 5 mph increments. Lastly, the driver can set the desired gap behind the next car, most commonly by pressing a button to cycle among short, medium, and long following distances. Some automakers show icons with 1, 2 or 3 distance bars between two vehicle icons. Others, such as Mercedes-Benz, show the following distance in feet, though it’s really in seconds of following gap translated to feet — for example, 200 feet of following distance at 60 mph (88 feet per second) is about 3 seconds.

An indicator in the instrument panel or head-up display shows a car icon and often what looks like converging-at-infinity lines, indicating the roadway. When radar detects a car ahead, a second car icon appears or the lone car icon changes color.

When you’re just starting out in a newly acquired car with ACC, start with the longest following distance. If you set the closest following distance, you’ll get nervous if the following distance seems to get dangerously close and you’re not sure if ACC is actually working. Most likely it is working and the driver may have lightly brushed the brake pedal, didn’t realize it, and now ACC is available but not engaged.

## **FUTURE ASPECTS OF NUCLEAR ENERGY IN INDIA**

**Nitesh Jain A.P., ME**

With limited resources of conventional energy sources, there has always been a quest to develop alternative energy sources. One energy source with the most potential is nuclear energy. The use of nuclear energy to generate electricity is not new and has been practised by many countries. Nuclear energy as a viable energy source is gaining more ground with the prospect of conventional energy sources diminishing drastically in the next few decades.

### **Nuclear Sector development in India**

India has developed nuclear energy sources over the past four decades and today nuclear power is the fourth-largest source of electricity in India after thermal, hydroelectric and renewable sources of electricity.

India has a flourishing and largely indigenous nuclear power programme and expects to have 14.6 GW nuclear capacities on line by 2024 and 63 GW by 2032. It aims to supply 25% of electricity from nuclear power by 2050.

Because India is outside the Nuclear Non-Proliferation Treaty due to its weapons programme, it was for 34 years largely excluded from trade in nuclear plant or materials, which has hampered its development of civil nuclear energy until 2009.

In October 2010, the government drew up a plan to reach a nuclear power capacity of 63,000 MW by 2032. However, these plans have faced protests from people across the country especially after the March 2011 Japanese Fukushima nuclear disaster. It is expected that by 2017, India's installed nuclear power generation capacity will increase to 10,080 MW.

In answer to these demands, India has been developing a nuclear fuel cycle that will effectively utilise the reserves of thorium in the country. Following the Indo-US nuclear deal, foreign technology and fuel are expected to boost India's nuclear power sector. With its expertise in fast reactors and thorium fuel cycle, India can become the world leader in nuclear technology.

### **Future plans**

Nuclear Power Corporation of India Limited, a public sector enterprise under the Department of Atomic Energy (DAE), Government of India has many plans on the anvil to further develop the sector. In line with the eight-unit Rajasthan nuclear plant, NPCIL plans to set up five further 'Nuclear Energy Parks' in different parts of the country, each with a capacity to generate 10,000 MW at a single location. With the government planning to increase the existing nuclear power capacity five-fold by 2020 and global majors in the sector wanting to shift manufacturing operations to India, the future of this sector looks bright. As for employment demand, experts estimate that the industry would require about 2,000-trained nuclear engineers every year to meet the demands of these growth plans.

#### **India's nuclear power reactors under construction:**

Reactor	Type	MW gross, net (each)	Project control	Construction starts	Comercial Operation Due
Kudankulam 2	PWR (VVER)	1000, 917	NPCIL	July 2002	criticality late 2015?, so maybe 2016
Kalpakkam PFBR	FBR	500, 470	Bhavini	Oct 2004	criticality April 2016
Kakrapar 3	PHWR	700, 630	NPCIL	Nov 2010	2017
Kakrapar 4	PHWR	700, 630	NPCIL	March 2011	2018
Rajasthan 7	PHWR	700, 630	NPCIL	July 2011	June 2016
Rajasthan 8	PHWR	700, 630	NPCIL	Aug 2011	Dec 2016

### **New phase of nuclear industry developments**

Following the Nuclear Suppliers Group agreement with US which was achieved in September 2008, the scope for supply of both reactors and fuel from suppliers in other countries opened up.

Civil nuclear cooperation agreements have been signed with the USA, Russia, France, UK, South Korea, Czech Republic and Canada, as well as Australia, Argentina.

On the basis of the 2010 cooperation agreement with Canada, in April 2013 a bilateral safeguards agreement was signed between the Department of Atomic Energy (DAE) and the Canadian Nuclear Safety Commission (CNSC), allowing trade in nuclear materials and technology for facilities which are under IAEA safeguards. A similar bilateral safeguards agreement with Australia was signed in 2014 and finalised in November 2015. Both apply essentially to uranium supply.

Between 2010 and 2020, further nuclear plant construction is expected to take total gross capacity to 21,180 MW. The nuclear capacity target is part of national energy policy. This planned increment includes those set out in the Table below including the initial 300 MW Advanced Heavy Water Reactor (AHWR). In mid-2015 NPCIL confirmed plans for Kaiga 5&6 as 700 MW PHWR units, costing about Rs 6,000 crore.

NPCIL is also planning to build an indigenous 900 MW PWR, the Indian Pressurised Water Reactor (IPWR), designed by BARC in connection with its work on submarine power plants. A site for the first plant is being sought, a uranium enrichment plant is planned, the reactor pressure vessel forging will be carried out by Larsen & Toubro (L&T) and NPCIL's new joint venture plant at Hazira, and the turbine will come from Bharat Heavy Electricals Limited (BHEL).

Meanwhile, NPCIL is offering both 220 and 540 MW PHWRs for export, in markets requiring small- to medium-sized reactors.

### **Nuclear Energy Parks**

In line with past practice such as at the eight-unit Rajasthan nuclear plant, NPCIL intends to set up five further "Nuclear Energy Parks", each with a capacity for up to eight new-generation reactors of 1,000 MW, six reactors of 1600 MW or simply 10,000 MW at a single location. By 2032, 40-45 GW would be provided from these five. NPCIL was hoping to be able to start work by 2012 on at least four new reactors at all four sites designated for imported plants, but this did not happen. In mid-2015 it was reported that an additional site could be assigned for a Japanese multi-unit plant. However, apart from the Russian projects under inter-governmental agreement, no overseas reactor vendor has been ready to proceed under India's unique liability arrangements.

India's has developed its own indigenous nuclear power plants and expects to supply 25% of electricity from nuclear power by 2050. This is in answer to the demand for electricity which is increasing every year. The other drivers for the growth of the nuclear power sector are the huge supply and demand gap in the energy sector which nuclear energy is expected to fill, the need to develop alternative and clean energy systems considering the global increase in the prices of oil and gas and the need to develop energy resources for energy security and energy independence.

# **SMALL SCALE INDUSTRY: ROLE AND IMPORTANCE IN INDIA**

**Amit Kumar A.P., ME**

In most of the developing countries like India, Small Scale Industries (SSI) constitutes an important and crucial segment of the industrial sector. They play an important role in employment creation, resource utilization and income generation and helping to promote changes in a gradual and phased manner. They have been given an important place in the framework of Indian planning since beginning both for economic and ideological reasons.

It is estimated that this sector has been contributing about 40% of the gross value of output produced in the manufacturing sector and the generation of employment by the small-scale sector is more than five times to that of the large-scale sector.

This clearly shows the importance of small-scale industries in the economic development of the country. The small-scale industry has been playing an important role in the growth process of Indian economy since independence in spite of stiff competition from the large sector and not very encouraging support from the government.

The following are some of the important role played by small- scale industries in India.

## **1. Employment generation:**

The basic problem that is confronting the Indian economy is increasing pressure of population on the land and the need to create massive employment opportunities. This problem is solved to larger extent by small-scale industries because small- scale industries are labor intensive in character. They generate huge number of employment opportunities. Employment generation by this sector has shown a phenomenal growth. It is a powerful tool of job creation.

## **2. Mobilization of resources and entrepreneurial skill:**

Small-scale industries can mobilize a good amount of savings and entrepreneurial skill from rural and semi-urban areas remain untouched from the clutches of large industries and put them into productive use by investing in small-scale units. Small entrepreneurs also improve social welfare of a country by harnessing dormant, previously overlooked talent.

Thus, a huge amount of latent resources are being mobilized by the small-scale sector for the development of the economy.

## **3. Equitable distribution of income:**

Small entrepreneurs stimulate a redistribution of wealth, income and political power within societies in ways that are economically positive and without being politically disruptive.

Thus small-scale industries ensure equitable distribution of income and wealth in the Indian society which is largely characterized by more concentration of income and wealth in the

organized section keeping unorganized sector undeveloped. This is mainly due to the fact that small industries are widespread as compared to large industries and are having large employment potential.

#### **4. Regional dispersal of industries:**

There has been massive concentration of industries in a few large cities of different states of Indian union. People migrate from rural and semi urban areas to these highly developed centres in search of employment and sometimes to earn a better living which ultimately leads to many evil consequences of over-crowding, pollution, creation of slums, etc. This problem of Indian economy is better solved by small-scale industries which utilize local resources and bring about dispersion of industries in the various parts of the country thus promoting balanced regional development.

#### **5. Provides opportunities for development of technology:**

Small-scale industries have tremendous capacity to generate or absorb innovations. They provide ample opportunities for the development of technology and in return, create an environment conducive to the development of small units. The entrepreneurs of small units play a strategic role in commercializing new inventions and products. It also facilitates the transfer of technology from one to the other. As a result, the economy reaps the benefit of improved technology.

#### **6. Indigenization:**

Small-scale industries make better use of indigenous organizational and management capabilities by drawing on a pool of entrepreneurial talent that is limited in the early stages of economic development. They provide productive outlets for the enterprising independent people. They also provide a seed bed for entrepreneurial talent and a testing ground for new ventures.

#### **7. Promotes exports:**

Small-scale industries have registered a phenomenal growth in export over the years. The value of exports of products of small-scale industries has increased to Rs. 393 crores in 1973-74 to Rs. 71,244 crores in 2002-03. This contributes about 35% of India's total export. Thus they help in increasing the country's foreign exchange reserves thereby reducing the pressure on the country's balance of payment.

#### **8. Supports the growth of large industries:**

The small-scale industries play an important role in assisting bigger industries and projects so that the planned activity of development work is timely attended. They support the growth of large industries by providing components, accessories and semi-finished goods required by them. In fact, small industries can breathe vitality into the life of large industries.

## 9. Better industrial relations:

Better industrial relations between the employer and employees helps in increasing the efficiency of employees and reducing the frequency of industrial disputes. The loss of production and man-days are comparatively less in small-scale industries. There is hardly any strikes and lock out in these industries due to good employee-employer relationship.

Of course, increase in number of units, production, employment and exports of small-scale industries over the years are considered essential for the economic growth and development of the country. It is encouraging to mention that the small-scale enterprises accounts for 35% of the gross value of the output in the manufacturing sector, about 80% of the total industrial employment and about 40% of total export of the country.

## LATEST TECHNOLOGY FOR WIND TURBINE

**SANJAY KUMAR, 3<sup>rd</sup> Year, ME**



Researchers have designed and patented a floating platform for offshore wind turbines that can reduce energy costs to 12 euro cents per kilowatt hour (kWh) through a more efficient design and cheaper building materials designed and patented a floating platform for offshore wind turbines that can reduce energy costs to 12 euro cents per kilowatt hour (kWh) through a more efficient design and cheaper building materials.

The prototype, WindCrete, is a cylindrical structure with a large float and a ballast base that makes it self-stabilising. According to the researchers, who belong to the Barcelona School of Civil Engineering, the main innovations of this model compared to similar ones on the market are the seamless, monolithic structure and the use of concrete for its construction.

By using concrete instead of the more expensive steel that has been used previously, the construction cost is reduced by 60%. In addition, concrete is more resistant in the marine environment, so the structure has fewer maintenance requirements and a life of about 50 years. The absence of joints in the platform increases its durability against the effects of wind and sea and avoids the damage that normally appears in transition areas.

### Cheaper energy and easier installation

The WindCrete includes a 5-megawatt (MW) wind turbine that can carry rotors of up to 15 MW with a minimum increase in the cost, making it far more economical. The new system reduces the cost of wind energy to 12 cents per kilowatt hour (kWh). This is half the price per kWh of this type of energy (about 24 cents) in the Canary Islands, one of the regions where wind power is to be promoted. Given the long useful life of this prototype, the possibility of replacing the turbine with a more powerful and more profitable one has been considered.

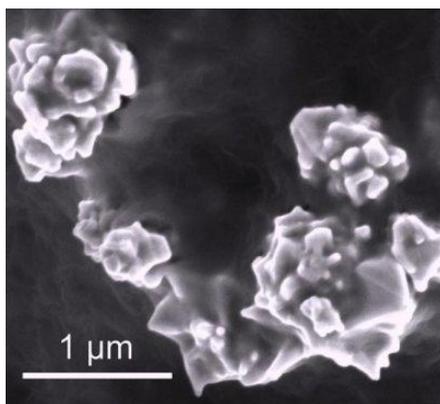
Partially submerged offshore platforms of this type require a minimum depth: 90 m in the case of WindCrete. However, there is no technical maximum depth at which they can be installed. In the Gulf of Mexico, for example, there are oil platforms of this type anchored at depths of up to 2300 m.

The prototype was developed within the framework of the European project "Alternative floating offshore substructure for offshore wind farms" (AFOSP), which is carried out in the framework of KIC-InnoEnergy in collaboration with Stuttgart Wind Energy at the University of Stuttgart and Gas Natural Fenosa. A preliminary design was carried out to ensure technical and economic feasibility. In order to check the behaviour of the platform and its anchoring system in an environment that simulates the sea, trials were also carried out in the wave flume of the UPC's Maritime Engineering Laboratory (LIM), using a WindCrete prototype with a scale of 1:100.

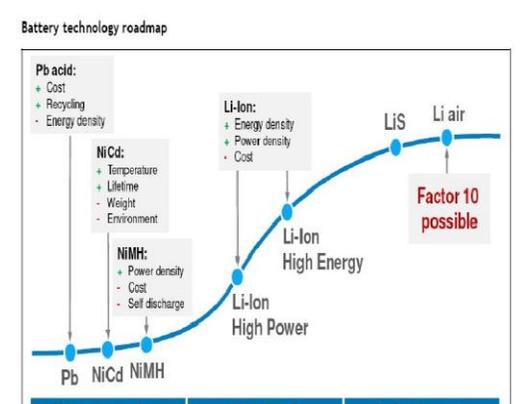
The WindCrete model was included in a report by the Carbon Trust association of experts in sustainability and energy published by the Scottish government on the current state of floating wind technology. The study specifically examines key trends in this technology, costs, and barriers to commercialisation based on the analysis of 18 models that are currently on the market.

## NEW BATTERY SHUTS DOWN AT HIGH TEMPERATURES, RESTARTS WHEN IT COOLS

DEVENDER SHEKHAWAT, 3<sup>RD</sup> YEAR, ME



32



Summary: The first lithium-ion battery has been developed that shuts down before overheating, then restarts immediately when the temperature cools. The new technology could prevent the kind of fires that have prompted recalls and bans on a wide range of battery-powered devices, from computers to hoverboards.

“Stanford researchers are using spiky nanoparticles of graphene-coated nickel to create a lithium-ion battery that shuts down when it's too hot, then quickly restarts when it cools (1 $\mu$  =1 micrometer).”

Researchers have developed the first lithium-ion battery that shuts down before overheating, then restarts immediately when the temperature cools.

The new technology could prevent the kind of fires that have prompted recalls and bans on a wide range of battery-powered devices, from recliners and computers to navigation systems and hoverboards.

A typical lithium-ion battery consists of two electrodes and a liquid or gel electrolyte that carries charged particles between them. Puncturing, shorting or overcharging the battery generates heat. If the temperature reaches about 300 degrees Fahrenheit (150 degrees Celsius), the electrolyte could catch fire and trigger an explosion.

Several techniques have been used to prevent battery fires, such as adding flame retardants to the electrolyte. In 2014, Stanford engineer Yi Cui created a 'smart' battery that provides ample warning before it gets too hot.

"Unfortunately, these techniques are irreversible, so the battery is no longer functional after it overheats," said study co-author Cui, an associate professor of materials science and engineering and of photon science. "Clearly, in spite of the many efforts made thus far, battery safety remains an important concern and requires a new approach."

### **Nanospikes**

To address the problem Cui, Bao and postdoctoral scholar Zheng Chen turned to nanotechnology. Bao recently invented a wearable sensor to monitor human body temperature. The sensor is made of a plastic material embedded with tiny particles of nickel with nanoscale spikes protruding from their surface.

For the battery experiment, the researchers coated the spiky nickel particles with graphene, an atom-thick layer of carbon, and embedded the particles in a thin film of elastic polyethylene.

"We attached the polyethylene film to one of the battery electrodes so that an electric current could flow through it," said Chen, lead author of the study. "To conduct electricity, the spiky particles have to physically touch one another. But during thermal expansion, polyethylene stretches. That causes the particles to spread apart, making the film nonconductive so that electricity can no longer flow through the battery."

When the researchers heated the battery above 160 F (70 C), the polyethylene film quickly expanded like a balloon, causing the spiky particles to separate and the battery to shut down. But when the temperature dropped back down to 160 F (70 C), the polyethylene shrunk, the particles came back into contact, and the battery started generating electricity again.

"We can even tune the temperature higher or lower depending on how many particles we put in or what type of polymer materials we choose," said Bao, who is also a professor, by courtesy, of chemistry and of materials science and engineering. "For example, we might want the battery to shut down at 50 C or 100 C."

## **SUPERCHARGER KIT FOR SMALL DIESEL ENGINES WITH THE DISPLACEMENT OF 200CC TO 1,200CC**

**LOVE SWAMI, 3<sup>RD</sup> YEAR, ME**



Supercharger Kit improves a very common small diesel engines like 170F(E), 178F(E), 186F(E), R175, R180, R185, R190, S195, S1100, ZH195, ZH1100, ZH1105, ZH1115 with the engine displacement from 200cc up to 1200cc or the similar ones. The Supercharger (air compressor) as a main unit of the Supercharger Kit supplies the naturally aspirated engine with as much as additional 40% to 75% fresh air. Diesel engine power and torque increase accordingly.

### **Full Description:**

By supplying compressed fresh air, the proposed Supercharger dramatically improves performance of the diesel engine with displacement within 200cc to 1,200cc used for vehicles like small tractor and power barrow, as well as electrical generator set.

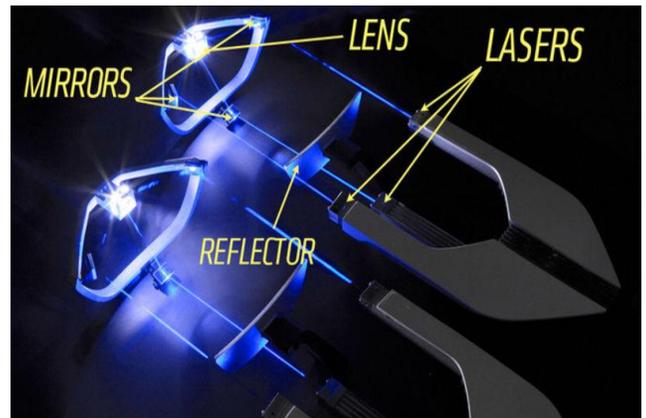
The Supercharger is a positive displacement pump. This "true compressor" has a simple design, acceptable reliability and lighter weight. Easily manufactured, mass production of the device

creates an inexpensive air pump, which offers power boosting and torque increase of up to 75%. Vehicles and electrical generator sets powered by diesel engines of lower displacement enjoy the greatest benefits from the Supercharger running at 500rpm through 6,000rpm. Significant features of the technology:

1. Engines equipped with this Supercharger have higher (40% to 75%) torque, specifically at lower RPM.
2. Manufacturing cost is 5 to 10 times lower than similar products available on the market
3. The Supercharger is easily adapted to a broad range of power train designs, and requires simple installation in order to provide the best fresh air supply.

## LASER HEADLIGHT TECHNOLOGY

LOVE SWAMI, 3<sup>RD</sup> YEAR, ME



Audi and BMW race to become leaders in the field of laser headlight technology.

First blood went to Audi with the laser-equipped R8 LMX, while deliveries of laser-lit BMW i8 models have already started.

BMW showed how advanced technology can revolutionize automotive lighting. Laser headlights have the ability to very specifically shape the thrown light, and even add driver assistance features. Rear organic light emitting diodes (OLED) make for an efficient and flexible tail light

The laser headlights themselves throw light up to 650 yards, much further than even LED headlights. The laser light, reflected through filters, will not blind or harm pedestrians, and the laser diodes use a fraction of the electricity of modern headlights.

This concept further, a camera in the car can identify potential hazards on the road ahead, such as deer or pedestrians. The headlights then can throw a spotlight on that specific area, alerting the driver to the hazard

The most innovative feature had the headlights serving as a driver-assistance feature. BMW's video showed an instance where a large truck was crowding the lane ahead. The headlights used the car's camera data to paint lines on the road for the driver, between the truck and the roadside barrier. When the system's computer determined the space was too narrow for the M4, it painted a warning sign for the driver not to attempt to pass.

1. Laser diodes create three separate beams of blue laser light.
2. The beams are directed through a prism, merging into a single beam.
3. The concentrated beam passes through a phosphorous lens that yields a diffuse white light, which is safer for human eyes.
4. The white beam bounces off a reflector and past a clear lens onto the road.

## **BLAST FURNANCE AND ITS PROCESS**

**RISHAV, 3<sup>RD</sup> YEAR, ME**

A **blast furnace** is a type of metallurgical furnace used for smelting to produce industrial metals, generally iron, but also others such as lead or copper. In a blast furnace, fuel, ores, and flux (limestone) are continuously supplied through the top of the furnace, while a hot blast of air (sometimes with oxygen enrichment) is blown into the lower section of the furnace through a series of pipes called tuyeres, so that the chemical reactions take place throughout the furnace as the material moves downward. The end products are usually molten metal and slag phases tapped from the bottom, and flue gases exiting from the top of the The downward flow of the ore and flux in contact with an upflow of hot, carbon monoxide-rich combustion gasesfurnace. In contrast, air furnaces (such as reverberatory furnaces) are naturally aspirated, usually by the convection of hot gases in a chimney flue. According to this broad definition, bloomeries for iron, blowing houses for tin, and smelt mills for lead would be classified as blast furnaces. However, the term has usually been limited to those used for smelting iron ore to produce pig iron, an intermediate material used in the production of commercial iron and steel, and the shaft furnaces used.



FIG:-FIRST BLAST FURNANCE INSTALL AT TATA STEEL JAMSHEDPUR

### **EARLY MODERN BLAST FURNANCE:-**

The direct ancestor of these used in France and England was in the Namur region in what is now Wallonia (Belgium). From there, they spread first to the Pays de Bray on the eastern boundary of Normandy and from there to the Weald of Sussex, where the first furnace (called Queenstock) in Buxted was built in about 1491, followed by one at The first blast furnace in Russia opened in 1637 near Tula and was called the Gorodishche Works.

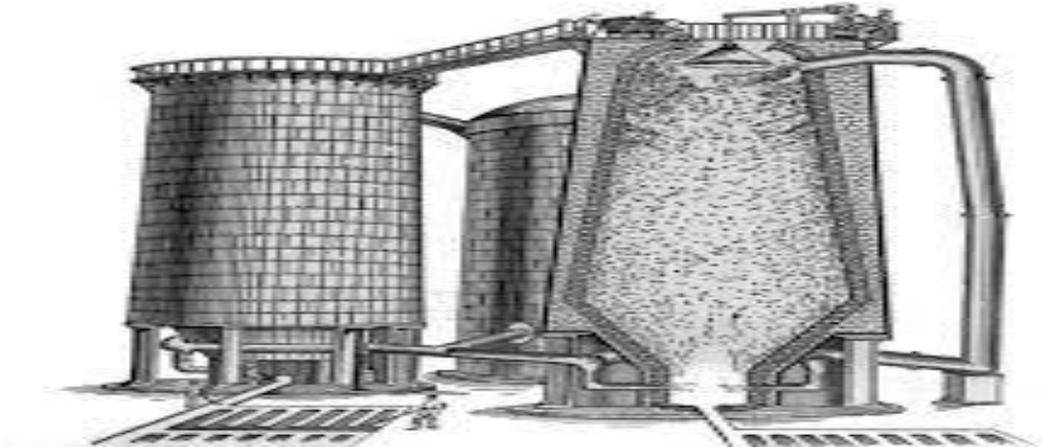
### **1>COKE BLAST FURNANCE:-**

In 1709, at Coalbrookdale in Shropshire, England, Abraham Darby began to fuel a blast furnace with coke instead of charcoal. Coke's initial advantage was its lower cost, mainly because making coke required much less labor than cutting trees and making charcoal, but using coke also overcame localized shortages of wood, especially in Britain and on the Continent. Metallurgical grade coke will bear heavier weight than charcoal, allowing larger furnaces.

### **2>HOT BLAST:-**

Hot blast was the single most important advance in fuel efficiency of the blast furnace and was one of the most important technologies developed during the Industrial Revolution. Hot blast was patented by James Beaumont Neilson at Wilsontown Ironworks in Scotland in 1828. Within

a few years of the introduction, hot blast was developed to the point where fuel consumption was cut by one-third using coke or two-thirds using coal, while furnace capacity was also significantly increased. Within a few decades, the practice was to have a "stove" as large as the furnace next to it into which the waste gas (containing CO) from the furnace was directed and burnt. The resultant heat was used to preheat the air blown into the furnace.



**MODERN BLAST FURNANCE**

#### 1>IRON BLAST FURNANCE:-

The blast furnace remains an important part of modern iron production. Modern furnaces are highly efficient, including Cowper stoves to pre-heat the blast air and employ recovery systems to extract the heat from the hot gases exiting the furnace. Competition in industry drives higher production rates. The largest blast furnaces have a volume around  $5,580 \text{ m}^3$  (197,000 cu ft) and can produce around 80,000 tonnes (79,000 long tons; 88,000 short tons) of iron per week.

This is a great increase from the typical 18th-century furnaces, which averaged about 360 tonnes (350 long tons; 400 short tons) per year. Variations of the blast furnace, such as the Swedish electric blast furnace, have been developed in countries which have no native coal resources.

#### 2>LEAD BLAST FURNANCE:-

Blast furnaces are currently rarely used in copper smelting, but modern lead smelting blast furnaces are much shorter than iron blast furnaces and are rectangular in shape. The overall shaft height is around 5 to 6 m. Modern lead blast furnaces are constructed using water-cooled steel or copper jackets for the walls, and have no refractory linings in the side walls. The base of the furnace is a hearth of refractory material (bricks or castable refractory). Lead blast furnaces are often open-topped rather than having the charging bell used in iron blast furnaces.

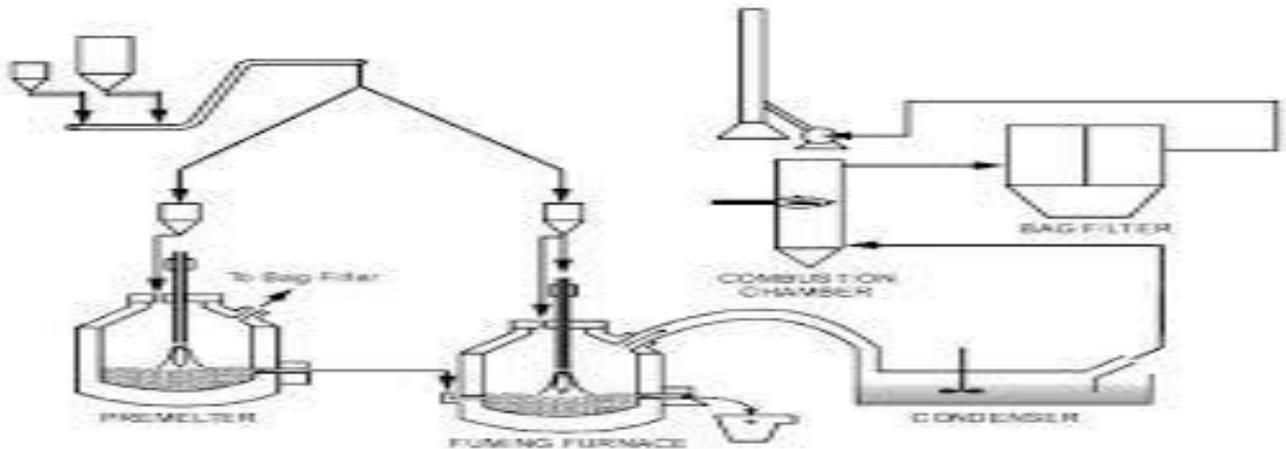
The blast furnace used at the Nyrstar Port Pirie lead smelter differs from most other lead blast furnaces in that it has a double row of tuyeres rather than the single row normally used. The lower shaft of the furnace has a chair shape with the lower part of the shaft being narrower than the upper. The lower row of tuyeres being located in the narrow part of the shaft.

### 3 ZINC BLAST FURNANCE:-

The blast furnaces used in the Imperial Smelting Process ("ISP") were developed from the standard lead blast furnace, but are fully sealed. This is because the zinc produced by these furnaces is recovered as metal from the vapor phase, and the presence of oxygen in the off-gas would result in the formation of zinc oxide.

Blast furnaces used in the ISP have a more intense operation than standard lead blast furnaces, with higher air blast rates per m<sup>2</sup> of hearth area and a higher coke consumption.

Zinc production with the ISP is more expensive than with electrolytic zinc plants, so several smelters operating this technology have closed in recent years. However, ISP furnaces have the advantage of being able to treat zinc concentrates containing higher levels of lead than can electrolytic zinc plants.



### PROCESS OF BLAST FURNANCE

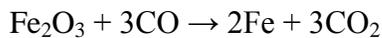
Blast furnaces operate on the principle of chemical reduction whereby carbon monoxide, having a stronger affinity for the oxygen in iron ore than iron does, reduces the iron to its elemental form. Blast furnaces differ from bloomeries and reverberatory furnaces in that in a blast furnace, flue gas is in direct contact with the ore and iron, allowing carbon monoxide to diffuse into the ore and reduce the iron oxide to elemental iron mixed with carbon. The blast furnace operates as a countercurrent exchange process whereas a bloomery does not. Another difference is that bloomeries operate as a batch process while blast furnaces operate continuously for long periods because they are difficult to start up and shut down. Also, the carbon in pig iron lowers the melting point below that of steel or pure iron; in contrast, iron does not melt in a bloomery.

Carbon monoxide also reduces silica which has to be removed from the pig iron. The silica is reacted with calcium oxide (burned limestone) and forms a slag which floats to the surface of the

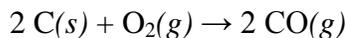
molten pig iron. The direct contact of flue gas with the iron causes contamination with sulfur if it is present in the fuel. Historically, to prevent contamination from sulfur, the best quality iron was produced with charcoal.

The downward moving column of ore, flux, coke or charcoal and reaction products must be porous enough for the flue gas to pass through. This requires the coke or charcoal to be in large enough particles to be permeable, meaning there cannot be an excess of fine particles. Therefore, the coke must be strong enough so it will not be crushed by the weight of the material above it. Besides physical strength of the coke, it must also be low in sulfur, phosphorus, and ash. This necessitates the use of metallurgical coal, which is a premium grade due to its relative scarcity.

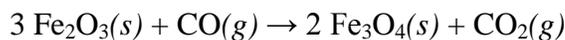
The main chemical reaction producing the molten iron is:



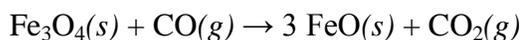
This reaction might be divided into multiple steps, with the first being that preheated blast air blown into the furnace reacts with the carbon in the form of coke to produce carbon monoxide and heat



The hot carbon monoxide is the reducing agent for the iron ore and reacts with the iron oxide to produce molten iron and carbon dioxide. Depending on the temperature in the different parts of the furnace (warmest at the bottom) the iron is reduced in several steps. At the top, where the temperature usually is in the range between 200 °C and 700 °C, the iron oxide is partially reduced to iron(II,III) oxide,  $\text{Fe}_3\text{O}_4$ .



At temperatures around 850 °C, further down in the furnace, the iron (II,III) is reduced further to iron(II) oxide:



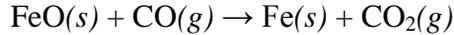
Hot carbon dioxide, unreacted carbon monoxide, and nitrogen from the air pass up through the furnace as fresh feed material travels down into the reaction zone. As the material travels downward, the counter-current gases both preheat the feed charge and decompose the limestone to calcium oxide and carbon dioxide:



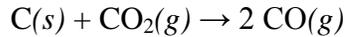
The calcium oxide formed by decomposition reacts with various acidic impurities in the iron (notably silica), to form a fayalitic slag which is essentially calcium silicate,  $\text{CaSiO}_3$



As the iron(II) oxide moves down to the area with higher temperatures, ranging up to 1200 °C degrees, it is reduced further to iron metal:



The carbon dioxide formed in this process is re-reduced to carbon monoxide by the coke:



The temperature-dependent equilibrium controlling the gas atmosphere in the furnace is called the Boudouard reaction:

## **M.TECH. DISSERTATION (ABSTRACTS) 2013-2015 Batch**

### **“SUPPLY CHAIN MANAGEMENT IN A HARYANA ROADWAYS WORKSHOP: A CASE STUDY”.**

**Monika Duhan**

The key effective to supply chain management is supply chain integration, ensuring that all parts of the supply chain work together, rather than cross —purpose.

The objectives of the study to learn the strategic importance of good supply chain design, planning and operation for every firm. This study helps to understand how good supply chain management can be of competitive advantages, whereas weakness in the supply chain management can hurt the performance of a firm. Within the strategic framework, we identified inventory, transportation, information sourcing and pricing as the key driver of supply chain performance.

The goal in the study is to convey how these drivers may be used on a conceptual work during supply chain design, planning and operation, and operation to improve performance. In present work, efforts have been made to analyze techniques like logistic management, quick customer service, vendor base management, inventory management etc.

The key effective to supply chain management is supply chain integration, ensuring that all parts of the supply chain work together, rather than cross purpose.

The supplier selection is no more based on factor like having low cost or speed of delivery alone. Productivity and quality have become requisite. Trustworthiness, speed flexibility and responsiveness are main issues. Adversarial buyer has grown in to a buyer and win-win relationship.

The thesis report begin with the introduction to supply chain in general followed by past literature review, planning, supply chain decision making framework, IT in supply chain and implementation of the supply chain management. After this, the report suggest some recommendations so as to see where the improvement may be brought in supply chain management in order to lower the final cost of the product to customer and increases supply chain surplus.

## **EFFECT OF SOLIDIFICATION ON STRUCTURE AND MECHANICAL PROPERTIES OF ALUMINUM-SILICON ALLOYS**

**Ravinder Kumar**

Within the last few years there has been a rapid increase in the utilization of Aluminum-Silicon Alloys, particularly in the automobile industries, due to their high strength to weight ratio, high wear resistance, low density and low coefficient of thermal expansion. The advancements in the field of application has made the study of the wear and mechanical properties of these alloys of utmost importance. The present work was planned keeping in view the application of Al-Si alloys in industries. The aim was to study the effect of solidification on structure and mechanical properties of Al-Si alloys. Before testing the mechanical properties it is essential to understand their structural features as structure primarily governs the properties.

Micro structural features are the key features that provide the backbone for the wear characteristics of all the materials. Structure can be changed by changing the solidification rate. Considering this aspect the proposal was planned and two different composition were prepared which are Al-Si alloys (5 wt% Si and 12 % Si). The specimens were cast by (i) sand casting (ii) chill casting (iii) melt stirred, chilled cast.

After that the specimens were prepared for micro structural examination, Brinell hardness test and wear test on pin on disc apparatus. One of the applications is piston alloys where distribution of silicon phase is considered to be important to achieve good mechanical strength along with good wearing property. Considering this fact alloys of near hypo-eutectic and eutectic composition were made. In order to understand the distribution of silicon phase, different solidification conditions were used. These influence the development of varieties of structure.

It has been observed that the structure, hardness and wear properties are significantly influenced by solidification conditions. Fast cooling as in chill mould, give a refined structure which results in fine Si needles. Such a structure provides higher hardness and better wear properties in the alloys. Since Si also acts a strengthening element, Al-12% Si alloy gives higher hardness.

**Mukesh Kumar**

The key effective to supply chain management is supply chain integration ensuring that all parts of the supply chain works together, rather than cross- purpose .The objectives of the study is to learn the performance parameters of Supply Chain in agro-food sector. This study helps to understand how good supply chain management can be of competitive advantage in agro-food sector. Within the strategic framework, we identified inventory, transportation, information sourcing, pricing and quality as the key parameters of supply chain management.

The goal of the study is to convey how these parameters may be used on conceptual work during agro chain design, planning and operation, to improve the overall performance. In present work, efforts have been made to analyze the role of Government and Public-Private Partnership and private sector in the development of agro supply chains.

The thesis report begins with the introduction to supply chain management, its evolution and history, introduction to agro supply chain in general followed by the literature review, than covering critical issues for the design and management of AFSCS, losses in agriculture and emerging technologies in agro supply chains.

### **M.TECH. (Mechanical Engineering) DISSERTATION TOPICS (2014-2016 Batch)**

<b>S.NO.</b>	<b>NAME OF STUDENT</b>	<b>GUIDE</b>	<b>TOPIC</b>
1	Jyoti	Sunil and Ajay Mahendru	Fabrication and performance analysis of simple solar still
2	Abhishek Duggal	Amit Kumar	Experimental study of effect of parameters on performance of AJM using various abrasive particles
4	Abhishek Kaswan	Vishwas Yadav	Total productive maintenance: A Case study to measure and improve effectiveness of performance measures of Tube Mill Industry
5	Amit Kishor Thapliyal	Sunil	Analysis of the Effects of Control Parameters on Die Sinking Electrical Discharge Machining of Die Steel using Taguchi & Anova Method
6	Dharmender Kumar	Sunil and Ajay Mahendru	Fabrication and performance analysis of simple solar still coupled with flat plate collector
7	Hemant Kumar	Vishwas Yadav & Mahender Singh Kaswan	Experimental analysis of work hardness during turning of EN08 Steel under different machining parameters
8	Jitender Singh	Ajay Mahendru and Kanwarpal Singh	Study of mechanical behavior of Al-Si alloy
10	Raj Kumar	Kanwarpal Singh	Experimental study of flow properties of coal ash in pipelines
11	Sandeep Kumar	Nitesh Jain	Temperature Modelling of Friction Welding of Aluminium and stainless steel 304

12	Sant Lal	Kanwarpal Singh	CFD Modeling of flow behavior of coal ash slurry & effect of chemicals at various concentrations
13	Vinay Kumar Sharma	Vishwas Yadav	Analysis of TPM Implementation in Auto Sector – A Case Study

## NATIONAL WORKSHOP MF-2015

The Department of Mechanical Engineering under the banner of Mechanical Engineering Society (MES) successfully organized a National Workshop on “**Metallurgical Failure**” during September 11-12, 2015. Shri K P Singh, Former General Manager BHEL Haridwar, was the Chief Guest in the inaugural function and Dr. S.K. Sinha, Director BRCM Education Society was Guest of Honour on this occasion. In the workshop, there were 6 expert lectures, 4 expert lectures were delivered on 11th September & the remaining 2 expert lectures were delivered on 12th September, 2015. Around 225 participants from NITs, BITS Pilani and nearby colleges attended the National Workshop DERC-2015. The keynote speakers enlightened faculty/students/research scholars/PG & UG students of Engineering & Science streams about the fundamental aspects of materials Failure and exposure to participants about various wear test procedures and equipments.

### Keynote lectures were delivered by:-

1. **Dr. D.B Goel**, Professor Emeritus, BRCM CET delivered an expert lecture on “*Cracking – The cause Of Metal Failures*”.
2. **Dr R.P. Mishra**, Asstt. Professor, BITS Pilani, delivered an expert lecture on “*Modeling and Simulation of cutting tool wear* ”.
3. **Dr Sanjay Panwar**, Associate Professor, MMU Mullana, Ambala, delivered an expert lecture on “*Failure in Engineering Materials*”.
4. **Shri K P Singh**, Former General Manager BHEL Haridwar, delivered an expert lecture on “*Failure Analysis of a steel casting*”.
5. **Anurag Hemilton**, Research Scholar, MNIT Jaipur, delivered an expert lecture on “*Different methods to combat erosion in hydro turbine*”.
6. **Vatsala Chaturvedi**, Research Scholar, MNIT Jaipur, delivered an expert lecture on “*Study of friction and wear behaviour of AZ91 Alloy*”.



## **Industrial visit of Mechanical Engineering Students to Star Wire Ltd. Ballabgarh, Faridabad**

There was a industrial visit of Mechanical Engineering student of 3<sup>rd</sup> year on 5<sup>th</sup> March, 2016 organized by Mechanical Engineering Department. Student visited the STARWIRE India pvt. ltd ,a reputed industry in the field of manufacturing situated at Ballabgarh, Faridabad. There were 47 students of 6<sup>th</sup> semester Mechanical Engineering along with three faculty members of Mechanical deptt. had visited the industry. They start the journey on 5<sup>th</sup> of March from BRCM Campus 4:30 am early morning. The breakfast facility was provided by college mess .they reached the company at 10:00am after travelling nearly 225 kilometer. They entered the company with permitted gate pass. Faculty coordinator Sh. Ajay Mahendru, Sh. Mahender Singh Kaswan and Sh. Mahesh Juneja met the industry representative authorities and the carry all the visitors firstly for tea refreshment than for a tour to different section of company. Student saw all the latest machinery and manufacturing operation for various machine parts. STARWIRE India pvt. ltd company deals with the manufacturing of various automobile vehicles parts and have a good casting and foundry shop. They are also associated with the various research organizations. The managing director Dr. Subodh Goel is a well known person in the field of corporate world. He is representative of all industries of Faridabad city. He met the faculty coordinator of our college and promise for future visits at 1:00 pm they provide hygienic lunch from company side to all the visitors. Our faculty coordinator gave sincere thanks to all the authorities of company and start return journey along with student. They reached the campus at 9:00 pm.

### **List of Technical Lectures held during last year (2015-16)**

<b>Sr No.</b>	<b>Year</b>	<b>Topic</b>	<b>Expert's Name</b>	<b>Organization</b>
1	2015-16	Iron-Carbon Diagram	Dr. D.B. Goel	BRCM-CET, Bahal
2	2015-16	TTT Diagram	Dr. D. B. Goel	BRCM-CET, Bahal

### **Interaction Program**

Every year students from the 3<sup>rd</sup> year organize an interaction program for the 2<sup>nd</sup> year students and welcome them to the Mechanical Engineering Society with some healthy interaction with them. The entire program was planned and handled by the students of the 3<sup>rd</sup> year.

Like every year this time the interaction program was organized on 7<sup>th</sup> September, there was a huge gathering of the Mechanical students from 2<sup>nd</sup> year and 3<sup>rd</sup> year in the seminar hall. During the program each student from the 2<sup>nd</sup> year was invited on stage to introduce himself and was given some task to perform on stage and was allowed to interact with their seniors and faculty member. Students from 3<sup>rd</sup> year gave a treat to their junior for their respect and sincere cooperation towards them made it memorable one.



### Pre-celebration of Teacher's day





The Mechanical Engineering Society paying a tribute to the complete faculty of the college organized pre-celebration of the “Teacher’s Day” on 4<sup>th</sup> September.

There was an interaction of the students and the faculties of the Mechanical Department in the seminar hall at 11:00 a.m. the students were ready with their dialogues and quotes for every faculty member. The complete event was boosted by the music and cheers, faculty member

shared their experience and some memorable and funny moments of their life with the students and were given some tasks to perform on the stage creating a fun loving environment. After the interaction event there were some fun events for the faculty member like “Catch the Ball”, “Arm Wrestling”, “Pillow Passing” and many more. The complete event was boosted by the music and the support from the faculty. The winners of the fun events were awarded with gifts. At last, the stage was put on fire with the dance of the faculty and the students.

### **Vishwakarma Day Celebration**

Vishwakarma Day also known as Vishwakarma Jayanti or Vishwakarma Pooja 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. Every year the Mechanical Engineering Department celebrates Vishwakarma day on 17<sup>th</sup> September, as a mark of reverence. The day of worship is marked by the engineering and architectural community. This year on 17<sup>th</sup> September the all the faculties from Mechanical Engineering Department along with students gathered in machine shop, performed holy “Havan” and prayed for a better future, safe working conditions, success in their respective fields and for the smooth functioning of various machines.



### **MECHAFEST – A TECHNICAL EVENT**

Mechanical Engineering Society organized an annual inter-college Technical Presentation competition “The MECHAFEST” on 16<sup>th</sup> October, 2015. The event was energized by 51 participants from nearby colleges like Textile Institute of Technology & Sciences (Bhiwani), Rani Jhansi Lakshmi Bai Government Polytechnic (Loharu), and Government polytechnic (Hisar). Dr. DB Goel (Emeritus Professor) BRCM-CET inaugurated the technical event with motivating & encouraging words. The event was adjudicated by Mr. Kanwarpal, Head of Mechanical Engineering Department and Mr. Ajay Mahendru, Assistant Professor Mechanical Engineering Department. Dr. DB Goel (Emeritus Professor) BRCM-CET inaugurated the technical event with motivating & encouraging words.



**Event details: -**

There were two technical sessions; the first technical session started at 10:30 a.m. and continued till 1:00 p.m. In this session twenty-six participants presented their work covering various technical topics on Mechanical Engineering which were highly informative.

The second technical session started from 2:00 p.m. after the lunch, during which the remaining participants presented their work on various recent topics of Mechanical Engineering like Internal combustion engine, refrigeration and air-conditioning, automation, automobile and advance topics like robotics, drones, magnetic refrigeration, advance robotics etc.

After a tough competition the top three positions were grabbed by following students:-

1<sup>st</sup> position was grabbed by Sharma Sumit of BRCM-CET, B. Tech. 3<sup>rd</sup> Year Student. Master Sumit gave his presentation on Unmanned Air Vehicle & Micro Air Vehicles.

2<sup>nd</sup> position was grabbed by Mayank Dwivedi of BRCM-CET, B. Tech 2<sup>nd</sup> Year Student. Master Mayank delivered his presentation on Magnetic Refrigeration.

3<sup>rd</sup> position was grabbed by Rajat Sheroran of TIT&S, Bhiwani. Master Rajat presented his talk on Internal Combustion Engine.

Participants were given the participation certificate by Head of Department of Mechanical Engineering, Mr. Kanwarpal and Dr. DB Goel. On this occasion Dr. B C Sharma, principal said that such activities are very important for overall development of students. Organizing such type of activities enhances the communication skills and presentation skills of the students.

### **CRICKET BATTLE**

The Mechanical Engineering Society showing a great interest in sports, organized an inter-year cricket tournament for the students of Mechanical department which was managed and handled by the student itself and played from 24<sup>th</sup> to 27<sup>th</sup> August in the central cricket ground. There were four participating each from one year and one from the Mechanical faculty.

The tournament was inaugurated on the 24<sup>th</sup> August by the Head of Mechanical Department and Computer Department, and then an inauguration match was played between the faculty and the 4<sup>th</sup> year in which after a lot of struggle on field final year team made its way after winning the game.

On the second day there was a match between the 1<sup>st</sup> year and the 2<sup>nd</sup> year in which the later grabbed the title of the winner and made its way towards the final.

On 3<sup>rd</sup> day it was a tough match in which 3<sup>rd</sup> year team played against the final year team and 4<sup>th</sup> year team maintaining its consistency won the match.

On the 27<sup>th</sup> August the 4<sup>th</sup> year team entered the field for defending their title against the 2<sup>nd</sup> year team and were successful with it, at last closing ceremony was done in presence of the complete Mechanical faculty and the Principal of the college, winning trophy was handed to the winning team and Mr. Anil Saini from the final year was awarded as “Man of the Tournament”.



## ROBOCON-2016



Robocon (short for Robotic Contest) is organized by Asia-Pacific Broadcasting Union (ABU), a collection of over 20 countries of Asia Pacific Region. Robocon has been organized at National level in the famous Shree Shiv Chhatrapati Sports Complex, Mahalunge, Balewadi, Pune by a joint collaboration of Doordarshan and Maharashtra Institute of Technology Academy Of Engineering (MITAOE), Alandi, Pune since 2002. Being the leading broadcaster in India, Doordarshan has been instrumental in providing wide coverage and public reach to Robocon.

This time there were around 5 thousand participants of 105 teams from 15 different states of the country, including the renowned institutes of engineering like IITs, NITs, BITS-Pilani, Nirma Institute of Technology, Ahmedabad and many other Technical Institutes. This time our technical team “SWAT” with 15 members was participating for the second time and consecutively was the only team from Haryana.

The theme for Robocon-2016 was “Clean Energy” and the participants were supposed to build two robots i.e. one hybrid robot and one eco-bot based on the theme, which completes the given task in time limit of 3 minutes. The complete event was scheduled from 3<sup>rd</sup> march 2016 to 5<sup>th</sup> march 2016, with three rounds i.e. league round, semi-finals and final.

BRCM-CET built two bots as per the theme and were named its eco bot as “Little Boy” and hybrid was named “Fat Boy”. The major feature of our bots was its design simplicity making it unique among all our team used the principle of line follower in eco-bot to trace the given path and hybrid was driving the eco-bot by using wind energy and was appreciated for its economy and design. Our college competed with two experienced team Sardar Patel College of Engineering, Andheri, Mumbai and Sardar Patel Institute of Technology, Mumbai in the league round and gave them a tough competition, but unfortunately our team got eliminated from the event on the second last day of the event.

Overall it was a great experience for the students and provided the students an excessive exposure to actual engineering, robotics and qualities like team management and working under pressure and gave a platform to the students to learn and interact with participants and experts from different colleges of India.

## **ACME-2016**

### **Technical PowerPoint Presentation**

A technical PowerPoint presentation was organized on 10<sup>th</sup> March at 2.00 pm in the seminar hall and the event was judged by Mr. Ajay Mahendru AP (ME Department), Mr. Nishant Bhardwaj AP (Civil Department), Mr. Vinod Kumar AP (ME Department) and Mr. Jitendra Gaur HOD (AS&H). Chief Guest for the event was Dr. D.B. Goel, Emeritus Professor BRCM-CET.

The event TPP was held for the holistic development of student, participants presented various topics on “Advance Engineering and Technology”.

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

1. Ravi Singh from ME gave presentation on AERODYNAMICS.
2. Govinda Poddar from CSE gave presentation on TELECOM CLOUD.
3. Rishab Aggarwal from CSE gave presentation on MICROSOFT HOLOLENS.

- Event coordinators - Sudeep Kadyan and Anil Kalirawana



### **APTITUDE TEST/ GD / TI / HR**

Aptitude test / GD / TI / HR event was organized in ACME-2016 by MES, 120 participants boosted the event started with the aptitude test and the exam was conducted in their respective classes at 9:15 AM and the time allotted for the test was 30 minutes, out of 120 participants, 60 participants were shortlisted for the GD. The group discussion was held in seminar hall, after some informative discussions on the following topics:-

- Reservation in INDIA.
- Odd - Even formula (Delhi Government).
- Censorship of Media NECESSARY or NOT.
- Has Democracy hampered India's progress?
- JNU campus STIR.
- Educational qualification for politicians.

15 students were shortlisted for the technical interview and HR which was conducted in HOD office of ME Department and the judges were Mr. Kanwarpal Singh HOD, ME department, Mr. Ajay Mahendru AP, ME department, Mr. Suresh Kumar AP, SRM University Sonipat.

Results of the events are as follow:-

- ❖ 1<sup>st</sup> position :- Mayank (14-ME-2528)
- ❖ 2<sup>nd</sup> position :- Tushar Gandhi (13-ME-1954)
- ❖ 3<sup>rd</sup> position: - Pratik Jain (14-ME-2541),  
Gagan (15-ME-3110), Mohit (15-CSE-2817).
- **Mr. Punit (14-ME-1978) secured 1<sup>st</sup> position in the aptitude test with highest marks and was appreciated with prize.**  
Event coordinators : Virender (3<sup>rd</sup> year ME)  
Santosh (3<sup>rd</sup> year ME)  
Baljeet Singh (2<sup>nd</sup> year ME)  
Sushil Kumar (2<sup>nd</sup> year ME)  
Prabhanshu Sinha (2<sup>nd</sup> year ME)



## Report on Cad Race

A CAD race was organized on 11<sup>th</sup> march at 10.00 AM in the CAD LAB. There were around 30 participants, showed their skills of design. Participants showed their skills by designing multiple drawings in AutoCAD in limited period of time. The event was judged on the basis of time, was held under the guidance of Mr. Mukesh Kiroriwal.

The top three positions in CAD race were grabbed by following students:-

- 1<sup>st</sup> position was grabbed by Sahajdeep Rao (ME)
- 2<sup>nd</sup> position was grabbed by Manjeet(ME)
- 3<sup>rd</sup> position was grabbed by Yogesh Verma(ME)

Event Coordinators- Sudeep Kadyan and Rajnish



## PROJECT DEMONSTRATION

A Project demonstration event was organized in ACME-2016 on 11<sup>th</sup> march 2016 in which around 10 teams demonstrated their working project. The events was judged by Mr. Vishwas Yadav AP ( ME department), Mr. Nitesh Jain AP (ME department), Mr. Vinod Kumar AP (ME department), Mr. Parveen Mudgil Lecturer (RJLB Govt. Polytechnic, Loharu) the event was organized under the guidance of Mr. Nitesh Jain AP (ME Department).

Students demonstrated various working projects and 1<sup>st</sup> position was shared by the following participants:-

- Baljeet & Prabhanshu they demonstrated their Project “CVT”.
- Virender demonstrated “Magnatica”.

Event Coordinators: - Pradeep Bhardwaj, Sahil



## TOOL RECOGNIZATION

A tool reorganization event was organized as a part of ACME-2016. In which the participants would have to recognize the Mechanical tools used in workshop, the complete event was conducted under the guidance of the Mr. Amit Kumar AP (ME department) and held in workshop at 2:00PM, 25 students participated in the event out of which top three positions were grabbed by the following students.

Results:-

- 1<sup>st</sup> position :- Tanuj Garg (13-ME-1953)
- 2<sup>nd</sup> position :- Pushpa (15-CE-2708)
- 3<sup>rd</sup> position :- Rohit ( 15-CE-2722)

Event coordinators: Prabhanshu Sinha (2<sup>nd</sup> year ME) and Abhishek Pathak (3<sup>rd</sup> year ME)



## TALENT HUNT

Talent Hunt event was organized in ACME 2016 under the banner of MES held in seminar hall on 10<sup>th</sup> march at 4:00PM. 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 Dr. Suman, Sudha nursing home, Bahal and Ms Rajni, Faculty GDC Memorial College, Bahal.

- **Winners** : 1<sup>st</sup> Position Sushil Kumar (2<sup>nd</sup> Year ME) and Virender (3<sup>rd</sup> Year ME) {SKIT}  
2<sup>nd</sup> Position Abhiraj (1<sup>st</sup> year ME) {DANCE}  
3<sup>rd</sup> Position Sahil (2<sup>nd</sup> year Civil) {DANCE}
- Event coordinators : Sonu Shah (3<sup>rd</sup> year ME) and Sachin Phogat (3<sup>rd</sup> year ME)



## REPORT ON TREASURE HUNT

An event of treasure hunt was organized under the banner of MES on 11<sup>th</sup> March, 2016 seven teams participated in the event held at central lawn of college. The Clues of the treasure were hidden at various places in the campus and participating teams competed with each other in finding the hidden clue. The complete event was organized under guidance of Mr. Vinod Kumar (A.P. ME Department). The participating teams were:-

Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7
Neelabh	Neelesh	Somesh	Atul	Shreya	Abhishek	Vishal
Punya	Kamlesh	Deepak	Sudeep	Nisha	Dhruv	Rohit
Tanmay	Armaan	Ravi	Anil	Daman	Smobir	Pushpa
Sachin	Mohit	Gagan	Rajnish	Parvin	Vikas	Komal
Soju	Vinod	Deepak	Mohit			Pankaj
M.Shariq			Dharminder			
			Ravi			

Result:-

**Team 4 won the event and got the ultimate treasure.**

- Event coordinators : Bhavesh Ojha (2<sup>nd</sup> year ME) and Mayank Dwivedi (2<sup>nd</sup> year ME)

## LOGO QUIZ

Logo quiz was organized in ACME-2016 by MES on 11<sup>th</sup> march at 11:30 AM in seminar hall. In this event 22 teams participated and were supposed to guess the logos of brands and organizations. This event was conducted in three rounds. In first two rounds each team was given two chances and in the final round the teams were given three chances. Each correct answer was rewarded with 10 points and for each wrong answer 5 marks were deducted. A Bonus of 5 points was given for answering a question passed to next team.

The event was judged by Mr. Vishwas Yadav (A.P. ME department). The results of the event are as follow:-

Winners: 1<sup>st</sup> Position Mayank (14-ME-2528) and Neelabh (14-ME-2532)

2<sup>nd</sup> Position Tushar (13-ME-1954) & Pradeep Bhardwaj (13-ME-1930)

3<sup>rd</sup> Position Bhavesh (14-ME-2513) and Pratik Jain (14-ME-2541)

- Event coordinators : Baljeet Singh (2<sup>nd</sup> Year ME)  
Sushil Kumar (2<sup>nd</sup> Year ME)  
Chandrakant (2<sup>nd</sup> Year ME)  
Virender (3<sup>rd</sup> Year ME)



## Report on “NFS-MW”

The Mechanical Engineering Society organized a computer gaming competition “Need for Speed MW” on 11<sup>th</sup> march at 10.30 am in CAD lab. The event was judged on basis of lap timing and was managed by the coordinators.

There were around 50 participants from all branches and competition was neck to neck. There were some tough digital races and in the end the top positions were secured by following students:-

- 1<sup>st</sup> position was grabbed by Girnar Jain (ME).
- 2<sup>nd</sup> position was grabbed by Sudeep Kadyan (ME).
- 3<sup>rd</sup> position was grabbed by Dhruv (CSE).

Event coordinator-Sudeep kadyan, Yogesh



## Just A Minute!

Just A minute was organized as a part of ACME-2016 on 11<sup>th</sup> March 2016 at 1:30 PM, 33 students participated in the event, every participant was given some funny task to performed in just one minute like eating banana, biscuits and other funny tasks. The most loved participants were prized.

The event was managed and conducted by students itself.

Event Coordinator: - Hiten sangwan (ME) and Abhishek Pathak (ME)

## Faculty Mechanical Engineering Department

Name	Designation	Qualification
Dr. D.B.Goel	Emeritus Professor	B.E.(IISc.),M.E.(BHU), Ph.D(Max Planck Institute Germany)
Mr. Ashok Kumar Mishra	Asstt. Prof.	B.E.(Aeronautical Engg.), M.E.(Space Engg. & Rocketry) (Ph.D Pursuing)
Mr. Kanwar Pal	Asstt. Prof.	B.E.(ME), M.Tech.(MT&A) (Ph.D Pursuing)
Mr. Suresh Kumar	Asstt. Prof.	B.E.(ME), M.Tech.(MT&A)
Mr. Ajay Mahendru	Asstt. Prof.	B.Tech.(ME), M.Tech.(MT&A)
Mr. Sunil	Asstt. Prof.	B.Tech.(ME), M.Tech.(Thermal Engg.) (Ph.D Pursuing)
Mr. Amit Kumar	Asstt. Prof.	B.Tech.(ME), M.Tech.(ME)
Mr. Mahender Singh Kaswan	Asstt. Prof.	B.Tech.(ME), M.Tech.(I&P)
Mr. Vinod Kumar	Asstt. Prof.	B.Tech.(ME), M.Tech.(I&P)
Mr. Vishwas Yadav	Asstt. Prof.	B.Tech.(ME), M.Tech.(I&P)
Mr. Mahesh Juneja	Asstt. Prof.	B.E.(ME), M.Tech.(Thermal Engg.)
Mr. Ravinder Kumar	Teaching Assistant	B.E.(ME), M.Tech.(MT&A)

## Supporting Staff Mechanical Engineering Department

<b>Name</b>	<b>Designation</b>	<b>Qualification</b>
Mr. Arvind Godara	Instructor (Sr. Scale)	Diploma (ME)
Mr. I.C.Sharma	Instructor	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**

#### **Dr. B.C. Sharma**

- Steels for Erosion Resistant Applications, Students conference on Engineering and system, SCES-2014, May 28 -30, 2014, MNNIT, Allahabad.
- CFD analysis of natural gas based carburetor for a two stroke spark ignition engine, Proc.
- International Conference on “Recent Trends in Mechanical Engineering” ICRTME-2013, ITM Gurgaon, 16th Nov., 2013.
- Optimization of Tribological Parameters in Al6061/SiC Metal Matrix Composite by Taguchi’s Technique, International Journal of Innovative Technology And Creative Engineering (ISSN: 2045-8711) VOL.2 NO.11 November 2012.

## Dr. D. B. Goel

- Steels for Erosion Resistant Applications, Students conference on Engineering and system, SCES-2014, May 28 -30, 2014, MNNIT, Allahabad.
- Man and Metal, Mechanica , BRCM CET, June 2014
- Erosive behavior of Fe-alloys for under water components of hydroelectric power plants, Trans. Ind. Inst. Met. 66(4), 2013, 425-428
- Effect of Carbides on Erosion Resistance of 23-8-N Steel, Bulletin of Materials Science, Accepted.
- Erosive Damages in Hydro Power Projects in the Himalayan Region and the Role of Metallurgy in providing relevant remedial Measures, Proc. National Seminar on Metallurgical Problems in Power Projects in India, MNIT Jaipur, Feb 22-23, 2013, p.10.
- Study of Nitronic Steels for Hydro Power Plant Applications, Proc. National Seminar on Metallurgical Problems in Power Projects in India, MNIT Jaipur, Feb 22-23, 2013, p.11-16.
- Effect of Heat treatment on Erosion Behaviour of 23-8-N Steel, Proc. National Seminar on Metallurgical Problems in Power Projects in India, MNIT Jaipur, Feb 22-23, 2013, p.25-29
- Cavitation and Solid Particle Erosive Behaviour of Hydro Turbine Stainless Steel, Proc. National Seminar on Metallurgical Problems in Power Projects in India, MNIT Jaipur, Feb 22-23, 2013, p.44-49
- Role of Nitrogen in Steels for erosion Resistance Applications, Proc. National Seminar on Metallurgical Problems in Power Projects in India, MNIT Jaipur, Feb 22-23, 2013, p.67-72
- Erosion Behaviour of 13/4 Martensitic Stainless Steel, Proc. National Seminar on Metallurgical Problems in Power Projects in India, MNIT Jaipur, Feb 22-23, 2013, p.126-131
- Silt damages in hydroelectric projects in the himalayan region – a challenge to material scientists, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp. 1-10, BRCM CET, Bahal (Haryana).
- Prospects of nitronic steel as an substitute to 13/4 steel for hydro power plant, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp. 11-15, BRCM CET, Bahal (Haryana).
- Design and indigenous fabrication of dry erosion tester, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp. 26-33, BRCM CET, Bahal (Haryana).
- Erosive wear behavior of different grade stainless steels, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp. 34-40, BRCM CET, Bahal (Haryana)
- Effect of heat treatment on carbides of as-cast 23-8n nitronic steel for erosion resistance applications, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp. 41-45, BRCM CET, Bahal (Haryana).
- Mechanism and application of adsorption inhibitors in hydro power plants, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp. 255-267, BRCM CET, Bahal (Haryana).
- Opportunities of entrepreneurship in mechanical engineering, Technical journal of

- Mechanical Engineering Society (MES), June, 2013, p. 1, BRCM CET, Bahal (Haryana)
- A comparative study of cavitation erosion behavior of 23/8N Nitronic steel and 13/4 martensitic stainless steel, Advanced Materials Research ( trans. Tech. Publications), 585, 2012, 554-558
  - Nitronic steel as erosion resistant material for hydro turbine applications, Presented in National Conference on Allied Trends of Engineering for Development of Technological Aspects, March 2, 2012, Dhamangaon (Rly).
  - Combating erosion in hydro turbine applications, Proceedings of International Conference on Advancements in Engineering & Technology (ICAET-2012) October12-13, 2012 Sangrur, Punjab, India, 47-51
  - Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal

### **A.K. Mishra**

- Optimization of Tribological Parameters in Al6061/SiC Metal Matrix Composite by Taguchi's Technique, International Journal of Innovative Technology and Creative Engineering (ISSN: 2045-8711) VOL.2 NO.11 November 2012.
- Tribological Behaviour of Al-6061 / SiC Metal Matrix Composite by Taguchi's Techniques, International Journal of Scientific and Research Publications, Volume 2, Issue 10, October 2012 ISSN 2250-3153.
- Parameters Optimization For Gas Metal Arc Welding of Mild Steel Using Taguchi's Technique, International Journal of Innovative Technology And Creative Engineering (ISSN: 2045-8711) VOL.3 NO.3 March 2013.
- Wear Behaviour of Al-6061with different Reinforcement & Particle Size of SiC Metal Matrix Composites, European Journal of Scientific Research ISSN 1450-216X / 1450-202X Vol. 98 No 4 March, 2013, pp.542-550.
- Application of Taguchi Technique to optimize Tribological behaviour of Al6061T6/SiC/Al<sub>2</sub>O<sub>3</sub> MMCs, IJSRP, Vol.3, Issue. 8, ISSN: 2250-3153, 2013.
- Study of dry sliding wear behaviour of Al-6061/SiC/Al<sub>2</sub>O<sub>3</sub>/Graphite Hybrid MMCs using Taguchi's Technique, IJSRP, Vol.3, Issue. 8, ISSN: 2250-3153, 2013.
- Wear behaviour of Al-6061/SiC/Al<sub>2</sub>O<sub>3</sub>/Fly ash Metal Matrix Composite, Proceeding of National Conference RTME-2013, October 4-5, 2013, pp.416-422, BRCM CET, Bahal (Haryana).
- Wear Behaviour of A6061- T6/SiC/Al<sub>2</sub>O<sub>3</sub>/Graphite Hybrid Metal Matrix Composite Using Taguchi Technique, Proceeding of National Conference RTME-2013, October 4-5, 2013, pp.52-63, BRCM CET, Bahal (Haryana).
- Optimization of tribological performance of Al6061T6 – 15% SiCp –15% Al<sub>2</sub>O<sub>3</sub> hybrid metal matrix composites using Taguchi method & Grey relational analysis Journal of Minerals & Materials Characterization Engg., Vol.2, No. 4, 2014.
- Mechanical behaviour of Al6063/MoS<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> hybrid metal matrix composites IJSRP, Vol-4, Issue-12, Dec.-2014.

- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal.

### **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.

### **Mukul Kararia**

- Synthesis of Magneto Rheological Fluid, International Journal of Engineering and Advanced Technology (IJEAT), 2013.
- Effect of constituents on sedimentation of magneto rheological fluid, Proceeding of National

Conference RTME-2013, October 4-5, 2013, pp.128-135, BRCM CET, Bahal (Haryana).

- Effect of constituents on the off-state properties of magneto rheological fluid, Proceeding of National Conference RTME-2013, October 4-5, 2013, pp.196-202, BRCM CET, Bahal (Haryana).

### **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 Aluminium 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 Modelling 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

### **Ankit Kumar**

- Techniques of Erosion Testing, Mechanica (BRCM CET), June, 2014.
- Steels for Erosion Resistant Applications, Students conference on Engineering and system, SCES-2014, May 28 -30, 2014, MNNIT, Allahabad.
- Design and indigenous fabrication of dry erosion tester, Proceedings of National Conference RTME-2013, October 4-5, 2013, pp.26-33 BRCM CET, Bahal (Haryana).

### **Suresh Kumar**

- An Overview of Optimization Techniques Used in Solar Drying, Asian Journal of Science and Applied Technology (AJSAT) Vol1.No.1 2013 pp 5-11.
- Experimental methods for measuring local deformation, Proceedings of National Conference on Recent Developments in Mechanical Engineering, February 19-20, 2010, BRCM-CET, Bahal, Haryana, pp. 304-309.
- An overview of heating process used in Jaggery making, Proceedings of National Conference on Recent Trends in Materials Engineering, October 4-5, 2013, BRCM-CET, Bahal, Haryana, pp. 76-81.
- Application of Taguchi method for optimizing CNC milling machine process parameters, Proceedings of National Conference on Recent Trends in Materials Engineering, October 4-5, 2013, BRCM-CET, Bahal, Haryana, pp. 245-254.
- Attended Workshop on “Powering Teaching Competencies” at JCDCOE, Sirsa.
- Attended national level workshop on CA-x from 4<sup>th</sup> to 6<sup>th</sup> March 2011, at BRCM CET Bahal.
- Attended national level workshop on Engineering Drawing- the language of Engineers from 23<sup>rd</sup> to 25<sup>th</sup> Sept., 2011, at BRCM CET Bahal.
- Attended one week short term course on “Fundamentals of Tribology” from May 26<sup>th</sup> – 30<sup>th</sup>, 2014, at NIT, Hamirpur (HP).

- Organizing Secretary of National Conference RTME-2013 on the topic “Recent Trends in Materials Engineering” which was held on Oct. 4<sup>th</sup> & 5<sup>th</sup>, 2013 at BRCM CET, Bahal.
- 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).
- Experimental investigation of the performance of an indirect mode natural convection solar dryer for drying Fenugreek Leaves, J Therm Anal Calorim DOI 10.1007/s10973-014-3949-2. Available online 22 July, 2014.
- Construction and performance analysis of an indirect solar dryer integrated with solar air heater, Procedia Engineering (Elsevier) 38 (2012), pp. 3260 – 3269.
- Modelling the Drying Kinetics of Green Peas in a Solar Dryer and Under Open Sun, IJEE, Vol. 4, Issue 4, 2013, pp. 663-676.
- An Overview of Optimization Techniques Used in Solar Drying, Asian Journal of Science and Applied Technology (AJSAT) Vol1.No.1 2013 pp 5-11.
- Optimization of thermal performance of a flat plate solar air heater using constrained non linear optimization technique, Proceedings of 4th International Congress of Environmental Research, December 15-17, 2011, SVNIT Surat, Gujarat.
- Construction and performance analysis of an indirect solar dryer integrated with solar air heater, International Conference on Modeling Optimization and Computing (ICMOC-2012), April 10-11, 2012 at Kumarakoil (Tamil Nadu).
- 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.
- An overview of heating process used in Jaggery making, Proceedings of National Conference on Recent Trends in Materials Engineering, October 4-5, 2013, BRCM-CET, Bahal, Haryana, pp.76-81.
- 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 modelling 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

### **Mahender Singh Kaswan**

- Ordering policy selection criterion and methods, Proceedings of National Conference on Recent Trends in Mechanical Engineering, March 21-22, 2013, MET's Institute of Engineering Bhujbal Knowledge City, Nashik-422003, pp. 149-152.
- Just in time approach of waste reduction in health care sector: A critical Literature review, 3<sup>rd</sup> International Conference on Production and Industrial Engineering CPIE-2013, NIT Jalandhar.
- Elements of JIT in Health Care Services, Proceedings of National Conference on Recent Trends in Materials Engineering, October 4-5, 2013, BRCM-CET, Bahal, Haryana, pp.320-328.
- Elements of JIT in Health Care Sector with Research guidelines, IUP Journal of Supply Chain Management, 2013.
- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal

### **Vinod Kumar**

- Computerized Maintenance Management Information System: A Critical Literature Review, Proceedings of National Conference on Recent Trends in Mechanical Engineering, March 21-22, 2013, MET's Institute of Engineering Bhujbal Knowledge City, Nashik-422003, pp. 149-152.
- A Proposed framework of Computerized Maintenance Management Information System for JCB India Limited Ballabgarh, IUP Journal of Mechanical Engineering, Vol. IV.,2013.
- Development of Computerized Maintenance Management Information System for JCB India Limited Ballabgarh, Proceedings of National Conference on Recent Trends in Materials Engineering, October 4-5, 2013, BRCM-CET, Bahal, Haryana, pp. 398-408.
- Attended three days workshop on "Advanced Engineering Optimization through Intelligent Techniques" at SVNIT Surat.
- Attended two days workshop on "Entrepreneurship during E summit'13" at NIT Kurukshetra.
- Attended two days National Seminar on "Applications of Graph Theory A Novel Technique for Research" at YMCA-UST.
- Attended two days National Workshop on "Eco-Friendly Structural Innovations for

Sustainable Developments” held at NIT Warangal.

- Attended one week workshop on “Applications of MAT Lab and SPSS in Research” held at YMCAUST, Faridabad.
- Attended three days Faculty Development Programme on “Advances in Thermal Engineering” held at UIET Kurukshetra.
- Attended one week Short-Term Course on “Maintenance Management in Industries” held at NIT Hamirpur.
- Attended two days National Workshop on “Developments in Energy Resources and Conservation DERC-2015” held at BRCM-CET, Bahal, Bhiwani.
- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal

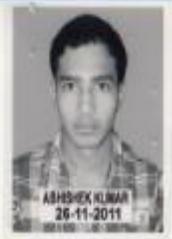
### **Vishwas Yadav**

- 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

### **Ajay Mahendru**

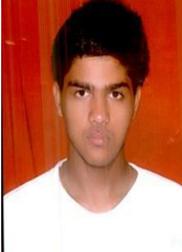
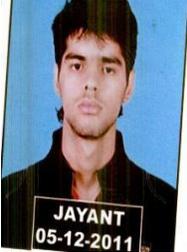
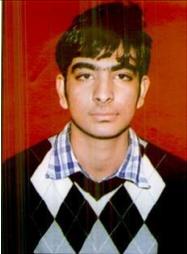
- Performance analysis of solar parabolic trough collector for domestic hot water generation using Aluminium as reflective material, Proceedings of national conference on Research Methodology & advancement in engineering and science , April 2013, Shanti Niketan College of engg., Hisar.
- Participated in Workshop MF-2015, 11-12 September, 2015 held at BRCM-CET, Bahal.

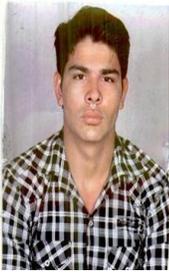
## B.TECH. MECHANICAL ENGINEERING STUDENTS (2012-2016 BATCH)

<p>College Roll No.:- 12-ME-1201            Name:- Aakash verma            D.O.B.:- 12 jul., 1995            P.A.:- Near vikash bhawan,            Chattar, Champawat,            Uttarakhand            E-mail ID:-            Life at BRCM:-            I'll always remember:-            P.J.:-</p>		<p>College Roll No.:- 12-ME-1202            Name:- Abhilash Parmar            D.O.B.:- 23 oct., 1993            P.A.:- VPO- Mehchana tehsil- Farukh            nagar,            Gurgaon, Haryana            E-mail ID:-            Life at BRCM:-            I'll always remember:-            P.J.:-</p>	
<p>College Roll No.:- 12-ME-1203            Name:- Abhishek Kumar            D.O.B.:- 24 jun., 1995            P.A.:- VILL- Ganjpar PO+PS-            Athmalgola,            Patna , Bihar            E-mail ID:-            krabhisheks1993@gmail.com            Life at BRCM:-            I'll always remember:-            P.J.:-</p>		<p>College Roll No.:- 12-ME-1204            Name:- Ajay Rampal            D.O.B.:- 11 feb., 1995            P.A.:- VPO-Lohani, Bhiwani, Haryana            E-mail ID:-            Life at BRCM:-            I'll always remember:-            P.J.:-</p>	
<p>College Roll No.:- 12-ME-1205            Name:- Ajay            D.O.B.:- 02 oct., 1993            P.A.:- VPO-Kashni kalan, Loharu,            Bhiwani, Haryana            E-mail ID:-            ajaypooniaone77@gmail.com            Life at BRCM:-            I'll always remember:-            P.J.:-</p>		<p>College Roll No.:- 12-ME-1206            Name:- Alok Bhalothia            D.O.B.:- 01 jan., 1900            P.A.:- H.No.- SB-308, New Bharat nagar,            Bhiwani, Haryana            E-mail ID:- alokbhalothia24@gmail.com            Life at BRCM:-            I'll always remember:-            P.J.:-</p>	
<p>College Roll No.:- 12-ME-1208            Name:- Amit Kumar Yadav            D.O.B.:- 25 jan., 1994            P.A.:- VPO- Jamawari, Hansi, Hisar,            Haryana            E-mail ID:-  <a href="mailto:y.amit60@yahoo.com">y.amit60@yahoo.com</a>            Life at BRCM:-            I'll always remember:-            P.J.:-</p>		<p>College Roll No.:- 12-ME-1209            Name:- Amrit Raj            D.O.B.:- 22 mar., 1994            P.A.:- VPO- Bharwar, VIA- Mirjapur,            Banduar            Begusarai, Bihar            E-mail ID:- amritraj373@gmail.com            Life at BRCM:-            I'll always remember:-            P.J.:-</p>	
<p>College Roll No.:- 12-ME-1211            Name:- Anil Kumar            D.O.B.:- 08 dec. 1994            P.A.:- H.NO. 1017, Near Maman dada            ground,            Bahal, Bhiwani, Haryana            E-mail ID:-            anilsaini555555@gmail.com            Life at BRCM:-            I'll always remember:-            P.J.:-</p>		<p>College Roll No.:- 12-ME-1212            Name:- Ankit Vashisth            D.O.B.:- 20 jun., 1993            P.A.:- VPO- Hetampura, Bhiwani,            Haryana            E-mail ID:-            ankitvashisth10081@gmail.com            Life at BRCM:-            I'll always remember:-            P.J.:-</p>	

<p>College Roll No.:- 12-ME-1213  Name:- Ankur  D.O.B.:- 02 nov., 1994  P.A.:- Patram Gat Suglan Dhani,  Bhiwani, Haryana  E-mail ID:-  ankurshandilya267@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1214  Name:- :- Anshumaan Jain  D.O.B.:- 14 jan., 1994  P.A.:- CP 116-118, Paras Complex,  Avas vikash colony, Gonda, UP  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1215  Name:- Arun Kumar Balhara  D.O.B.:- 28 sep., 1994  P.A.:- :- H NO. - 476, VPO – Kungar,  Bawani khera, Bhiwani,Haryana  E-mail ID:- balhararun@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1216  Name:- Arvind  D.O.B.:- 05 may., 1994  P.A.:- VPO- Kaliyana Ch. Dadri,  Bhiwani, Haryana  E-mail ID:- arvindbhatti04@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1217  Name:- Balram  D.O.B.:- 24 oct., 1994  P.A.:- VPO- Khorra, Matenhail, Jhajjar,  Haryana  E-mail ID:-  balramchahar007@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1218  Name:- Bhupender Singh  D.O.B.:- 03 apr., 1994  P.A.:- H.no. 208 Rajput Bhawan,  Krishana Colony, Mohindergarh,  Haryana  E-mail ID:- samittian28@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1219  Name:- Deepak  D.O.B.:- 22 apr., 1995  P.A.:- VILL- Mirch, Ch. Dadri,  Bhiwani, Haryana  E-mail ID:-  kuleriasatish91@yahoo.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1220  Name:- Deepak  D.O.B.:- 01 apr., 1996  P.A.:- Gali no. 2, Patel nagar, near sec.-  6,Bhadurgarh, Jhajjar, Haryana  E-mail ID:- deepakkadyann@yahoo.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1221  Name:- Deepak Joon  D.O.B.:- 22 dec., 1994  P.A.:- H. no. 117, Near base model  school, Ch. Dadri, Bhiwani, Haryana  E-mail ID:deepakjoon1994@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1222  Name:- Deepak Kumar  D.O.B.:- 11 may., 1994  P.A.:- Gali. No. 15, Shanti Nagar  Bhiwani, Haryana  E-mail ID:-deepakthorian76@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:- 12-ME-1223  Name:- Deepak Kumar  D.O.B.:- 27 feb., 1996  P.A.:- VPO- Kirawar, Tosham  Bhiwani, Haryana  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1224  Name:- Devendra Singh  D.O.B.:- 05 jul., 1994  P.A.:- VILL- Rampura, Rajgarh  Churu, Rajasthan  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1225  Name:- Dheeraj Bhardwaj  D.O.B.:- 15-mar., 1996  P.A.:- H. no. 34, Amer Enclave, Azad  Nagar,Hisar, Haryana  E-mail ID:-  dheerajbhardwaj711@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1227  Name:- Gaurav  D.O.B.:- 14 jul., 1995  P.A.:- Rohilla Ladies Wear, Durga  MarketBhiwani, Haryana  E-mail ID:-  gauravtanwar610@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1228  Name:- Gaurav Jain  D.O.B.:- 21 may., 1995  P.A.:- 134, Shant Vihar Colony  Hisar, Haryana  E-mail ID:-  gauravjam1228@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1229  Name:- Gaurav Kumar Yadav  D.O.B.:- 10 oct., 1993  P.A.:- VPO- Bisoha, Kosli  Rewari, Haryana  E-mail ID:- gyadav456@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1230  Name:- Govind  D.O.B.:- 25 aug., 1995  P.A.:- VPO- Hetampura, Bhiwani,  Haryana  E-mail ID:-  govindtanwar95@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1231  Name:- Gufran Hussain  D.O.B.:- 19 sep., 1995  P.A.:- AT+PO- Roshanpur- Pirpainti  Bhagalpur, Bihar  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1232  Name:- Guruvinder Gill  D.O.B.:- 25 jan., 1995  P.A.:- VPO- Samain, H.no. 202,  Tohana  Fatehabad, Haryana  E-mail ID:-  parveensharma358@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1233  Name:- Harinder Singh  D.O.B.:- 17 jan., 1996  P.A.:- New Jindal Colony , Quar- 7  Hisar, Haryana  E-mail ID:- coolharish17@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:- 12-ME-1234  Name:- Hemant  D.O.B.:- 07 jun., 1995  P.A.:- VPO- Misri, Ch. Dadri  Bhiwani, Haryana  E-mail ID:- hemantrao543@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1235  Name:- Himanshu Verma  D.O.B.:- 02 dec., 1993  P.A.:- Gali no. 9, Bhagat Sinsh Nagar  Hisar, Haryana  E-mail ID:- aaran.scot788@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1236  Name:- Hitesh  D.O.B.:- 22 sep., 1992  P.A.:- 726, sec. 14, Hisar, Haryana  E-mail ID:- hitesh726@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1237  Name:- :- Inderjeet Singh  D.O.B.:- 24 feb., 1995  P.A.:- VPO- Mundana, Tijara  Alwar, Rajasthan  E-mail ID:-  1995inderjit.singh@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1240  Name:- Jatin  D.O.B.:- 25 sep., 1993  P.A.:- H.no.169, Hanuman Gate, moh-  Ramganj  Bhiwani, Haryana  E-mail ID:- vermajatin999@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1241  Name:- Jayant  D.O.B.:- 13 oct., 1994  P.A.:- H.no. 672/5, Patel Nagar  Gurgaon, Haryana  E-mail ID:-  jagdish.vashisht@maxop.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1243  Name:- Keshav Vashisht  D.O.B.:- 15 may., 1994  P.A.:- H.no. 672/5, Patel nagar  Gurgaon, Haryana  E-mail ID:-  jagdish.vashisht@maxop.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1244  Name:- Krishan Kumar  D.O.B.:-  P.A.:- Vill- Gokal, PO- Rambass, Ch.  Dadri  Bhiwani, Haryana  E-mail ID:- coolkrishan1994@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1245  Name:- Kumar Love Swami  D.O.B.:-27 May,1994  P.A.:- VILL - RAMGARH, PO-  BIBIPUR,JIND,HARYANA  E-mail ID:- kaku.swami@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:-12-ME-1246  Name:- Kunal  D.O.B.:-11<sup>th</sup> feb,1995  P.A.:- H NO. - 6, ADARSH KRISHANA  COLONY,MALL GODAM  ROAD,BHIWANI,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1247  Name:- Kunal  D.O.B.:- 17 oct., 1992  P.A.:- Old Grain Market, Bhiwani,  Haryana  E-mail ID:- ka4721@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1248  Name:- Lalit Kumar  D.O.B.:- 28, aug., 1994  P.A.:- Gali no. 4, 166, Patel Nagar,  Bahadurgarh  Jhajjar, Haryana  E-mail ID:-lalitkumar8683@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:- 12-ME-1252  Name:- Manoj Maderna  D.O.B.:- 16 sep., 1992  P.A.:- VPO- Shekhpur Daroli  Fatehabad, Haryana  E-mail ID:-  manojmanderna11@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1253  Name:- MD. Taufik Alam  D.O.B.:- 10 jan., 1994  P.A.:- AT+PO- Pirpainti Bazar  Bhagalpur, Bihar  E-mail ID:- 786taufikalam@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1255  Name:- Mitin Jindal  D.O.B.:- 04 mar., 1996  P.A.:- Near Satluj High School,  Kalanwali  Sirsa Haryana  E-mail ID:- jindalmitin04@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1256  Name:- Mohit Kumar  D.O.B.:- 24 dec., 1994  P.A.:- H.no. 618, Sec. 13  Bhiwani, Haryana  E-mail ID:- mohitparwar247@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1258  Name:- Munmun Kumar Ray  D.O.B.:- 05 oct., 1993  P.A.:- Vill- Barakhraur, Bisulpura,  Gopalganj, Bihar  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1260  Name:- :- Navdeep  D.O.B.:- 21 jan., 1996  P.A.:- Durga Colony, H.no. 676, Gali no.  4  Bhiwani, Haryana  E-mail ID:- navdeep10x@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1261  Name:- Navdeep Aggarwal  D.O.B.:- 19 jul., 1994  P.A.:- Navdeep Book Store, Patram  Gate  Bhiwani, Haryana  E-mail ID:- navdeep7077@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1262  Name:- Navin Kumar  D.O.B.:- 29 oct., 1995  P.A.:- H.no.12, Chaudhary Complex,  TCPZ  Hisar, Haryana  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1263  Name:- Nikhil Pannu  D.O.B.:- 22 aug., 1993  P.A.:- H.no. 388/15, Near Kalidevi  Mandir, Hansi  Hisar, Haryana  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1266  Name:- Om Parkash  D.O.B.:- 20 mar., 1993  P.A.:- Gali no. 2, Surya Nagar  Hisar, Haryana  E-mail ID:- opsingh001@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:- 12-ME-1267  Name:- Pankaj  D.O.B.:- 20 jun., 1994  P.A.:- VPO- Pur, Bawani Khera  Bhiwani, Haryana  E-mail ID:- pankajsharma@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1268  Name:- Pankaj  D.O.B.:- 24 jul., 1993  P.A.:- VPO- Kairu, Tosham  Bhiwani, Haryana  E-mail ID:- tanwarpankaj94@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1269  Name:- Pankaj Sharma  D.O.B.:- 05 oct., 1995  P.A.:- VPO- Bapora, Bhiwani, Haryana  E-mail ID:-  pankajbhardwaj715@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1270  Name:- Parveen Chahal  D.O.B.:- 09 aug., 1995  P.A.:- H.no.614, Ram gali, Kirti Nagar  Sirsa, Haryana  E-mail ID:- lovey93@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1973  Name:- Praveen  D.O.B.:- 25 jan., 1995  P.A.:- 55, New Rishi Nagar,  Hisar, Haryana  E-mail ID:-  praveenthakur1995@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1274  Name:- Praveen Sharma  D.O.B.:- 23 jan., 1995  P.A.:- VPO- Samain, Tohana  Fatehabad, Haryana  E-mail ID:-  parveensharma.358@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1275  Name:- Rahul  D.O.B.:- 31 may., 1995  P.A.:- Near Gopi ki kui, Kirti Nagar  Bhiwani, Haryana  E-mail ID:- rahulvats44@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1276  Name:- Rahul  D.O.B.:- 14 sep., 1993  P.A.:- H.no. 1875, Sec. 13, Hudda  Bhiwani, Haryana  E-mail ID:- radhamya368@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1277  Name:- Rahul  D.O.B.:- 02 jan, 1996  P.A.:- Vill- Paintawas Khurd, Kitalana,  Ch. Dadri  Bhiwani, Haryana  E-mail ID:- royalrahul368@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1278  Name:- Rahul Kumar  D.O.B.:- 18 jun., 1995  P.A.:- VPO- Kharak Punia, Barwala  Hisar, haryana  E-mail ID:- rahulpunia1437@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1279  Name:- Raj Kumar  D.O.B.:- 01 dec., 1993  P.A.:- Barnala Road, DC Colony  Sirsa, Haryana  E-mail ID:-  raj9992656117@yahoo.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1280  Name:- Rajesh Kumar  D.O.B.:- 07 sep., 1992  P.A.:- VPO- M.P. Rohi, Fatehabad,  Haryana  E-mail ID:- raju88149@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:- 12-ME-1281  Life at BRCM:-  Name:- Rakesh Kumar  D.O.B.:- 02 jan., 1995  P.A.:- Dev Nagar Colony, Hansi Road  Bhiwani, Haryana  E-mail ID:- bassrakeshmor@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1282  Name:- Ravi Uttam  D.O.B.:- 25 may., 1994  P.A.:- VPO- Bhattu Kalan  Fatehabad, Haryana  E-mail ID:- raviuttam234@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1283  Name:- Ravinder  D.O.B.:- 15 feb., 1994  P.A.:- VILL- Jitwanbas, Leghan  Bhiwani, Haryana  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1284  Name:- Ravinder Kumar  D.O.B.:- 01 jun., 1994  P.A.:- VPO- Dhani Siswal, Mandi  Adampur  Hisar, Haryana  E-mail ID:- ravindersaini084@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:-12-ME-1285  Name:- Rishav  D.O.B.:-18 sep., 1994  P.A.:-Dhurwa Ranchi-4  Ranchi, Jharkhand  E-mail ID:- rishav1285@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:-12-ME-1287  Name:- Rohit  D.O.B.:-13 oct., 1994  P.A.:-VPO- Serla , Loharu  Bhiwani, Haryana  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:-12-ME-1288  Name:- Sachin Kumar  D.O.B.:-05<sup>th</sup> jun.1996  P.A.:- VPO - PAINTAWAS KALAN  TEHSIL - CH.  DADRI,Bhiwani,HARYANA  E-mail ID:- sharmassv.123@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:-12-ME-1289  Name:- Sandeep Kumar  D.O.B.:-3<sup>rd</sup> nov,1993  P.A.:- VPO - KHARIAN TEHSIL –  RANIA, SIRSA,HARYANA  E-mail ID:- bandersandeep@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:-12-ME-1290  Name:- SANJAY KUMAR  D.O.B.:-30<sup>TH</sup> MAR,1994  P.A.:- KHAIRPUR KHANNA,  COLONY,JANDIWALI NEAR  RAILWAY LINE , HISAR  ROAD,SIRSA  E-mail ID:- sk9996875@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:-12-ME-1291  Name:- SANJAY KUMAR  D.O.B.:-07<sup>TH</sup> MAY,1994  P.A.:- VPO - KIRDHAN,TEHSIL -  FATEHABAD  E-mail ID:- sanjayjyani50@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.: -12-ME-1292  Name:- SATYENDRA RANA  D.O.B.: -2<sup>ND</sup> AUGUST,1994  P.A.: - VPO- CHIRIYA,TEHSIL-  CHARKHI  DADRI,BHIWANI,HARYANA  E-mail ID:- jatrana007@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1293  Name:- SAURABH  D.O.B.: -1<sup>ST</sup> JULY,1994  P.A.: - H NO. - 1220,HUDA, SECTOR -  13,BHIWANI,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1294  Name:- SHARWAN SINGH  D.O.B.: -28<sup>TH</sup> SEPT,1995  P.A.: - MAAN SINGH KI  DHANI,GUDAGAUR  JLJHUNJHUNU,RAJASTHAN  E-mail ID:-  singhshekhwatsharwan@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1295  Name:- SHIVAM  D.O.B.: -12<sup>TH</sup> JUN,1993  P.A.: - VPO - CHIRYA,TEHSIL - CH.  DADRI,BHIWANI,HARYANA  E-mail ID:-  shiramkaushik1295@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1296  Name:- SHUBHAM SINGLA  D.O.B.: -18<sup>TH</sup> DEC,1994  P.A.: - 100 VIKAS  NAGAR,BHIWANI,HARYANA  E-mail ID:-  AKSINGLA007@GMAIL.COM  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1297  Name:- SOMBIR  D.O.B.: -5<sup>TH</sup> APRIL,1994  P.A.: - VILLAGE - BURE,PO -  SHARWA,HISAR,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1298  Name:- SOURAB KUMAR  D.O.B.: -2<sup>ND</sup> MAY,1994  P.A.: - AT-BANAHRA,PO-  BANAHRA,MUNGER,BIHAR  E-mail ID:-  NILAMBERSINGH@YAHOO.COM  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1299  Name:- SUMEET TANWAR  D.O.B.: -23<sup>RD</sup> SEPT,1993  P.A.: - GALI NO-13, SHANTI  NAGAR,GUJARS  DHANI,BHIWANI,HARYANA  E-mail ID:-  sumeetrajpat619@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1300  Name:- SUMIT BENIWAL  D.O.B.: -23<sup>RD</sup> NOV,1993  P.A.: - H NO.- 1057/34 VIJAY  NAGAR,BAGWALI  GALI,ROHTAK,HARYANA  E-mail ID:sumitbeniwal23@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1301  Name:- SUMIT KAUSHIK  D.O.B.: -15<sup>TH</sup> MAY,1994  P.A.: - VPO - TALWANDI  RUKKA,HISAR,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.: -12-ME-1303  Name:- SURENDER SINGH  D.O.B.: -22<sup>ND</sup> JAN,1994  P.A.: - VPO - TALWANDI  RUKKA,HISAR,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1304  Name:- TANMAY CHACHAN  D.O.B.: -11<sup>TH</sup> DEC,1993  P.A.: - C/O SHIVAM STATIONERS,  CHACHAN MARKET FIRST FLOOR  SUTAPATTY,MUZAFFARPUR,BIHAR  E-mail ID:-  tanmay.chachan@rediffmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	 TANMAY CHACHAN 20-1-2012
<p>College Roll No.: -12-ME-1306  Name:- VIKAS  D.O.B.: -13<sup>TH</sup> NOV,1994  P.A.: - HOUSE NO. - 8A,D C  COLONY,BHIWANI,HARYANA  E-mail ID:- phaseworld5@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	 VIKAS D.O.P:16-05-2011	<p>College Roll No.: -12-ME-1307  Name:- VIKAS BALODA  D.O.B.: -2<sup>ND</sup> APRIL,1994  P.A.: - VILL - KHERI SANWAL, PO -  DHANI PHOGAT,TEHSIL - CH.  DADRI,BHIWANI,HARYANA  E-mail ID:- vbaloda82@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1308  Name:- VIKAS  D.O.B.: -10<sup>TH</sup> OCT,1993  P.A.: - F-426/23, SANJAY COLONY  SECTOR - 23,  NIT,FATEHABAD,HARYANA  E-mail ID:-  VK2206AJ@GMAIL.COM  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1309  Name:- VIKRAM  D.O.B.: -16<sup>TH</sup> MAY,1995  P.A.: - H NO. 420, VPO-  JATAI,BHIWANI,HARYANA  E-mail ID:-  VIKRAM.JREATJATT@GMAIL.COM  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1310  Name:- VIKRAM SINGH  D.O.B.: -19<sup>TH</sup> JAN,1996  P.A.: - VPO - KHARAK  KALAN,BHIWANI,HARYANA  E-mail ID:-  vikramsinghtanwar506@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1311  Name:- VIPIN BANSAL  D.O.B.: -15<sup>TH</sup> AUG,1996  P.A.: - AADRESH NAGAR, NEAR  ANAJA MANDI,BAHAL  E-mail ID:-  VIPINBANSAL000@GAMIL.COM  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.: -12-ME-1312  Name:- VIVEK KUMAR GOUR  D.O.B.: -13<sup>TH</sup> FEB,1992  P.A.: - H.NO.- 1963,,HUDA SECTOR -  13,BHIWANI,HARYANA  E-mail ID:- vkumargaur@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.: -12-ME-1313  Name:- YOGESH  D.O.B.: -19<sup>TH</sup> MAY,1992  P.A.: - C/O RAMBILASH SANJAY  KUMAR,HALLU  BAZAAR,BHIWANI,HARYANA  E-mail ID:- aggarwal11@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:-12-ME-1314  Name:- YOGESH CHAUHAN  D.O.B.:-28<sup>TH</sup> AUG,1995  P.A.:- BRIJWASI COLONY  (SHASTRI NAGAR),GALI NO.- 6,  DINOD ROAD,NEAR CITY  SCHOOL,BHIWANI,HARYANA  E-mail ID:-  dabanggchauhan@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:-12-ME-1315  Name:- YOGESH MEHTA  D.O.B.:-24<sup>TH</sup> FEB,1995  P.A.:- VPO -  PANJUANA,SIRSA,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:-12-ME-1316  Name:- CHANDAN  D.O.B.:-10<sup>TH</sup> FEB,1995  P.A.:- GYAN CHAND COMRED,  WARD NO.1,TOSHAM, BHIWANI,  HARYANA  E-mail ID:-  chandanbundela1316@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:-12-ME-1317  Name:- KARAMPAL  D.O.B.:-16<sup>TH</sup> APRIL,1994  P.A.:- VPO. CHAHAR KALAN, TEH.  LOHARU,BHIWANI,HARYANA  E-mail ID:- karmasheoran@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1318  Name:- ANKUR  D.O.B.:-14 June, 1992  P.A.:- VPO - BAHAL, WARD - 16,  AMBEDKAR NAGAR, BAHAL  E-mail ID:- arbrar14@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1319  Name:- DAYAKISHAN  D.O.B.:- 15 Aug, 1995  P.A.:- VPO - MANDHOLI KALAN,  TEHSIL - LOHARU  E-mail ID:-  dayakshansheoran@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1320  Name:- HIMANSHU  D.O.B.:-31 Aug., 1994  P.A.:- JITTU WALA JOHAR, DINOD  ROAD, NEAR VIKAS HIGH  SCHOOL, GALI NO.-2, BHIWANI  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1321  Name:- HITESH BHUTANI  D.O.B.:- 02 July, 1995  P.A.:- 8-A, ANAJ MANDI, BHUNA,  FATEHABAD  E-mail ID:-  hiteshbhutani.com@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1322  Name:- Joginder  D.O.B.:-1 Jan,1992  P.A.:- VILLAGE-  MALWAS(DEVSAR), PO-  KASUMBHI, TEH-  BHIWANI,HARYANA  E-mail ID:-  joginderranga18@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1324  Name:- Naveen  D.O.B.:-22<sup>ND</sup> APRIL,1993  P.A.:- VPO - CHAHAR KALAN,  TEHSIL -  LOHARU,BHIWANI,HARYANA  E-mail ID:-  naveensheoran978@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	

<p>College Roll No.:- 12-ME-1325  Name:- Pardeep Singh  D.O.B.:-4<sup>TH</sup> March,1995  P.A.:- VPO-  HETAMPURA,BHIWANI,HARYANA  E-mail ID:-  rathorepardeep50@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1327  Name:- Sukhchain Singh  D.O.B.:-10<sup>th</sup> Jan,1993  P.A.:- VISHVAKARMA ENGG.  WORKS, BHUNA ROAD UKLANA  MANDI,HISSAR,HARYANA  E-mail ID:-  prince.bhuller143@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1328  Name:- Sukhvinder Singh  D.O.B.:-30<sup>TH</sup> OCT,1992  P.A.:- VPO-KAIRU, TEH-  TOSHAM,BHIWANI,HARYANA  E-mail ID:- rsukhaa47@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1329  Name:- Suraj Kumar  D.O.B.:-30<sup>TH</sup> JULY,1994  P.A.:- VPO - KHAIRAMPUR,  HISAR,HARYANA  E-mail ID:-  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1330  Name:- Suraj Saini  D.O.B.:-10<sup>th</sup> Nov,1994  P.A.:- H. NO. 392/17 JAIDEV  NAGAR, NEAR GROVER  AGENCY,HISAR,HARYANA  E-mail ID:-  mechanicalengg133@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>		<p>College Roll No.:- 12-ME-1331  Name:- Surender  D.O.B.:-20<sup>th</sup> April,1991  P.A.:- VPO-KASUMBHI, TEH &amp;  DISTT-BHIWANI,HARYANA  E-mail ID:-  surender.master.kumar@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>	
<p>College Roll No.:- 12-ME-1332  Name:- Aatam Dev Phogat  D.O.B.:-15<sup>th</sup> Aug,1994  P.A.:- PREM NAGAR, GALI NO.-4,  DHANI ROAD, CH. DADRI,  BHIWANI,HARYANA  E-mail ID:- kanwarpal7@gmail.com  Life at BRCM:-  I'll always remember:-  P.J.:-</p>			



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