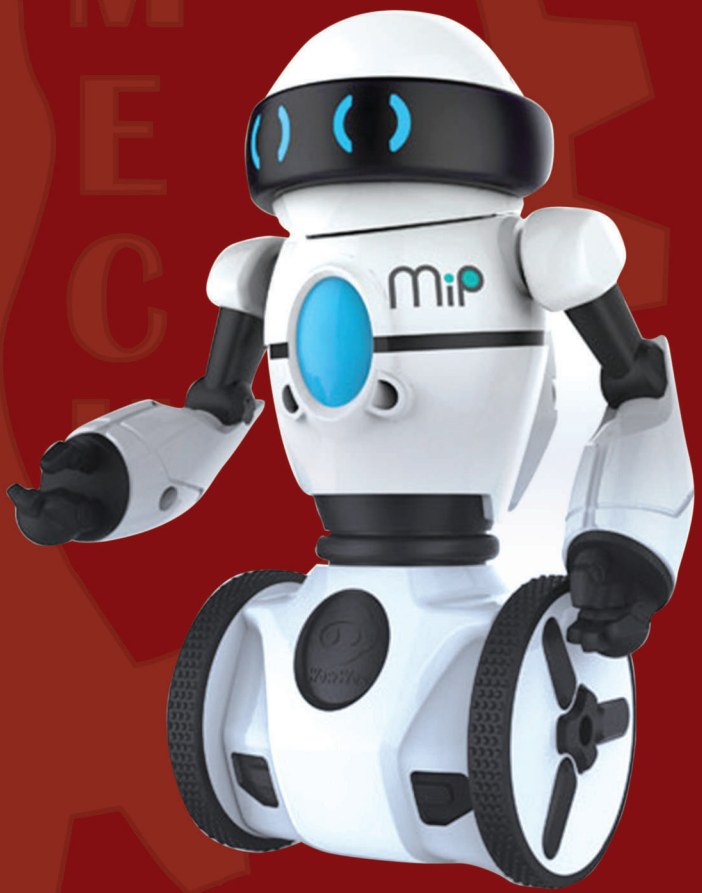
MECHAZINE

DEPARTMENT OF MECHANICAL ENGINEERING



2016-17

GALGOTIAS COLLEGE OF ENGINEERING & TECHNOLOGY

Mechazine

HoD's Message:

It gives me immense pleasure to congratulate editors of Magazine of Mechanical Engineering Department. The department always motivates its students to achieve the highest standard of excellence. During the last session various extracurricular activities were conducted successfully by Mechanical Engineering Department like organization of expert lectures, paper publication & presentation by staff members in national and international journals, various student activities etc. I congratulate all the contributors and editorial board for successful publication of annual magazine of department.

I earnestly wish and sincerely hope that this Magazine turns out to be a resounding success.

Prof. Mohd. Asim Qadri
(HoD-ME)

Editor's Message:

I am delighted to introduce the annual Magazine of Mechanical Engineering department of Galgotias College of Engineering & Technology. The guiding philosophy of Mechanical Engineering Department is to inculcate knowledge and practical skills among students so that they can face challenges globally. I hope this magazine will provide a platform for the students to show their extracurricular skills. This magazine also provides a brief detail of all activities conducted by faculty and students of mechanical engineering department during the last session.

At last, I take this opportunity to thank all who are directly or indirectly involved for publication of this magazine specially the editors and students of mechanical engineering department.

Dr. M. K. Lohumi

Waterjet Cutting

Water jet cutting is a non-traditional method of cutting. It uses a very high speed stream (or jet) of water to cut through various materials. It is generally used when the material to be cut is sensitive to high temperatures. The speed is usually supersonic, nearly 2 to 3 times the speed of sound which can be as high as 1000m/s or 1km/s. It is very versatile and can be used to cut through a wide range of materials, which include paper, textiles, wood, rubber, metals, glass, quartz, etc.

It was first used in mid 1800s for hydraulic mining. Then there were developments in the technology and by 1970s, it made its appearance in manufacturing workshops.

The concept of this technology is very simple. It is derived from the phenomenon that high speed water can erode soil, making large cuts in it. So the objective is to increase the speed of water so high that it can erode through a wide range of materials. Harder the material, higher is the speed of water jet. To achieve this, we use specialized pumps and nozzles. For harder materials, we add some fine particles called abrasives.

The pump is of two types: intensifier pump and crankshaft pump. The intensifier pump makes us of hydraulic oil at high pressure to increase the pressure of the water jet. The crankshaft pump is similar to the working of engines and uses piston-cylinder mechanism to increase the velocity of the water.

The nozzle is a very important element at the exit phase of water jet for further increasing the velocity. The nozzles come in various ranges of strength and materials depending on the operating pressures and material to be cut. A nozzle can be as narrow as 0.05mm in diameter (which is the size of a human hair).

The water jet is also of two types: pure water jet and abrasive water jet. Pure water jet uses water without any abrasives and is used for softer materials like wood and rubber. Abrasive water jet uses some very fine powdered metal or some other hard substance. It is used to cut through harder materials. The grain size of powder affects the finishing and smoothness of the surface.

The benefits of using this technology include smooth surface finish, less scrap as the width of cut (called kerf) is very narrow. It does alter the grain structure of the material being cut, thus there is no change in inherent properties of the material after machining. Also there are no heat-affected zones (HAZs). There is no health hazard to operator like metal dust, high temperatures etc.

This technology also has certain limitations. It can cut up to a maximum distance of 480mm or 48cm or half a meter approximately. Also it cannot cut through diamond.

Thistechnologyisrapidlysubstitutingthetraditionalmethodsofcutting,becauseofitsversatilityandconvenience; smooth finishing, less scrap, and the reusability of the working fluid water. It has a very promising future.

AYUSH MANI (ME-3rd Year)

Eduaction and Employment

The $150 billion Indian IT sector has been a constant contributor to the county's GDP growth. It has also been able to create decent jobs for the otherwise unemployed youth in the country.

Several colleges around the country rely on the tech giants for mass recruitment of the engineering graduates. Infosys, Wipro, Cognizant, TCS are some of the companies which shine in this field. But of late, many of them have reduced their scale of recruitment and their workforce. Many reasons can be cited for the creation of this situation.

Over the past few years, automation has increased manifold and is ready to take over the job of humans. Another major reason can be the cancellation of H1B visa by the American government, forcing the companies for a mass layoff which affects the process of mass recruitment directly.

Indian education system further makes the problem worse. Instead of focusing on practical training, it heavily relies on the test of the bookish knowledge. Hence, these mark and grades become less significant in the

industry where practical knowledge matters. The companies now prefer to recruit skilled and trained fresher's rather than an untrained college graduate with no exposure to the practical projects thus making them very necessary for the students.

With layoff still on and the high competition for engineering jobs, it has become important for students to not only gain marks but also gain some real world experience for their own survival.

Katyayni Rastogi (CS-3rd Year)

Elon Musk-Scientist

There is a joke that serial entrepreneur Elan Musk tells during a 2013 interview for TED Talks that goes:

"Did you hear the joke about the man who made a small fortune in the space industry?"

He subtly pauses before delivering the punch line:

"He started with a large one."

Musk, currently the chief executive of SpaceX, Tesla Motors and chairman of Solar City, is all too aware of the enormous risks and upsides involved in sinking his time and fortune into high-risk tech ventures.

He came into millions at the age of 27, after he sold his first company, Zip2, an online-media services company, to Compaq for $307 million in 1999. He founded another startup, X.com, that same year, which eventually became PayPal and was sold to eBay for $1.5 billion in 2002. He reportedly netted approximately $180 million from the sale.

So, Musk was already deemed successful when he launched SpaceX in 2002. However, six years later, following three failed launches for his flagship rocket, his prospects looked grim. He was down to his last $75 million, says The Telegraph, which is a fortune for many startups, but considering the rockets at the time cost approximately $90 million to build and he was the sole funder of SpaceX at the time another launch failure would have likely meant financial ruin.

Plus, things were touch and go at his other company, Tesla Motors. The company (launched in 2003) had released its first electric car in 2008, a $100,000 Roadster, which encountered multiple quality issues that led to multiple recalls.

To top it off, Musk was going through a very acrimonious divorce from his first wife, the mother of his five children.

"Both Tesla and SpaceX were very close to dying," admits Musk looking back. "SpaceX had our third launch failure. We just barely had enough resources to do a fourth."

The fourth launch took place in September 2008 and was successful. As a result, the company was awarded several multibillion-dollar contracts from NASA to help the U.S. resupply the International Space Station (ISS) and reestablish astronaut travel to and from the space station.

As of 2015, SpaceX was valued at $12 billion, reports the Wall Street Journal and has moved on to successfully test a more advanced and powerful launcher, the Falcon 9. The next generation of launcher, the Falcon Heavy, is slated to test this year and "will be the most powerful operational rocket in the world by a factor of two," reads the SpaceX website.

Tesla, which teetered close to bankruptcy in 2013, according to a report from Bloomberg, also powered through its rough patch and won back public trust. In a tweet dated April 3, 2016, Musk announced that Tesla's third generation of car, which comes out in 2017, to date has 325,0000orders in pre-sales, says CNBC.

And Musk's personal fortune is back in the billions. As of 2016, he is estimated to be worth $14.4 billion, according to Forbes.

Related: An Emotional Elan Musk Admits He's Only 'Tried' to Take Two Weeks Off in Past 12 Years

The Musk titillates and fascinates as a larger-than-life figure who risks where most don't dare, so his moments of humanity are oddly reassuring. He's come close to tears during multiple televised interviews. His romantic life is rocky: he's two-times divorced soon to be three times and married his second wife, twice.

RAVI TIWARI (ME-3rd Year)

The Future of Nuclear Energy in India

Global carbon emissions have been rising sharply since the start of the 20th century, and countries have adopted various policies in recent years to reduce greenhouse gas (GHG) emissions in different sectors. However, the implemented measures have not been sufficient to negate worsening global warming and climate change. India's NDC has outlined goals to reduce the carbon emissions intensity of its economy by 33-35 percent by 2030 as well as increase the clean energy electricity capacity to 40 percent of the total installed capacity in the same period.

Perhaps the most important source of energy for India in the coming decades is nuclear power, given its huge potential for growth, emission-free nature and consistent nature of production. A significant expansion of nuclear power can both enable the connectivity of millions of Indians who currently lack access to the power grid and help it contribute to global efforts to tackle climate change by curbing its total carbon emissions.

In June 2016, after PM Modi's visit to the US, it was announced that the long awaited project for American nuclear giant Westinghouse to build reactors in India was set to go through.

India's energy status

The total installed electrical capacity of India (utilities) was just over 300 giga watts (GW) as of May 2016. Of this, 210 GW (70 percent) constituted thermal power such as coal, gas and diesel. Hydroelectric power too contributes over 40 GW. The total installed capacity of grid-interactive renewable power—which consists of wind, solar, biomass and small hydro is just under 43 GW. The installed capacity of nuclear power is 5.78 GW, a mere 1.8 percent of the total capacity.

Estimates for nuclear power growth: A review

India currently has 21 operating nuclear reactors at six locations across the country, their combined capacity totaling 5.8 GW. Its civil nuclear strategy has proceeded largely without fuel or technological assistance from other countries for more than 30 years. This was a result of its Peaceful Nuclear Explosion (PNE) in 1974 and its voluntary exclusion from the Non-Proliferation Treaty (NPT), which led to India's isolation from trade in nuclear power plant materials. Civil nuclear cooperation agreements have since been signed with the US, Russia, France, Australia and Kazakhstan, among other countries.

In December 2011, the Indian parliament was informed that nuclear power targets were set at 14.6 GW by 2020 and 27.5 GW by 2032. 8 This is a reflection of the fact that India currently has five nuclear reactors under construction all due to finish by 2017, which would add 3.8 GW, raising the total capacity to 9.6 GW. The government's plan for nuclear to generate 25 percent of electricity by 2050 could mean between 150 GW and 200 GW of installed nuclear capacity.

The Energy and Resources Institute (TERI) has also published a report with inputs from the World Wide Fund for Nature (WWF) India. The total electricity capacity of India is thus estimated at nearly 2,000 GW in 2051, a more ambitious estimate than other studies for the same period. Nuclear capacity is expected to increase to over 100 GW, indicating far higher rates of growth than business-as-usual (BAU).*

The now-defunct Planning Commission had also produced an online tool called India Energy Security Scenarios (IESS) 2047 in 2015, developed in consultation with the UK DECC, TERI, C-Step and Prayas Energy. The tool shows various combinations of energy demand and energy supply pathways available for India and the potential impact of following certain pathways on the energy system and carbon emissions.

Factors influencing nuclear power growth Land requirements:

In terms of land area, in line with past practice, the NPCIL intends to develop Nuclear Energy Parks, each with a capacity for up to eight new-generation reactors of 1 GW, six reactors of 1.6 GW or simply 10 GW at a single location. Five such parks have been proposed, last of those parks faced protests and challenges, leading to a shift in the location of the Westinghouse AP 1000 to Andhra Pradesh.

Nuclear power projects require significant areas of land due to the additional requirement of a 1.5-km exclusion zone around the plant in India. According to the Atomic Energy Regulatory Board (AERB) code, an area in the radius of 1.5 km, called exclusion zone, around the reactors is established where no human habitation is permitted.

There has been significant opposition and local protests to the government plans of land acquisition to develop these nuclear energy parks, potentially delaying their development and forcing the NPCIL to search for alternative locations.

Fuel Requirements:

India operates a closed fuel cycle designed to make maximum use of its limited uranium resources, act as a plutonium guarantor for its strategic programme if need be and to be a key element in its envisioned three-stage nuclear programme. According to Anil Kakodkar, former chair of the AEC, "India considers a closed nuclear fuel cycle of crucial importance for implementation of its three-stage nuclear power programme," the third stage being the long-term objective of tapping vast energy available in thorium resources in India.

India's uranium reserves were boosted recently by the discovery of the Tummalapalle, uranium mine in Andhra Pradesh, which has the potential to be among the largest uranium mines in the world. India has uranium supply agreements with various countries such as Russia, France and Kazakhstan to import the majority of its uranium needs.

Manufacturing needs:

Nuclear power plants are simultaneously critical on their requirement of heavy engineering components and forgings while also requiring delicate and precision-engineered equipment for purposes of measurement and safety. The most engineering heavy requirement of nuclear reactors is the reactor pressure vessel.

Manpower needs:

To scale up nuclear energy in India, human resource for nuclear engineering is paramount. India currently faces a shortfall in nuclear scientists and engineers. As per a DAE projection exercise done in 2006, it was estimated that to replace retiring personnel and provide manpower for expansion of the programme in the coming decade, it would be necessary to train and recruit about 700 scientists and engineers every year in R&D units and about 650 engineers every year in public sector and industrial units.

Regulatory oversight, too, faces a huge manpower shortage as noted by the parliamentary Public Affairs Committee (PAC) report on the AERB.

Conclusion

The fundamentals underlying the possibility of breakthrough growth in India's civil nuclear programme are strong: political will, bilateral agreements with most supplier countries, an NSG waiver for nuclear trade, and a non-trivial level of domestic human resources and capability developed in the last 30 years of nuclear power operations.

If India is able to perfect the building and operation of its 700-MW PHWR technology, it can rapidly scale up construction of those reactors across the country unhindered by international politics, tricky bilateral agreements, unreliability of foreign supply chains and massive costs.

MRINAL GUPTA (EE-3rd Year)

Growth and scope of a Mechanical Engineering

The Indian Engineering sector has witnessed a remarkable growth over the last few years driven by increased investments in infrastructure and industrial production. The engineering sector, being closely associated with the manufacturing and infrastructure sectors, is of strategic importance to India's economy.

India on its quest to become a global superpower has made significant strides towards the development of its engineering sector. The Government of India has appointed the Engineering Export Promotion Council (EEPC) as the apex body in charge of promotion of engineering goods, products and services from India. India exports transport equipment, capital goods, other machinery/equipment and light engineering products such as castings, forgings and fasteners to various countries of the world.

India became a permanent member of the Washington Accord (WA) in June 2014. The country is now a part of an exclusive group of 17 countries who are permanent signatories of the WA, an elite international agreement on engineering studies and mobility of engineers.

Market size

The capital goods & engineering turnover in India is expected to reach US$ 125.4 billion by FY17.

India exports its engineering goods mostly to the US and Europe, which accounts for over 60 per cent of the total exports. Recently, India's engineering exports to Japan and South Korea have also increased with shipments to these two countries rising by 16 and 60 per cent respectively. Sri Lanka, Nepal and Bangladesh have also emerged as the major destinations for India's engineering exports.

According to data from the Engineering Export Promotion Council of India, engineering exports from India grew 11.33 per cent year-on-year to reach US$ 65.23 billion in FY 2016-17.

Investments

The engineering sector in India attracts immense interest from foreign players as it enjoys a comparative advantage in terms of manufacturing costs, technology and innovation. The above, coupled with favorable regulatory policies and growth in the manufacturing sector has enabled several foreign players to invest in India.

The foreign direct investment (FDI) inflows into India's miscellaneous mechanical and engineering industries during April 2000 to March 2017 stood at around US$ 3.31 billion, as per data released by the Department of Industries Policy and Promotion (DIPP).

In the recent past there have been many major investments and developments in the Indian engineering and design sector:

Larsen and Toubro Ltd (L&T) has been awarded with projects worth Rs 2,170 crore (US$ 336.93 million), which includes an order worth Rs 1,169 crore(US$ 181.51 million) from Oman Electricity Transmission Company SAOC.

Warburg Pincus is in advance talks with Tata Technologies to acquire up to 40 per cent minority stake for about Rs 2,300 crore (US$ 357.11 million).

Engineers India Ltd and Gazprom PJSC, the respective domestic companies of India and Russia in the engineering and oil and gas sectors, will prepare a blueprint for laying a gas pipeline between India and Russia, which is expected to help India diversify its energy mix and increase trade with Russia.

Hexagon Capability Centre India (HCCI) in collaboration with National Institute of Technology Karnataka (NITK), Surathkal, launched first-of-its-kind NextGen 3D Lab costing Rs 7.7 crore (US$ 1.15 million) at NITK Campus. The lab aims at making budding engineers industry-ready by the time they graduate.

Engineering and construction major L&T entered into a joint venture with European defense major Matra BAE Dynamics Alenia (MBDA) Missile Systems for development of missiles in India. L&T will own 51 per cent stake in the JV named L&T MBDA Missile Systems and the rest 49 with the European partner.

American plane maker Boeing Corporation has launched the Boeing India Engineering & Technology Center in Bangalore. The centre will employ hundreds of locals who will work to support Boeing, including its information technology & data analytics, engineering, research and technology, and tests.

Reliance Defense and Engineering Ltd said it has signed an agreement with the US Navy for undertaking service, maintenance and repair of Seventh Fleet of US Navy at the Reliance Shipyard at Pipavav in Gujarat.

Government Initiatives

The Indian engineering sector is of strategic importance to the economy owing to its intense integration with other industry segments. The sector has been de-licensed and enjoys 100 per cent FDI. With the aim to boost the manufacturing sector, the government has relaxed the excise duties on factory gate tax, capital goods, consumer durables and vehicles.

The Government of India is planning to merge 6 engineering consulting Public Sector Units (PSUs) to create a mega consultancy firm that can take up projects across sectors and compete with the likes of Bechtel of the US and domestic majors like Larsen & Toubro (L&T).

Road Ahead

The engineering sector is a growing market. Spending on engineering services is projected to increase to US$ 1.1 trillion by 2020.

PIHU SINGH (ME-3rd Year)

Hyperloop

We live in an age of unbelievable technological progress, yet in many areas of life, things don't seem to have changed all that much, and transportation is a woeful example of this. The roads are still lined with cars, the skies speckled with airliners.

The fantasy of futuristic transportation is very much alive right now as exemplified by a concept called the Hyperloop. While it's not as mind-shattering as a teleporter or as fun as a personal jetpack, the Hyperloop could revolutionize mass transit, shortening travel times on land and reducing environmental damage in the process.

The Hyperloop concept was proposed by billionaire inventor Elan Musk, CEO of the aerospace firm SpaceX and the guy behind Tesla.

Musk's Hyperloop consists of two massive tubes extending from San Francisco to Los Angeles. Pods carrying passengers would travel through the tubes at speeds topping out over 700 mph. For propulsion, magnetic accelerators will be planted along the length of the tube, propelling the pods forward.

Given the tight quarters in the tube, pressure buildup in front of the pod could be a problem. The tube needs a system to keep air from building up in this way. Musk's design recommends an air compressor on the front of the pod that will move air from the front to the tail, keeping it aloft and preventing pressure building up due to air displacement.

Conventional means of transportation (road, water, air, and rail) tend to be some mix of expensive, slow, and environmentally harmful. Road travel is particularly problematic, given carbon emissions and the fluctuating price of oil.

Rail travel is relatively energy efficient and offers the most environmentally friendly option, but is too slow and expensive to be massively adopted. At distances less than 900 miles, supersonic travel is unfeasible, as most of the journey would be spent ascending and descending (the slowest parts of a flight.) Given these issues, the Hyperloop aims to make a cost-effective, high speed transportation system for use at moderate distances. The Hyperloop tubes would have solar panels installed on the roof, allowing for a clean and self-powering system.

There are of course drawbacks. Most notably, moving through a tube at such high speeds precludes large turns or changes in elevation. As a result, the system is optimal for straightforward trips across relatively level terrain.

Realistically, the most important problem in getting any project off the ground is money, doubly so when talking about a public work. Even if one can produce an impressive blueprint, there are still issues of public approval, legislation, regulations, and contractors to worry about. Musk's white paper for the Hyperloop estimates the total cost could be kept under six billion dollars.

On January 30, 2016, the SpaceX Hyperloop design competition concluded. More than 100 prototype pod designs were submitted. According to the MIT team, the pod is lightweight and emphasizes speed and safety, including a fail-safe brake system. Whereas many Hyperloop designs use air jets to levitate, the MIT design uses two arrays of neodymium magnets to keep the pod aloft. Additional magnets inside the pod keep it stable as it races along the track.

In January 2017, the long-running SpaceX Hyperloop competition wrapped up with "Competition Weekend I," in which completed pods raced on the test track. A team from Delft University in the Netherlands took the top prize.

While SpaceX's contest was a good showcase for engineering students, the Hyperloop concept has also garnered interest from businessmen. Startups such asHyperloop One (formerly Hyperloop Technologies) and Hyperloop Transportation Technologies (HTT) are working on Hyperloop systems of their own, and what they lack in clever naming they make up for in ambition. Both companies are building their own test tracks, and HTT has recently announced a partnership with Oerlikon Leybold Vacuum, an engineering firm specializing in vacuum technology, and Aecom, an international corporation providing technical project support. The companies will receive stock options in exchange for their involvement.

January 2016 proved to be a big month for Hyperloop progress. HTT applied for a permit to begin construction on a test track along the I-5 freeway in Quay Valley, California. Meanwhile, Elon Musk's SpaceX, progenitor of the Hyperloop idea, partnered with Aecom to build its own test track in Hawthorne, California. With three test tracks currently in development, the Golden State is at the forefront of Hyperloop development.

It remains unclear whether commercial Hyperloop systems will ever be widely adopted. As the global population swells and the environment declines, however, better mass transit systems will become essential. Leonard Bernstein once claimed that great endeavors require two things: "a plan, and not quite enough time." The plan for the Hyperloop is there, but how much time do we have.

SIDDHIKA TRIPATHI (ME-3rd Year)

Research and Development vs India

The research ecosystem in India presents a significant opportunity for multinational corporations across the world due to its intellectual capital available in the country. Legions of Indian engineers working across the globe highlight the highly trained manpower available at competitive costs. Consequently, several MNCs have shifted or are shifting their research and development (R&D) base to India. These R&D bases either develop products to serve the local market or help the parent company overseas deliver new innovative generation of products faster to the markets across the world.

Market Size

India's Engineering R&D (ER&D) Globalization and Services market reached US$ 22.3 billion in 2016 and is set to rise to US$ 38 billion by 2020.

India accounted for 40 per cent (US$ 13.4 billion) of the total US$ 34 billion of globalised engineering and R&D in 2016.

India will likely get into the list of the top 25 nations in the Global Innovation Index, in the next 10 years.

Recent Investments and developments

Tata Motors has tied up with Microsoft for using its connected vehicle technology along with artificial intelligence (AI) capabilities to improve the in-car connected experience.

Robert Bosch Engineering and Business Solutions (RBEI) has inaugurated its new reliability testing laboratory in Naganathapura in Bangalore, build for US$ 3.5 million, and capable of testing Electronic Component Units (ECU) used in automobiles, aircrafts, home appliances and similar other systems.

Uber Technologies plans to make its Bengaluru technology centre a hub of product innovation for India as well as for global markets with a target of introducing new products on payments, vehicle intelligence and mapping.

Abbott Laboratories, a global drug maker based in US, plans to set up an innovation and development center (I&D) in Mumbai, which will help in developing new drug formulations, new indications, dosing, packaging and other differentiated offerings for Abott's global branded generics business.

The Tata Group has entered into collaborations with world's leading academic institutions, which include Harvard University, Yale University, the Indian Institute of Technology, Madras, and the Royal Society, United Kingdom, in order to fund research and development opportunities in those institutions.

The Government of India and the Government of the United Kingdom have signed an agreement to work together in the fields of Solar Energy and Nano Material Research, which is expected to yield high quality and high impact research outputs having industrial relevance, targeted towards addressing societal needs.

The Indian Space Research Organization (ISRO) has successfully launched 20 satellites and injected them into the required orbit, launching the maximum number of satellites in a single mission ever. The launch took place aboard the Polar Satellite Launch Vehicle (PSLV-C32) at the Satish Dhawan Space Centre in Sriharikota.

India is becoming a new innovation destination of choice, with Bengaluru been ranked fifth among the top ten destinations in the world to open innovation centers.

India's largest two wheeler manufacturer, Hero Motocorp has set up an integrated R&D facility with an investment of Rs 850 crore (US$ 126.74 million) on the outskirts of Jaipur.

The National Research Development Corporation (NRDC) has signed aMemorandum of Understand (MOU) with Indian Institute of Chemical Biology (IICB) which will give an impetus to the "Startup India" and "Make in India" missions of the Government of India by promoting entrepreneurships, incubation, Intellectual Property Rights (IPRs) and technology transfer.

Government Initiatives

Some of the major initiatives taken by the Government of India to promote R&D sector are:

The Union Cabinet has approved the MoU between United States Geological Survey (USGS) and Indian Space Research Organisation (ISRO) enabling ISRO to receive USGS's Landsat-7 & 8 in India and USGS to receive ISRO's Resourcesat-2 (AWiFS and LISS III) data of US region.

India and Israel have agreed to enhance the bilateral cooperation in science and technology in the next two years by providing US$ 1 million from each side to support new research and development (R&D) projects in the areas of big data analytics in healthcare and cyber security.

The Ministry of Environment, Forest and Climate Change (MoEFCC) has announced a R&D initiative to develop next generation sustainable refrigerant technologies as alternatives to the currently used refrigerant gases like hydrofluorocarbons (HFCs), in order to mitigate its impact on the ozone layer and climate.

The Union Cabinet has given an "in principle" clearance for the location of a Laser Interferometer Gravitational-Wave Observatory (LIGO) facility in India which will be the third in the world and will be set up and managed by the IndIGO Consortium (Indian Initiative in Gravitational-wave Observations).

A team of scientists from India and Bangladesh will conduct for the first time, joint marine research within Bangladesh's Exclusive Economic Zone (EEZ), which is expected to help in understanding climate change and monsoon patterns in India.

Road Ahead

With the government's support, the R&D sector in India is all set to witness some robust growth in the coming years. According to a study by management consulting firm Zinnov, engineering R&D market in India is estimated to grow at a CAGR of 14 per cent to reach US$ 42 billion by 2020.

India is also expected to witness strong growth in its agriculture and pharmaceutical sectors as the government is investing large sums to set up dedicated research centres for R&D in these sectors. The Indian IT industry is also expected to add to the development of the R&D sector.

PRASHANT TRIPATHI (ME-3rd Year)

Why Internet of Things is the next big Thing!

According to estimations by the McKinsey Global Institute, the Internet of Things will have a total economic impact of up to $11 trillion by 2025.

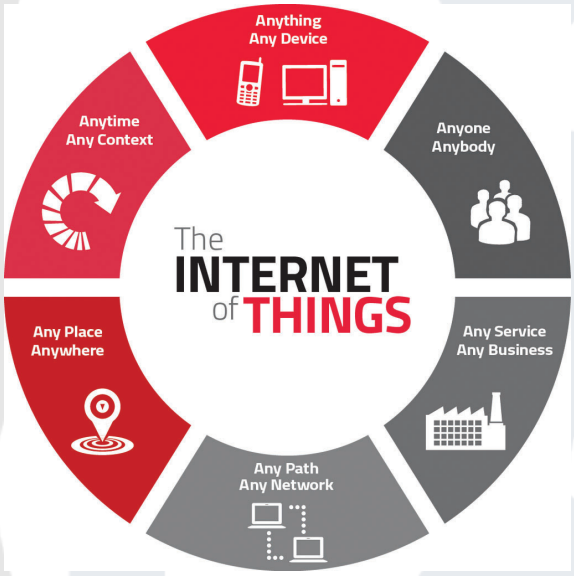
So what exactly is Internet of Things? Surveys suggest that most of the people still do not understand what does this term mean or what does it stand for and how it is going to affect the global market. First of all, what is it?

In an article on Today online, Bryan Ang explains IoT as "The Internet of Things (IoT) is simply the idea of machines communicating with machines to accomplish tasks without human intervention. On the not so exciting side, it's as simple as timing your lights and air-conditioning system using an app on your mobile phone. On the very intriguing flip side, we have driverless, autonomous cars."

Yes, you read that right. IoT basically means that the way you connect yourself to the internet and hence to various other people that you wish to connect with, the same pattern can be followed by connected devices. The basic idea is to create a grid of selected devices which can communicate with each other to make people's lives easier. Hence, the 'Internet' of 'Things'; just like people.

Why IoT?

According to an article published on Forbes.com, the analyst firm Gartner says that by 2020 there will be over 26 billion connected devices. This means the future is out there to shine down on us in a rapidly growing sector of the market which will change the way we live life. Imagine being stuck in traffic and worrying about your fridge out of groceries. But when you reach home, you see the home delivery of fresh veggies and ration waiting for you at the front door because your fridge sent an automatic refill update to your regular grocery store.



Or imagine your bedroom starts warming itself up with the heater before you enter the home and provides you a cozy haven? Too good to be true? No Sir, this is the time of the future.

Internet of Things aims at providing the futuristic perspective on life that we always wanted or dreamed of. With IoT, these things can become the reality very soon. One very popular example we can see of IoT can be that of Uber and Spotify in which your booked Uber syncs its music player with your Spotify account and your songs start playing the moment you get in your car.

This is revolutionary, but that doesn't mean it comes without its drawbacks. Scientists and marketers alike are pondering over the various points that can prove to be a risk for this technology. There are potential threats of the security breach when everything is digitally connected to every other thing. Not to forget, the amount of data generated by these devices needs proper channelization to make sense of it and that is a herculean task.

Despite these potential drawbacks, IoT is here to stay and become the best bet in the market pretty soon. A lot of people want in on this, but the clear picture might take some time to fall in place.

KAJAL LODHI (ME-3rd Year)

Four Technologies for Advancing Remanufacturing

Recycling is a nice idea. But the energy burned shipping a used material, melting it down, and reforming it, keeps it from being a perfectly sustainable system. If we could cut out that middle part, and simply fix products, and return them to the condition they were in when new and thereby double or triple their lifespan, we'd be doing the planet a lot more good.

Such rejuvenating of a product, and reissuing a good-as-new warranty, is a recent practice known as remanufacturing. And it doesn't just help the planet. Manufacturers and end users profit as well. "If we can remanufacture products, we can save huge in terms of material and energy costs," says Nicholas Yeo, technical director at Singapore's Advanced Remanufacturing and Technology Centre. When an excavator costs hundreds of thousands of dollars, a mining company doesn't want to have to buy a new one every time a part breaks, even if it's a major part. By remanufacturing it, Caterpillar will make money, and the mining company will save bundles. That it's refurbished, and not actually knew, doesn't bother them in the slightest. "They don't care. They know the business model works for them."

The remanufacturing movement is already underway for large, high-end products like airplanes and excavators. They owe their ability to do so to recent advanced manufacturing techniques. Without them, remanufacturing simply wouldn't be possible. And as these technologies improve, remanufacturing will become viable for more and more industries. Here Yeo points us to four technologies that are aiding the expansion of remanufacturing.

1) Laser Metal Deposition

Laser Metal Deposition is essentially a 3D printing technology. It uses a laser to melt powder or wire, be it titanium, nickel, cobalt, or a steel alloy, at a focal point into any shape on any surface. It can easily fill in a pitted, grooved, or otherwise worn surface, or entirely coat one, if need be. It allows parts to be fixed that would have previously required too much heat. "It isn't new," says Yeo. "Twenty years ago, GE was the first to use it. It didn't take off because of economy of scale, but right now things are coming down in cost."

2) Robotic High-Pressure Cold Spray

Where laser metal deposition better controls the heat used to rebuild a surface, Robotic High-Pressure Cold Spray, as the name implies, abandons heat altogether. Cold spray technology fires tiny particles in a high-pressure air jet, at supersonic speeds at a substrate. They move so fast that they adhere to the surface without heat. "The beauty of it, is that it easily deposits five to ten kilograms in a couple of minutes literally flying onto the part," says Yeo. Marine and oil and gas companies can now salvage a five ton piece that previously would have been scrapped. The technology has allowed the U.S. Air Force (an early adopter) to repair sand-pitted helicopters that would have had otherwise been out of service.

3) Automated Adaptive Machining for Parts Repair

"If you 3D print 10 parts, you get 10 different distortions," says Yeo. That doesn't work too well for crucial, highly specified parts in say, an airplane. That's where Automated Adaptive Machining for Parts Repair comes into play. With advanced scanning technology that scans at the micron level the injured part can be compared to the original. Then a tool path is generated which returns the part to its near-virgin state. In short, it removes the human element from repair.

4) Design for Remanufacturing

Design for manufacturing is certainly a useful concept, keeping costs down and production as efficient as possible by imagining the manufacturing process from the beginning of development. But Design for Remanufacturing takes it one step further. It asks designers to imagine not only how a product will be built, but how it will be rebuilt. With remanufacturing in mind, designers may change the materials, and coatings they chose, as well as the accessibility and layout of parts. Soon software will help designers make such an analysis. But first, of course, they have to know about it. In a sense, design for remanufacturing is an evangelical idea: Get the engineers of the world thinking about it, and remanufacturing will have a bigger chance of reducing waste.

LOVE ISHAN (ME-3rd Year)

The next Era of Drones will be defined by "Swarms"

What do you picture when you think of a drone? A solitary, remote-controlled toy with propellers, or perhaps a large, unmanned military aircraft? Soon, those images could be quite different: drones are becoming smaller, cheaper to make, can zoom around on their own, and gather in groups of hundreds, even thousands, to fly like a flock of birds.

They're called swarms get enough of them together, and they could outpace humans in many ways; they could save your life, or they could be a deadly collaborative force on the battlefield.

Why do drone swarms matter?

For starters, on the battlefield they could outperform weapons and technology that militaries have used for decades. Think about it: in a congested city, teams of tiny quadrotors could buzz around to gather intelligence. Tank battalions could be overrun by miniature attack drones diving in from all directions at once. At sea, thousands of small drones could sweep in to attack a warship; many might be shot down, but others might make it through, destroying radar and leaving the ship defenceless.

A drone swarm can lose dozens of members and keep going

Plus there is no leader or commander in a swarm; the swarm is a self-organizing system in which all the elements are equal. Swarming allows drones to search an area efficiently, or fly together without colliding. And only one operator is needed to control the whole swarm.

Swarms are tough. One missile can bring down an aircraft, but a swarm can lose dozens of members and keep going. Air defenses with a limited supply of missiles can be overwhelmed by enough opponents.

But drones will soon be swarming in many other situations too, from rock concerts to barnyards.

So I could start seeing swarms of drones in everyday life?

Indeed. In fact, you probably already have.

Earlier this year, 300 drones assembled into an American flag in Lady Gaga's Super Bowl halftime show, illuminating the night sky. And Intel is promoting their Shooting Star swarms as an alternative to fireworks. Chinese company eHang claimed the record for the biggest swarm, in a spectacular New Year show in which 1,000 drones formed a map of China and the Chinese character for 'blessings'.

Swarms could also check pipelines, chimneys, power lines and industrial plants cheaply and easily.

Drone swarms may even have a place on the farm. They can spot plant disease and help manage water use, or spray pesticides and herbicides only in the exact spot needed, all working cooperatively to cover the area and fill in gaps.

Nikolaos Papanikolopoulos of the Centre for Distributed Robotics at the University of Minnesota is working on solar-powered drones that will ultimately work together to survey large swathes of farmland at low cost.

"Their roles may include early detection of nitrogen deficiency, plant disease, and proper management of water resources," says Papanikolopoulos.

Which militaries are developing swarms and why?

There's more than one superpower pursuing swarm technology.

The US, for example, recently launched 103 small 'Perdix' drones from F/A-18 jets. These weigh a few hundred grams, and are released from dispensers normally used for flares. The 3D-printed Perdix drones are disposable, and are intended to suppress enemy air defenses by acting as decoys or jammers or by locating radar so they can be destroyed.

The US Navy also aims to develop a swarm of drones that costs less than a missile. It's developing software that allows sub-swarms to be split off for particular missions, or fresh drones to join the swarm seamlessly.

Another player is China, long the leader in small consumer drones. Chinese company DJI alone has around 70% of the global market, and now the Chinese military is seeing what they can do with this new technology. At an aerospace exhibition in December, state-owned China Electronics Technology Group Corporation (CETC) displayed a video of nearly 70 drones flying together. The drones flew in formation and collaborated in an intelligence-gathering mission. Those drones could also cooperate in a 'saturation attack' on an enemy missile launcher. They all dive in to attack simultaneously from different directions far too many at once for the defenders to stop.

Perhaps the most ambitious plan is the US Marine Corps' project for a range of drones for use on land, sea and air. These might be the first wave to hit the beach ahead of the humans, scouting, locating enemy positions, and possibly attacking them. The swarm may also provide defence against swarms of enemy drones. To explore this angle, the Corps is setting up swarm-versus-swarm wargames. (There have already been drones designed to capture other drones.)

These little drones could be spies, scouts, or intel-gatherers, too. The Defense Advanced Research Projects Agency (Darpa), the Pentagon's advanced science agency, envisages foot soldiers having their own swarm for reconnaissance, especially in urban areas and inside buildings.

"Two hundred and fifty small air vehicles have to occupy six city blocks," says Stephen Crampton of Swarm Systems. The swarms could potentially "self-organise in sub-swarms to deliver useful information, such as 'tell us about threats to our position'."

They all dive in to attack simultaneously from different directions far too many at once for the defenders to stop

So, what does the future hold for swarming drones?

Swarming drone technology is still very much in their infancy. But it's evolving fast.

In theory, swarms can defeat any existing weapon, and can deliver enough precision firepower to cause destruction on a massive scale. Their impact could rival the development of the machine-gun: anyone without their own drone swarm faces rapid defeat on the battlefield. Warfare may then become simply a matter of who has the biggest and best drone swarms.

But the battlefield is far from the only place we could see swarms. In fact, they could one day live alongside us.

In the long term, if researchers at Harvard's Wyss Institute are right, then small swarming drones might become as much a part of our environment as insects. Their RoboBee project is developing tiny drones smaller than a paper clip and weighing a tenth of a gram. Thousands of RoboBees could be used for weather monitoring, surveillance or even crop pollination as the number of honey bees declines.

SHIVAG AGRAHARI (EEE-2nd Year)

Top 5 Trends in Materials Engineering

Assembled marvels abound and astound. But the fundamental elements that make up any engineered piece of technology, be it a mobile gizmo or an arm on a Mars rover, are often just as marvelous as the whole of which they are a part. Here, we examine five areas that are likely to have a radical impact on the products of the future.

1. Atom Thick

Graphite's nice. You can write with it, or make squash rackets. But it's even cooler when it's wickedly thin. In 2004, researchers used Scotch tape to pull up layer after layer until there was only a single-atom layer left. Since then, others have come up with more efficient and more advanced methods for making atom-thick sheets, called graphene. The honeycomb lattice of carbon-to-carbon bonds has some pretty remarkable properties. It's flawless, light, and strong. It's flexible, can be bent into any shape, can carry a charge, and it won't oxidize.

The potential applications are many. "People are putting graphene in polymers, ceramics, and metals," says Nikhil A. Koratkar, professor of mechanical, aerospace, and nuclear engineering and materials science and engineering at Rensselaer Polytechnic Institute. "Researchers are trying to make gas sensors that can sense down to very low concentrations at the parts per trillion level." They're also using graphene to create coatings that would make any metal rust-free, windows that would darken themselves when the sun is at its strongest, anodes for lithium-ion batteries, flexible solar cells, membranes for fuel cells, and membranes that would remove salt from water.

2. Electric Ink

3-D printing is upending many a field with the speed at which a single part can be dreamed up and created. But right now, the things that come out of a 3-D printer are largely inert. "There is vast interest in 3-D printing, but most of the commercial printers developed to date are used to produce plastic prototypes," says Jennifer Lewis, a professor at the School of Engineering and Applied Sciences at the Wyss Institute of Biologically Inspired Engineering. "Conductive inks would enable the integration of electrical circuits not only on planar substrates, but within 3-D printed objects. One can imagine 'wiring' up 3-D objects to create an 'internet of things.'" The ink would allow the masses to print their own circuit boards. Antennas, solar cells, LEDs, and other electronics could come hot from the printer when and where they are wanted.

3. The Heroics of Multiferroics

Magnetism and ferroelectricity usually don't show up in the same material at the same time. Certain materials, though, particularly metal oxides, can exhibit both. An electric field will alter the magnetic state, and a magnetic field can alter the electrical polarization. "This allows us to store data using an electric field, which is much easier to generate than a magnetic field," says Caroline Ross, a professor in the Department of Materials Science and Engineering at MIT. But with the magnetic state still present, data can still be stored magnetically. "Additionally, the discovery that electric currents can flip the magnetization of small structures, or translate magnetic domain walls, is exciting for data storage and there are already 'spin-torque switching' magnetic memory cells being manufactured." says Ross.

4. The Nano Anode

"A major challenge in improving the energy density of lithium-ion batteries is the development of electrode materials increased lithium capacity," says Jeffrey Fergus, professor at the Materials Research and Education Center, Auburn University. The search has long been on for a better anode that will "maintain that high capacity during cycling and in a wide range of environmental conditions."

Silicon has been a contender for some time, thanks to the fact that it's cheap and highly conductive they have a much larger capacity than the standard carbon ones in use today. Unfortunately, silicon expands when lithium hits it. "This expansion can generate large stresses, so creative geometries or combinations of materials are needed to accommodate these large strains," says Fergus. Researchers at the University of Southern California may have found both. They used silicon spheres mixed with boron and etched pores onto them. The result is a battery that holds three times the energy and can be charged in ten minutes. So what's holding them back from getting into electric cars? So far, the batteries are good for only 200 or so cycles.

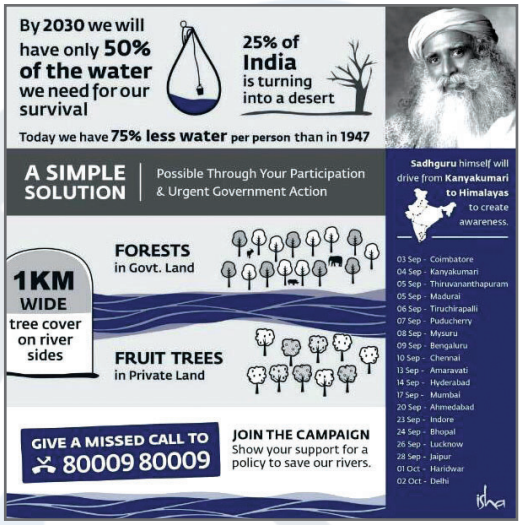
5. Spinning Smoke

Talk of nanotubes has been batted about for years. The promise of an incredibly strong, light thread was always just around the corner but never realized. But last year researchers at MIT came out with their nanotube pencil. With a tip of compressed nanotubes, it allows the user to sketch nanotubes wherever he might want them. Great for making sensors, but not quite what we need to lift things into, say, space.

Now researchers at Rice University have finally managed to make a nanotube thread. It's long enough and flexible enough that they've wrapped fifty meters of it around a spool. The trick was putting nanotubes in chlorosulfonic acid and drawing them out through tiny holes. The resulting thread is ten times as strong as steel. And it's as conductive as copper. "Spinning smoke" is what David Burleigh, a professor in the Materials and Metallurgical department at New Mexico Tech, calls it. "In theory we should be able to build the space elevator, an elevator to a geosynchronous space station."

RAJAT KUMAR (ME-Final Year)

Rivers of India- On verge of a Crisis!



Rivers have been the lifelines of this nation, and every nation in a way, if we look at it like that. We are a culture, a civilization that grew out of a river bank. Civilizations of Mohenjo-Daro and Harappa grew along a river and died when rivers shifted course. All rivers in India are on a dangerous level of depletion. If necessary action is not taken immediately, then in another 15 to 20 years, all the rivers will become seasonal, that is they will not remain perennial. Already, Kaveri does not touch the ocean four months, leaving a dry landline of 173kilometers. When there are rains it floods otherwise there is nothing.

The water availability per capita has come down to 25% of what it was in 1947, at the time of independence. Many environmentalists and social activists have worked towards the cause, but not to much effect. Governments have drained huge amounts of funds in cleaning Ganga. Due to loans and uncertainty of rains leading to crop failure, 5642 farmers in India committed suicide in 2014. Those who provide life-nourishing of food to us are taking their own lives, we can't just sit blindly and think nothing is happening. If the current practices continue, we will have only 50% of water we need for our survival by 2030. Already, 25% of India is turning into a desert .The organic content of top soil has come down to 0.05% in Punjab whereas it should be atleast 2% for any soil to qualify as a non-desert soil. If you fly over India, you can see the entire country looks like a brown desert.

To raise awareness to this crisis a recent campaign has been started by Sadhguru, a visionary and a humanitarian, an environmentalist, Padma Vibhushan awardee, and most importantly, a mystic, his unfailing wit has made him a speaker of international renown. The Isha foundation founded by Sadhguru has started a nationwide campaign "Rally for Rivers", to raise awareness that our rivers are dying. He is going to personally drive from Kanyakumari to Himalayan foothills, holding 21 major events, with the rally passing through 18 states. They have also signed an MOU with the Maharashtra government. CMs of all the states concerned have agreed to fully support the Rally. Isha Foundation has also made a record for planting 30 million, or 3 crore, saplings. They are also a recipient of the prestigious Indira Gandhi Paryavaran Puraskar.

The rally will be flagged off on 3rdof September from Isha Yoga Centre, Coimbatore and culminate on 2nd of October in New Delhi, where Isha Foundation will present a documentation to the government for urgent policy making . The policy is as follows, 1 km on either side of river bank, there should be plantation, no ploughing. The farmers should do horticulture, grow medicinal plants. This will increase their income by 3 to 8 times in 4 to 6 years. Until the trees grow government must give them subsidies. On Government land, there must be native forests. Sadhguru says that this can be achieved in only 10% cost of the present project of linking all the rivers.

The need of the hour is to understand the problem, acknowledge it and work towards a solution. A simple solution has been proposed above. To support this policy , give a missed call on 80009 80009. Let us give a beautiful land to live for the future generations of this country. Otherwise, we will create a society where water will be a priority over humanity. Let our children not look at us with an eye of hatred and disdain. I support the Rally for Rivers. Many famous celebrities have supported. You support it too. Give a missed call on 8000980009, Now!

RAHUL SATYAWALI (ME-3rd Year)

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