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MECHZINE

GET TO KNOW THE WORLD !

R.V.R. & J.C. COLLEGE OF ENGINEERING, GUNTUR, A.P.
KNOWLEDGE IS POWER
Estd 1985

A STUDENT INITIATIVE TECHNICAL MAGAZINE

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CONTENTS :

Contact Information

Mail us at
rvrmechzine@gmail.com

Visit us at
www.facebook.com/rvrmechzine

Alumni Article

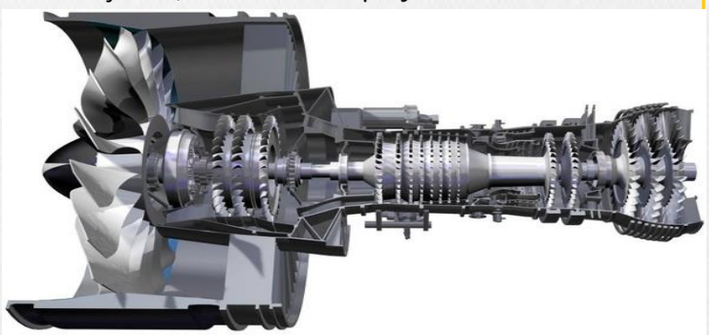
The Aviation Revolution

Babi Reddy Ambati, Indian Railways

It was believed that the invention of potter's wheel marked the beginning of the field of transportation which happened in Mesopotamia around 3000BC. Later on the world has witnessed various mean of transport let it be by air, water, land. Speaking the next gen transportation, people often quote about the Hyperloop whose existence in near future is quite hypothetical. Trying to dig deeper into this now myth, I've found about an invention, which totally changed the course of aviation. This article's is centred on the Gear turbo fan. Though the Gear turbo fan concept is quite older succeeding the Wright brother's times, the real revolution it brought in was after the Pratt and Whitney GTF. Pratt and Whitney geared turbo fan engine is regular Turbo fan with a planetary gearbox and fewer turbine stages. It uses the reduction planetary gearbox to reduce the speed of fan in order to make the turbine run faster so as to make every rotating part to spin at the most efficient speed possible. Due to the reduction in fan speed it can move more air through the bypass duct to increase the bypass ratio of a typical jet engine of 5:1 to around 12:1. Also now, because the fan tips spin at subsonic speed, the shockwave generated is very less so, it make less noise almost 75% than regular Turbo fan and also fuel efficient. All thanks to the simple gearbox.

Development:

P&W first attempted to build a production geared turbofan starting around 1998, with the PW8000, targeted for the 25,000–35,000 lbf (110–160 kN) range. This was an upgrade of the existing PW6000 that replaced the fan section with a gear box and a new single-stage fan, and aimed for 8–10% lower operating costs, or $600,000 per aircraft annually. The PW8000 had an 11:1 bypass ratio (twice that of the V2500), a 40:1 overall pressure ratio, and 13 compressor stages instead of the 22 in the V2500 for similar thrusts. Preliminary development was to end by June 1, the first test for 10 months later, and certification 20 months after, for $400 million. Pratt had tested gearboxes for 950 hours for $350 million in the previous decade and aimed for 99.5% efficiency. The ADP gearbox was 30% more powerful and the reversing pitch fan was not retained for the PW8000. Pratt was to control 60% of the program, shared with IAE partners MTU and FiatAvio but not Rolls-Royce, and possibly with Volvo and MHI. After several years, the PW8000 project was abandoned.



Soon afterwards the ATFI project appeared, using a PW308 core but with a new gearbox and a single-stage fan. It had its first run on March 16, 2001. This led to the Geared Turbofan (GTF) program, which was based around a newly designed core jointly developed with German MTU Aero Engines. In addition to the geared turbofan, the initial designs included a variable-area fan nozzle (VAFN), which allows improvements in propulsive efficiency across a range of the flight envelope. However, the VAFN has since been dropped from production designs due to high system weight. The first ground test of the Pratt & Whitney geared turbofan was performed in November 2007 at West Palm Beach, Florida. In July 2008, the GTF was renamed PW1000G, the first in a new line of "PurePower" engines. Pratt & Whitney claims the PW1000G is 16% more fuel efficient than current engines used on regional jets and single-aisle jets, as well as being up to 75% quieter

Design:

By putting a 3:1 gearbox between the fan and the low-pressure spool, each spins at its optimal speed: 4,000–5,000 RPM for the fan and 12,000–15,000 RPM for the spool, the high-pressure spool spinning at more than 20,000 RPM. The 30,000-horsepower (22,000-kilowatt) gearbox is designed as a lifetime item with no scheduled maintenance other than changing oil. The A320 PW1100G fan has 20 blades, down from 36 in the CFM56-5B. As the higher bypass ratio and gear leverage a higher propulsive efficiency, there is less need for a high performance engine core than the CFM LEAP, leaving a larger fuel burn gain margin of 5–7% over the next decade, averaging 1% per year combined with gear ratio tweaks.[36] It has up to 25,000 cycles LLPs, 25% better than others at 20,000 cycles, reducing maintenance costs, and the fan gear has no limit. The family of engines generates 15,000 to 33,000 lbf (67 to 147 kN) of thrust. It uses gearboxes rated between 16,000 hp (12,000 kW) and 32,000 hp (24,000 kW). The PW1431G variant for the Irkut MC-21 has a compression ratio of 42, and it has a specific fuel consumption (SFC) at cruise of 0.52–0.53 kg/kgf-thrust/hr.

UPCOMING
Guest Lectures/Webinars in the Department

- Guest Lecture on **"Design Thinking"** organized by RAJMEA on 31st May, 2020 (**Guest speaker - IETC Team, Indo European Technology Center)**)
- Guest Lecture on **"Career Opportunities After Engineering"** organized by RAJMEA on 7th Jun, 2020 (**Guest speaker - Krishna Malladi, Project Manager, AUDI AG, Germany, Vamsi Krishna Dasari, Quality Manager, Air Bus Group, LSSBB Professional Trainer)**
- Guest Lecture on **"Automotive Trends"** organized by RAJMEA on 27th Jun,2020 (**Guest speaker - Murugan Ganesan R&D Scientist, MAN AG, Germany)**

Compressor used

Fan Drive Gear System

Turbine

Applications:

- Airbus A320neo: PW1100G
- Irkut MC-21: PW1400G
- Airbus A220: PW1500G(exclusive)
- Embraer E-Jet E2 family : PW1700G & PW1900G (exclusive)
- Mitsubishi Regional Jet: PW1200G(exclusive)
- It has been proposed for the Sukhoi Superjet 130, and the Rekkof Aircraft F-120NG.

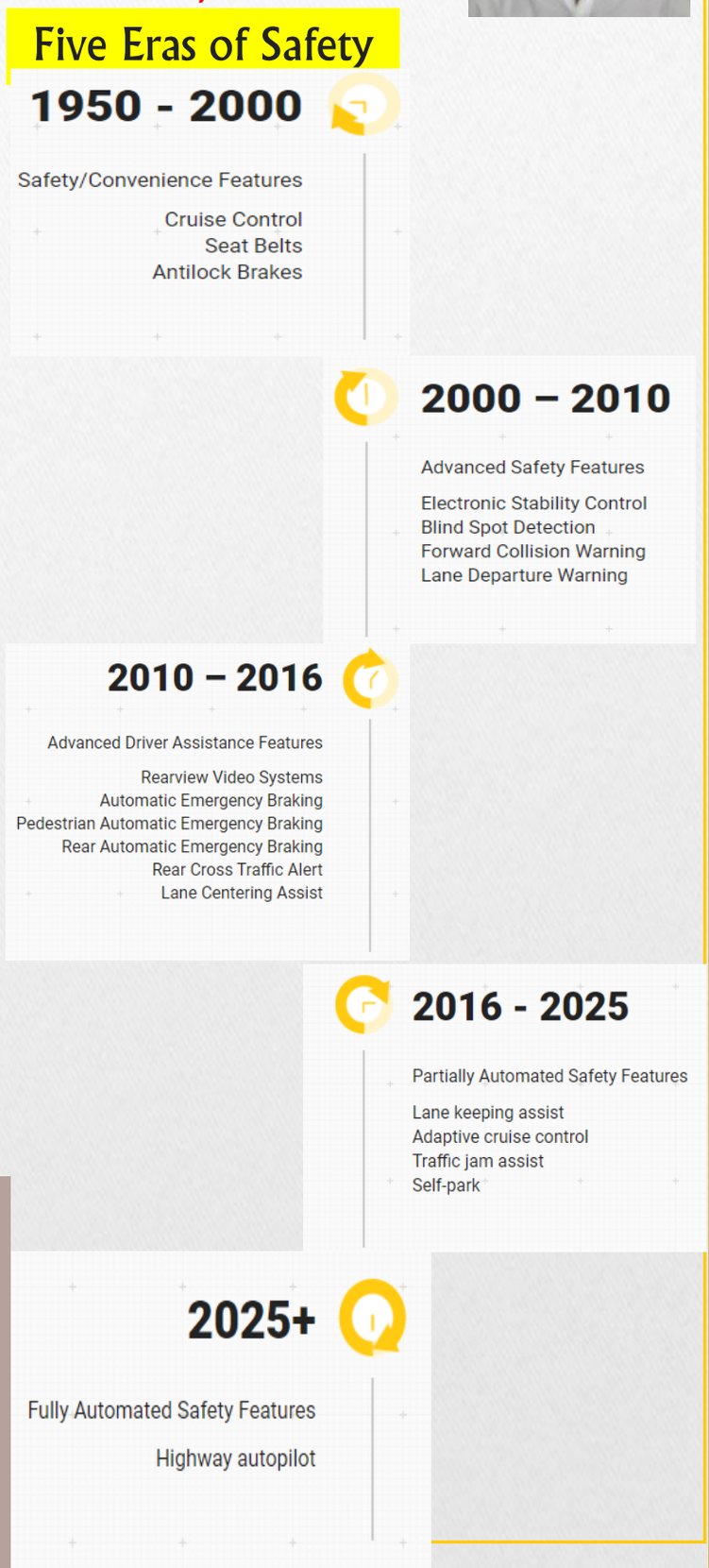
Student Article

Autonomous Driving
Can we turn the vision into reality?

- G.Kundan, Y17ME063

The vehicle of tomorrow: Shaping a new reality

Autonomous driving is no longer a dream. The automotive industry is evolving the vehicle to take more responsibility over maneuvers. Convincing drivers to hand over control requires significant trust in the vehicle's ability to plan the right maneuvers and strategies. The safest, most efficient approach is to have HD maps and sensors work together in unison for the best solution. Highly precise and dynamic maps have been identified as a key element to take a solution from reactive to proactive, for a more comfortable experience. HERE aims to significantly influence driver acceptance and the progression toward fully automated vehicles. Driver assistance technologies in today's motor vehicles are already helping to save lives and prevent injuries. A number of today's new motor vehicles have technology that helps drivers avoid drifting into adjacent lanes or making unsafe lane changes, or that warns drivers of other vehicles behind them when they are backing up, or that brakes automatically if a vehicle ahead of them stops or slows suddenly, among other things. These and other safety technologies use a combination of hardware (sensors, cameras, and radar) and software to help vehicles identify certain safety risks so they can warn the driver to act to avoid a crash. The continuing evolution of automotive technology aims to deliver even greater safety benefits and – one day – deliver automated driving systems (ADS) that can handle the whole task of driving when we don't want to or can't do it ourselves.



The Road to Full Automation

Fully autonomous cars and trucks that drive us instead of us driving them will become a reality. These self-driving vehicles ultimately will integrate onto roadways by progressing through six levels of driver assistance technology advancements in the coming years. This includes everything from no automation (where a fully engaged driver is required at all times), to full autonomy (where an automated vehicle operates independently, without a human driver)

Increases safety

Enables intelligent proactive maneuver planning for vehicles by helping them know when and how to make the safest choices with Live Map.

Builds trust

Live Map provides reliable, precise data giving more transparency about the environment for the vehicle to make safer decisions.

Student Article

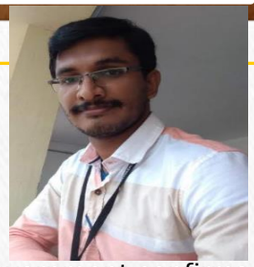
Biodiesel Production from Waste Cooking Oil by Using an Ultrasonic Tubular Reactor

- MV Thulasi, Y17ME100

The aim is to find an optimum synthesis biodiesel from waste cooking oil (WCO) using an ultrasonic tubular reactor. The experimental studies explored the variations in reaction time, molar ratio WCO to methanol (MeOH), amount of catalyst, the frequency of ultrasonic and output power ultrasonic on the ester contents. Comparisons of type ultrasonic and also the mechanical stirring method based on time reaction were investigated. The optimum results of the biodiesel process is the reaction time of 5 minute, NaOH catalyst 1%wt of WCO, molar ratio WCO to MeOH of 1:6, frequency ultrasonic of 20 kHz and output power ultrasonic of 650 W. The reaction time reduced 12-24 times compared to both of method and the yield of ester contents was obtained at 96.54%wt

How Robotics is Shaping India's Future?

- Y.N.V.SaiRam, Assistant Professor



Robotics will soon play a vital role in the "Make in India" initiative to attract global manufacturers to invest in the country. All thanks to the veritable powerhouse of robotics talent, India poses. Robotics play a big part nowadays in many areas of different industries, using such companies to help transform their manufacturing and output to assist in elevating their business. At present, the entire population and their day to day lives revolve around the Internet. From shopping to studying or planning a vacation, everything can happen in just a few clicks via smartphones or laptops. A decade ago, no one would have imagined, such as digital life; the same goes for the robotics. Its real talent and power waits to advance many field interests.

The Bigger Picture

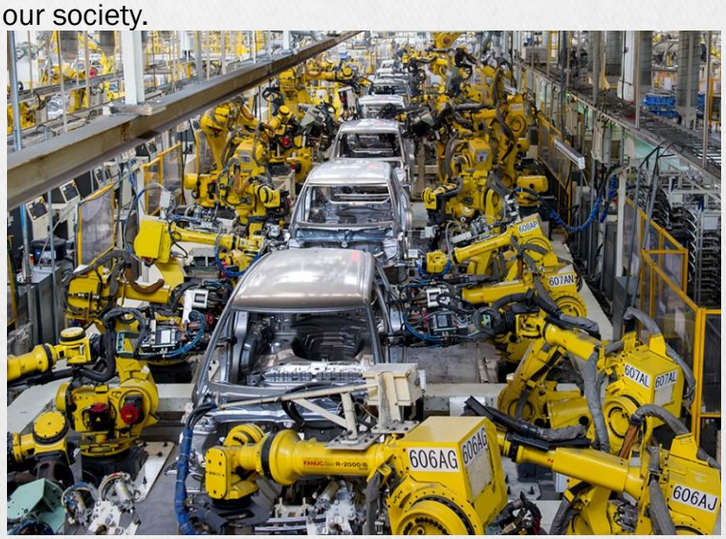
A robot can assist you, communicate with you, and potentially replace you if needed. Paired up with artificial intelligence, machine learning, computing, and the right software implementation, robotics can create a customized machine that can do anything. Years ago, the computing speed and AI weren't able to match robots' speed or keep up with what robotics was envisioned to create. Fortunately, the supplemental technologies, upgradation in the educational franchise in India, and robotics training in Pune will make it possible for robots to become what they were meant for in the past.

It is the Future. It is the Present.

Be it your home, schools, colleges, malls, or manufacturing facility, robots are everywhere, in every section of the society. Warehouse jobs that are risky and dangerous for men have now been replaced with robotic machines. The Indian government confirms that warehouse automation is projected to grow at a CAGR of 10-12%.

The Employment Scope in Robotics

Unemployment is the pressing issue for Indians, and with the inclusion of robotics technology, many jobs can shrink the employment graph. The bright side is robotics will create more golden opportunities for entrepreneurs and startup culture booming in India. Robotics is not just going to change our lives; it will expand the horizon of development, luxury, and necessities. In no time, it has already captured the leading sectors such as manufacturing, pharmaceutical, packaging, FMCG, and inspection. Some of the most promising areas are education, defense, and transportation. Experts believe that it is inevitable for robotics to become an essential part of our society.



Final thoughts

India is at the forefront of manufacturing and production. Companies with advanced and automated technology will help in meeting the global demands and set a new global standard under the "Make in India" initiative. Thus, in the coming years, there can be a massive surge in the adoption of robotics technology. India First Robotics is stepping forward to train the young minds in the booming robotics industry. We offer the best training program, fieldwork, live projects, and 3d printing in Pune. To learn more or enroll in our institution, feel free to get in touch with our experts to kick-start a bright career in robotics.

Guide to your world of robotics: PICK !

PICK

The vision processing solution that uses deep-learning to enable building and de-palletizing of mixed-SKU pallets. The Pick system integrates high resolution 3D and 2D sensing to accurately locate a wide variety of boxes in challenging environments. Pick's vision processing is extremely fast, minimizing robot dwell times and maximizing pick rates.

TECHNOLOGY:

AUTONOMOUS: Pick's deep learning algorithm identifies box locations and sizes, while its advanced motion planning creates paths for de palletizing.

PERCEPTION: 3D + 2D

FAST: Pick interleaves vision processing and motion execution to send commands to pick boxes quickly and effectively. Pick is easy to configure, minimizing integration time.

PICK RATE: Up to 720 boxes/hr

ADAPTABLE: Pick can locate many types of boxes, including those with printed graphics, different colors, reflective tape, straps or bands, and asymmetric flaps. It's also compatible with non-rectangular boxes and boxes with holes. Pick integrates with most industrial robot arms and has been deployed in a variety of challenging lighting conditions.

BOX SIZES: 6x6" to 48" L

BOX TYPES: Varied

BENEFITS:

Single or Mixed SKU: Pick enables box unloading from both single and mixed-SKU pallets. Pick is the only mixed-SKU robotic de palletizing solution currently in production in both the US and Japan.

Multiple Pallet Sizes: Pick works with a range of pallet sizes, including standard 48" x 40" and 48" x 48", 1100mm x 1100mm, and custom sizes.

Controlled Box Placement: Pick automatically sends commands to orient all boxes on the conveyor along their length. Pick also enables careful placement of more fragile boxes on roller conveyor belts using an additional sensor.

Mech Mantra 2020

3D Printing Materials

- Ameen Inturi

The materials available for 3D printing have come a long way since the early days of the technology. There is now a wide variety of different material types that are supplied in different states (powder, filament, pellets, granules, resin etc). Specific materials are now generally developed for specific platforms performing dedicated applications (an example would be the dental sector) with material properties that more precisely suit the application. However, there are now way too many proprietary materials from the many different 3D printer vendors to cover them all here. Instead, this article will look at the most popular types of material in a more generic way. And also a couple of materials that stand out.

Plastics:

Nylon, or Polyamide, is commonly used in powder form with the sintering process or in filament form with the FDM process. It is a strong, flexible and durable plastic material that has proved reliable for 3D printing. It is naturally white in colour but it can be coloured — pre- or post-printing. This material can also be combined (in powder format) with powdered aluminium to produce another common 3D printing material for sintering — Alumide. ABS is another common plastic used for 3D printing, and is widely used on the entry-level FDM 3D printers in filament form. It is a particularly strong plastic and comes in a wide range of colours. PLA is a bio-degradable plastic material that has gained traction with 3D printing for this very reason. It can be utilized in resin format for DLP/SL processes as well as in filament form for the FDM process.

Metals

A growing number of metals and metal composites are used for industrial grade 3D printing. Two of the most common are aluminium and cobalt derivatives. One of the strongest and therefore most commonly used metals for 3D printing is Stainless Steel in powder form for the sintering/melting/EBM processes. It is naturally silver, but can be plated with other materials to give a gold or bronze effect. In the last couple of years Gold and Silver have been added to the range of metal materials that can be 3D printed directly, with obvious applications across the jewellery sector. These are both very strong materials and are processed in powder form. Titanium is one of the strongest possible metal materials and has been used for 3D printing industrial applications for some time. Supplied in powder form, it can be used for the sintering/melting/EBM processes.

Ceramics

Ceramics are a relatively new group of materials that can be used for 3D printing with various levels of success. The particular thing to note with these materials is that, post printing, the ceramic parts need to undergo the same processes as any ceramic part made using traditional methods of production — namely firing and glazing.

Paper

Standard A4 copier paper is a 3D printing material employed by the proprietary SDL process supplied by Mcor Technologies. The company operates a notably different business model to other 3D printing vendors, whereby the capital outlay for the machine is in the mid-range, but the emphasis is very much on an easily obtainable, cost-effective material supply, that can be bought locally. 3D printed models made with paper are safe, environmentally friendly, and easily recyclable and require no post-processing.

Bio Materials

There is a huge amount of research being conducted into the potential of 3D printing bio materials for a host of medical (and other) applications. Living tissue is being investigated at a number of leading institutions with a view to developing applications that include printing human organs for transplant, as well as external tissues for replacement body parts. Other research in this area is focused on developing food stuffs — meat being the prime example.

Food

Experiments with extruders for 3D printing food substances has increased dramatically over the last couple of years. Chocolate is the most common (and desirable). There are also printers that work with sugar and some experiments with pasta and meat. Looking to the future, research is being undertaken, to utilize 3D printing technology to produce finely balanced whole meals. Up to 140 different Digital Materials can be realized from combining the existing primary materials in different ways.

Iron Pillar of Delhi: Why the Pillar doesn't Rust ... Solving the Mystery

The iron itself has a high level of phosphorus; when that is combined with the iron oxides as the weather goes from wet to dry, the film is formed. The smiths of the time did not add lime as people do today, and they used high phosphorus wood, which is why the mineral levels are so high. The theory of how the processing, the structure, and the properties of the iron affect the pillar is called the "Mixed Potential Theory." Another mystery is about why the pillar hasn't rusted away. There are two main theories about this. The Indian investigators favor the first concerns the materials used and this theory. The second is that it doesn't rust due to its surrounding environment; the foreign investigators favor this idea. From the scientific analysis, one can see that the pillar was created by forge welding of wrought iron. It is thought that there is a passive protective film on the iron caused by the particles and minerals in its structure. Surprisingly, the rust-resisting pillar is not the only one of its kind. Other large and ancient Indian artifacts having the same properties are found at Mandu, Dhar, and Mount Abu. There are also few cannons that show the same rust-free properties. The technology and skill of the ancient metallurgists of India exceed the skills and abilities today.

Fun Zone

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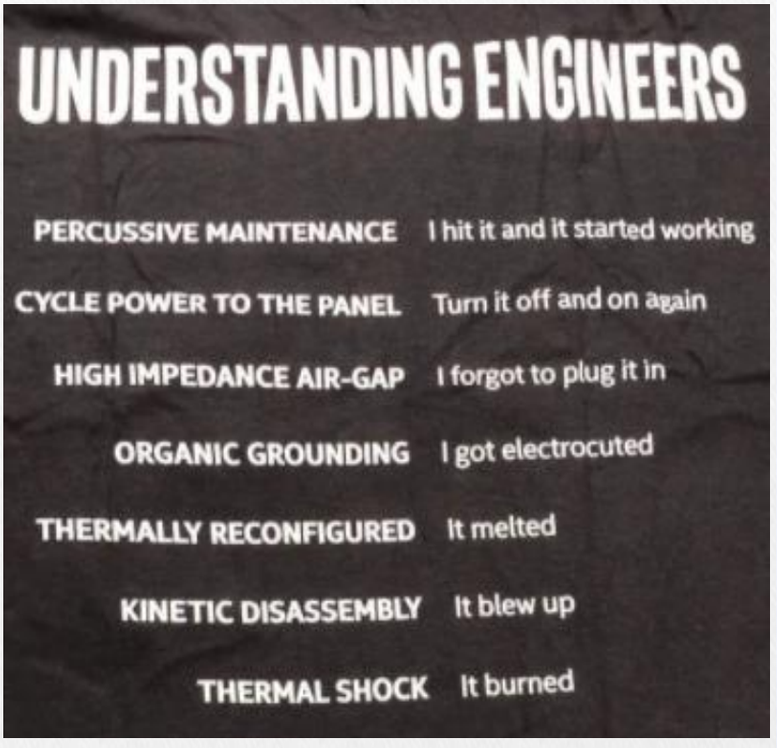
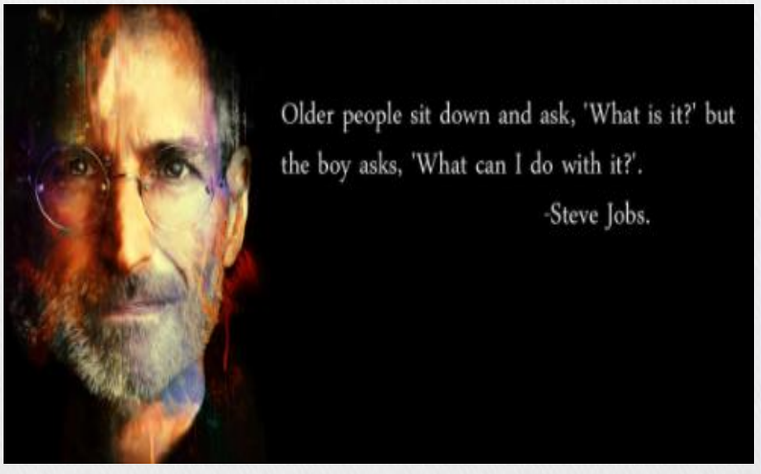
put your brain to work now 😜😃





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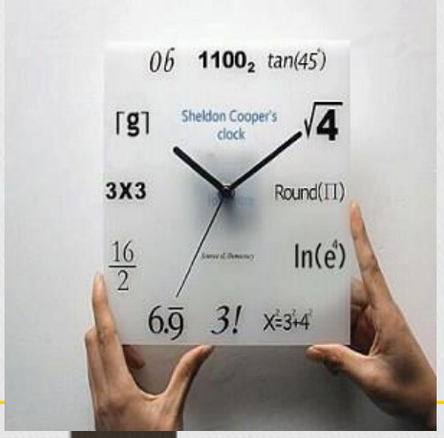

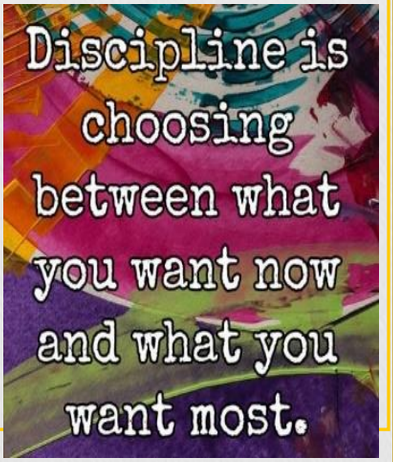

Department of Mechanical Engineering
R. V. R. & J. C. COLLEGE OF ENGINEERING
(AUTONOMOUS)
Chandramoulipuram, Chowdavaram
Guntur-522019
Andhra Pradesh