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MECH-TECH



Department of Mechanical
Engineering
Nadar Saraswathi College of
Engineering and
Technology, Theni



Theni Melapettai Hindu Nadargal Uravinmurai
NADAR SARASWATHI COLLEGE OF ENGINEERING AND TECHNOLOGY
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
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LIST OF CONTENTS

PAGE NO

1. ABOUT THE COLLEGE	3
2. ABOUT THE DEPARTMENT	4
3. STORIES BEHIND TECHNOLOGY	6
4. KNOW SOME TECHNOLOGY	7
5. PROFILE OF THE COMPANY	8
6. QUEEN OF CARS	11
7. COMBATING THE HAZARDS OF COMBUSTIBLE METAL DUST	13
8. FUTURE OF MANUFACTURING TECHNOLOGY	15
9. INDUSTRY 5.0	23
10. TYPES OF WRENCH	27
11. SOLAR FARM	28
12. EDITORIAL BOARD MEMBERS	30

About the College

"AN INVESTMENT IN KNOWLEDGE ALWAYS PAYS THE BEST INTEREST."

Nadar Saraswathi College of Engineering and Technology is one of the institutions run by Theni Melapettai Hindu Nadargal Uravinmurai.



Nadar Saraswathi College of Engineering and Technology was established in 2010 to uplift rural students' cadre and nurture them with excellence. It is exclusively constructed for moulding up outstanding Engineers as a responsible citizen and dynamic professionals. The institution is placed in a thriving eco-friendly ever-flourishing nature bound landscape of about 21 acres. It is located at Vadapudhupatti at about 6 km from Theni. NSCET educational programs that prepare the students to enter their chosen career field upon graduation. Through Quality Teaching, Learning, and Research, the College will provide students with opportunities to develop the knowledge, understanding, and skills necessary for successful employment. Our goal is to offer a lifelong educational solution that can equip the students with the knowledge, skills, and credentials needed to establish and advance professionally at any point on a chosen career path.

VISION

Place for Technology Revolution Mission

MISSION

- ◆ Promote and undertake all - inclusive developments.
- ◆ Develop high quality technical education with academic excellence and Innovative research with ethics
- ◆ Create an atmosphere where teacher enjoys facilitation and learners (students) enjoy learning through Foster innovation.
- ◆ Collaborate with industry and academic to meet the changing needs of Society.

About the Department

The Department of Mechanical Engineering was established in the academic year 2010-2011. The Department Approved by AICTE and Affiliated by Anna University Chennai. The Department plays a leading role in evolving an "Engineering Science" based curriculum.

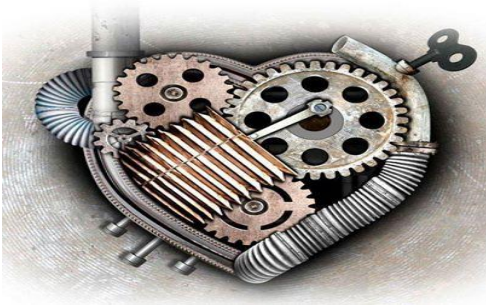


VISION

Centre for outstanding Education & Research in the fields of Mechanical Engineering.

MISSION

- ◆ Impart the highest quality education to the students to build their capacity and innovative skills to solve the industrial needs and social issues.
- ◆ Develop alliances with Research & Development, Industries organizations, and alumni for excellence in Consultancy and product design
- ◆ Enhancing the knowledge and expertise through professional programmes in thermal, manufacturing, and industrial Engineering.



CASTING THE WORLD.
FORGING THE CAMPUS.
SHARPENING OUR MIND.
SHAPING OUR BODY.
WELD THE HEART AND BRAIN.
IGNITE OUR IDEAS.
KNOCK(ING) OUR ENEMIES.
BECAUSE WE ARE MENS.
WE ARE MACHINES.

STORIES BEHIND TECHNOLOGY

GEAR HOBGING

In mechanical manufacturing firms, the maintains museums of how



products were produced in times past will have examples of manual gear hobs that helped produce gears before the gears of the 19th century and earlier.

Along with these completely manual gear, hobs will be samples of some of the first semi-automated gear hobs, and finally, examples of more recent technology that demonstrate the fully automated process that modern gear hobs used to produce gears today.

A few of the gear hobs producers also have interesting literature on gear hobs' history, including details about how modern gear hobs can produce thousand of gears in a single hour.

S.PRAVEENKUMAR
IV-MECHANICAL ENGINEERING

KNOW SOME TECHNOLOGY

Many technologies are trending in 2020.in the medical, automation in various industries. In this article, we will see technology in professional life.

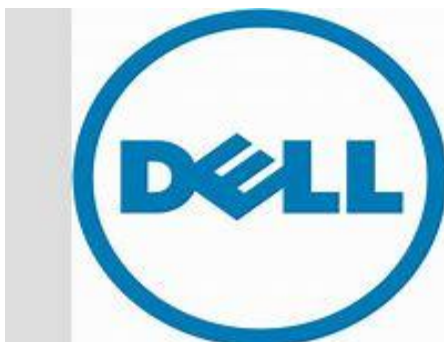
RPA:

RPA is nothing but Robotic process automation. Generally, any desk job in various industries tasks is standard procedures and standard procedures and states. And there are automated. The RPA or Robotic process automation allows you to automate such standard and repetitive tasks. In this RPA, you don't need any code or write any code to automate repetitive tasks.

Basically, in 2020 the trends of bots and machine learning is only going to skyrocket, which means RPA will become an invaluable skill to have



Deloitte, IBM, Intel, and DELL companies are mainly using the RPA process



A.SANTHOSH

IV-MECHANICAL ENGINEERING

PROFILE OF THE COMPANY



THE KING OF TATA GROUP



Although Ratan Naval Tata was born in a wealthy family in India, he began his career in the Tata Group by working on the shop floor of Tata Steel, shoveling limestone, and handling the blast furnace. In 1955, he graduated from Riverdale Country School in New York City, and in 1959, he received a degree in Architecture from Cornell University. He is an Indian industrialist, Philanthropist, and a former chairman of Tata Sons. He was also chairman of Tata Group, from 1990 to 2012, and again, as interim chairman, from October 2016 through February 2017, and continues to head its charitable trusts.

A RISE OF TATA GROUP

After working for almost 10 years, he was appointed as the Director-in-charge of the National Radio and Electronics Company Limited (NELCO) to help its economic slowdown.

Later he was appointed as the Chairman of Tata Group. During the 21 years he led the Tata Group, revenues grew over 40 times and profit over 50 times. He boldly got Tata Motors to acquire Jaguar-Land Rover, Tata Steel to acquire Corus, and Tata Tea to acquire Tetley companies.

BILL FORD INSULTS RATAN TATA

Tata Group launched its passenger car Tata Indica in 1998, but Tata Indica was a failure in its first year. Many people started advising Ratan Tata that he should sell the passenger car. Ratan Tata agreed the proposal was given to Ford, and they showed interest too.

During the three hours meeting at Ford headquarters in Detroit, the Chairman of Ford (Bill Ford) said to Ratan Tata, "why did you enter the passenger car business when you did not know of it. It will be a favor if we buy this business from you". Ratan Tata decided to move back home. While traveling, he was very tense as the feeling of being insulted was on his mind.



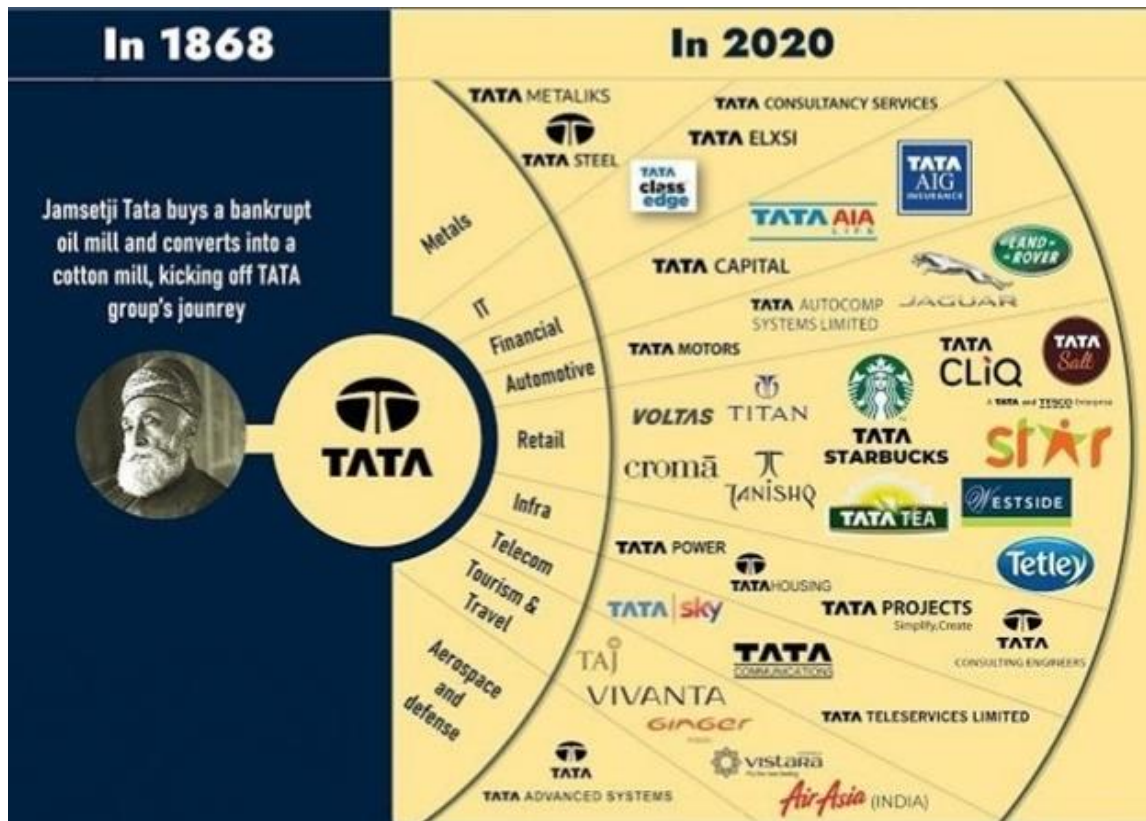
THE JAGUAR – LAND ROVER STORY

After earlier failures, Tata Motors did well with its business of passenger cars, but Ford did very poorly in the same period. In 2008, when Ford was on its way to bankruptcy, Tata Group offered Ford to buy its luxury car brand, Jaguar-Land Rover. Ford arrived in Mumbai for the meeting. In the meeting, Bill Ford said to Ratan Tata, "You are doing a big favour for us by buying Jaguar-Land Rover." Jaguar-Land Rover is now owned by Tata Group, and its currently making profits.



TATA GROUP'S BUSINESS EMPIRE

Tata Group's turnover will hit \$500 billion (Rs 25 lakh crore) by 2020-21.



"Ups and downs in life are very important to keep us going because a straight line even in an ECG means we are not alive."

-Ratan Naval Tata.

Former chairman of Tata Group.

N.MUTHUKARUPPASAMY,

IV YEAR – MECHANICAL ENGINEERING.

QUEEN OF CARS

Rolls Royce Motors Company was a luxury car company. It was created in 1973 by the nationalized Rolls Royce limited. They are two types of branded cars produced by this company. They are Rolls Royce and Bentley. The owner of the company is Vickers plc. He has started the company in 1980 and sold it to Volkswagen in 1998. After that, the new Rolls Royce Company was started.



MISSION STATEMENT OF ROLLS ROYCE;-

- Rolls Royce is a pre-eminent engineering company focused on world class power and propulsion systems.
- Rolls Royce motor cars offer the most exclusive luxury automobiles built to utmost perfection.
- Deliver products and services industry leaders.
- Delivering to customer what they expect.
- Achieving business excellence.
- Positioning the business to grow.

- People engaged and winning together.
- As a result, generate a profitable and growing contribution to the company and stakeholders.



“ THERE IS A PLACE WHERE BEAUTY IS MADE. WHERE WONDER GROWS FREELY. A CORNER OF SOUTHERN DREAMS ARE SHAPED, TESTED, ASSEMBLED BY NINETY PAIRS OF EXPERT HANDS. DRIVEN BY THE DNA OF OUR FOUNDERS. WELCOME TO OUR HOME, WHERE ROLLS ROYCE COME TO LIFE”

Combating the hazards of combustible metal dust



The right equipment, testing, and training can keep shops and workers safe

The dust generated during grinding has the potential to be dangerous, from creating a slipping hazard to possibly contributing to a combustible metal dust fire and explosion. To avoid the latter, metal fabricators should look at equipment that is designed to keep a dust-related catastrophe from occurring.

Even if you have never had a fire from combustible metal dust in your facility, are you fully aware of the dangers and costs involved with such an incident?

It doesn't take much to ignite a combustible metal dust. Many facilities struggle with fugitive dust and the laundry list of challenges it presents. Regardless of the type, fugitive dust settling on floors, equipment, ducting, surfaces, parts, and raw materials is a safety hazard.

Unfortunately, combustible metal dust fires and explosions haven't been high on the list of industrial safety problems that need solving, despite their regular occurrence.

Explosions Happen

In one case, workers at a facility in Southern California were using hand tools to polish aluminum rims. Although the workers wore N95 masks, the shop had no ventilation or dust collection system, and aluminum dust literally hung in the air and covered their faces and clothing. After a buildup of many years, the company suffered an aluminum dust explosion that resulted in several workers being injured and severely burned.

At another company, a worker used a shop vac with a little water left in it to vacuum up aluminum dust on a Friday afternoon. The shop vac was left over the weekend. The worker came in Monday morning, turned the shop vac on, and it exploded. The water and aluminum dust mixture generated hydrogen gas. The spark generated by turning on the motor caused the explosion.

And these are just two specific examples. How many combustible metal dust fires take place every day throughout the county that aren't reported because they were controlled and extinguished without requiring a visit from the local fire department?

The Dust Dilemma

As shown, a shop vac isn't the right equipment to use with combustible metal dust. You need a vacuum that is certified for use with combustible dust.

In fact, any dust under the right conditions is ignitable and potentially explosive. Different types of dust require different housekeeping procedures, dust collection equipment, storage, and handling. For instance, combustible metal dust such as aluminum, magnesium, and titanium requires different dust collection equipment, extinguishing agents, and housekeeping procedures and protocols than wood dust, yet both are highly ignitable.

Many companies employ a wet dust collector for our grinding operations. We have separate self-contained dust abatement systems for both ferrous and nonferrous materials that are clearly marked and color coded, in addition to the use of downdraft tables for grinding and deburr operation.

Addressing the Dangers

As new manufacturing technologies emerge, so do dust mitigation challenges. 3D printing frequently uses powdered metals like



aluminum, titanium, and magnesium, which introduce a whole new level of combustible metal dust handling, collection, and safety concerns to an already complex topic.

This wet downdraft table is an example of equipment that is able to collect combustible metal dust that is generated from activities such as deburring, cutting, and grinding.

A Dust Hazard Analysis - DHA identifies the potential fire and explosion properties of the dust in a shop. Each type of dust, from sanding, grinding, polishing, cutting, and sawing different metals and substrates, should be sampled and tested.

Trade organizations can be useful resources for guidance on safety procedures and worker training. Industry consultants are available who specialize in all things related to combustible dust. Industry

leaders and specialists offer virtual conferences, podcasts, and YouTube videos that address combustible dust safety, worker training, and equipment.

In addition, colleagues in the industry can be a great source of information about the type of dust collection equipment they use, their housekeeping procedures, and the worker safety training they've implemented.

The Cost of Compliance

What is the cost of combustible dust mitigation, including the testing and equipment required to comply with these standards? Equipment can range from minimum amount for a small industrial vac to several thousands for large wet dust collectors, central vacuum systems, wet downdraft tables, and wet dust booths.

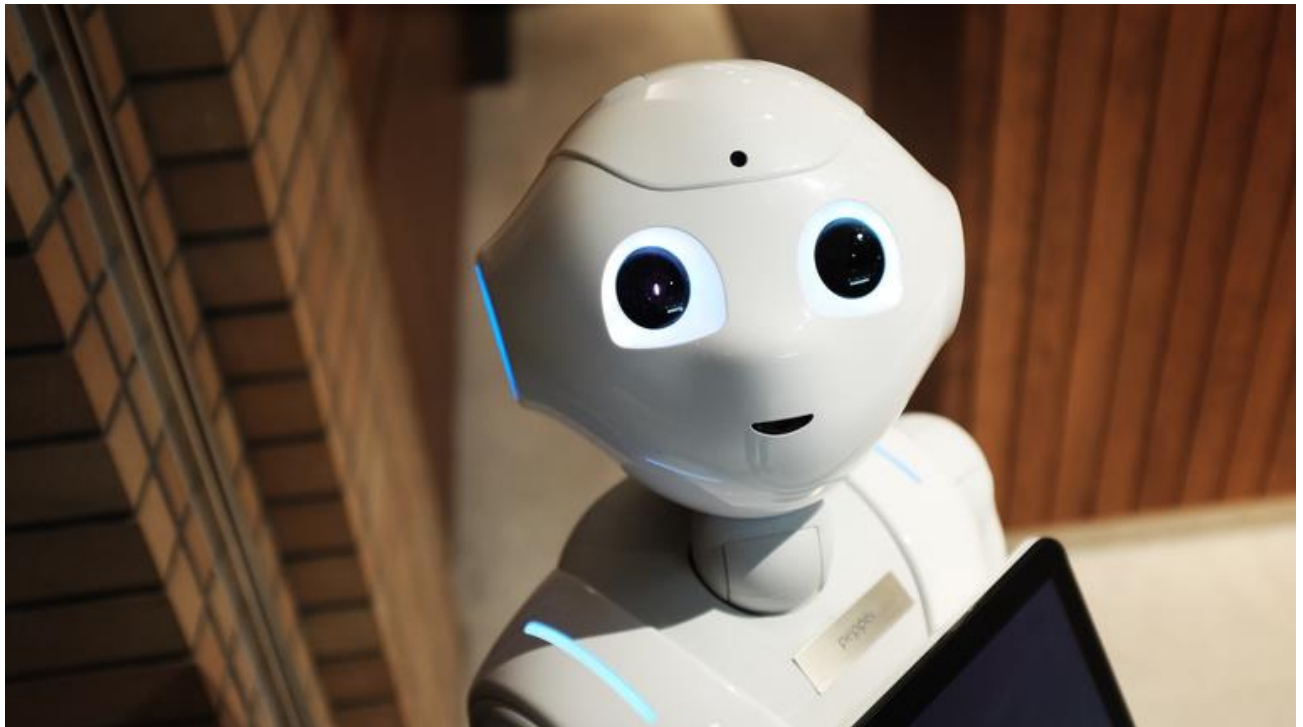
CODISSIA - 1 December 2020
Volume - 6, Issue - 20, Coimbatore

But keep in mind the potential costs of not being in compliance:

- What are the liability costs of worker injuries?
- Will any injuries temporarily or permanently displace valuable workers?
- What is the cost of equipment lost to fire or explosion?
- What is the cost of lost production to your customer?
- Will the insurance company cover all losses?
- Will insurance rates increase?

There's no wrong time to take even small steps to address combustible metal dust challenges. Everything doesn't have to be completed at once, and every effort in mitigation increases safety for the shop and its employees.

Source : www.thefabricator.com



2021: Future of Manufacturing Technology

1. TECHNOLOGY AND IIOT

Technology is an ever-evolving field, constantly mixing in new iterations and innovations to create exciting new opportunities for today's manufacturers to reimagine their operations. In some instances, new technologies open the door for progressive manufacturers release truly innovative offerings of their own.

The big question? Which technologies warrant the often-significant resource investments required to navigate the ongoing digital transformation and embrace what Industry 4.0 promises.

Let's take a deeper look at what's going on with a few of the key technologies:

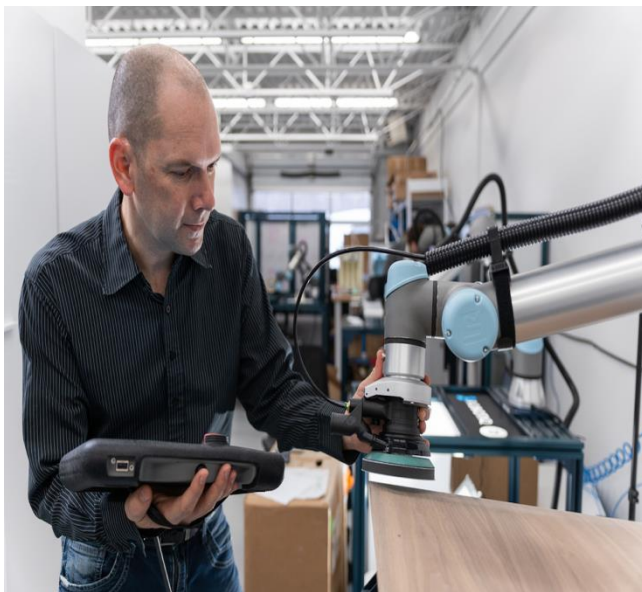
Advancing robotics and automation

Smart manufacturers are efficient by design. This is where robotics and automation thrive. And, according to the Robotic Industries Association, manufacturers see the potential. Specifically, robot orders are up 5.2% through the third quarter of 2019, with 23,894 robotic units ordered, a value of \$1.3 billion.

The continued trend toward collaborative environments is playing a significant role. Unlike historical deployments where one or two processes often consumed a disproportionate share of the project cost, collaborative robots (or cobots) allow for incremental investment. As a result, manufacturers can automate one process at a time.

Cobots are "easier to digest, faster to deploy and generate returns quicker," says Joe Campbell, Universal Robots' senior manager of strategic marketing and applications. "The enabler is the ability to work side-by-side with skilled operators."

According to Campbell, there has been a noticeable uptick in the number of small and medium sized manufacturing companies embracing collaborative robots.



"The difference is that in many cases the programming is taking place by the line operator. The business impact in these companies is significant because everyone is struggling to hire, which hits these companies even harder," he says. "We are regularly seeing collaborative robots go in right at or below the annual cost of an average manufacturing worker."

The boost in the availability of plug-and-play, pre-engineered peripherals is also making a significant difference. "Industry-focused

companies are building products to seamlessly integrate with robots in a matter that strips out the time, cost and risk commonly associated with robots," he says. "This trend is going to continue into deeper application kits, making collaborative robots more attractive."

As a prime example, Robotiq developed a software package that allows manufacturers to easily set up complex sanding patterns on contoured surfaces. "It is not just sanding head," says Campbell. "It is the means to apply it efficiently. They have reduced a multi-day programming operation down to a twenty-minute task."



As another example, Vectis Automation developed a full welding kit including a software process layer geared for a welder rather than an engineer to put the robot into action. "It is a matter of side-stepping the need for a skilled robot engineer for every application," says Campbell.

The overarching trend in automation, according to Rockwell Automation CEO Blake Moret, is the convergence of IT and OT technology.

"It is causing organizations to structure themselves differently in order to take advantage of the integration," he says. "When people talk about digital transformation, it is happening throughout the enterprise. We are seeing some very interesting things where the IT organization is taking on a different role—placing new demands on organizational infrastructure. You still need smart devices and the final mile to turn the motor and land the I/O, but productivity is provided with an increased amount of data driven software."

As automation makes its way into new spaces including life sciences and the electric vehicle, the efficient use of data is going to prove significant, explains Moret.

"The wrong way to do it is to land it all in a database where you have to go fishing for insights afterwards," he says. "To be able to have scalable solutions that process just enough data that could be right at

the edge or in the cloud. Your workforce needs to be comfortable interacting with the system, making simplification important. We need to drive the complexity out."

Embracing additive manufacturing and 3D printing

The 3D printing industry was worth \$3 billion in 2013 and grew to \$7 billion in 2017. By 2025, the market is forecast to account for more than \$20 billion in spend, according to GlobalData. There are a few key evolutions taking place in this space that are fueling the ongoing growth trajectory.

Most notably is the introduction of new materials and software advances, both of which are clearing paths to creative new applications. For instance, as bioprinting and digital anatomy continue to mature, the ability to seamlessly switch between materials to benefit from differing properties. While current advances continue to improve the ability to streamline prototyping, perhaps the most encouraging outcome is the ability to better visualize the future potential for mass customization.

Looking ahead, HP 3D Printing and Digital Manufacturing Chief Technologist **Paul Benning** offers four predictions around how 3D printing will further transform the manufacturing landscape in 2020:

- **Automated assembly will arrive, with industries seamlessly integrating multi-part assemblies including combinations of 3D printed metal and plastic parts.** There's not currently a super printer that can do all things intrinsically, like printing metal and plastic parts, due to factors such as processing temperatures. However, as automation increases, there's a vision from the industry for a more automated assembly setup where there is access to part production from both flavors. The auto sector is a great example of where automated assembly could thrive on the factory floor. Benefits of an automated assembly for industrial applications include printing metals into plastic parts, building parts that are wear-resistant and collect electricity, adding surface treatments, and even building conductors or motors into plastic parts. The industry isn't ready to bring this technology to market just yet,

but it's an example of where 3D printing is headed beyond 2020.

- **Data payloads for 3D printed parts will be coded into the surface texture.** It's a competitive advantage to be able to build interesting things onto surfaces. Something that HP has experimented with is coding digital information into a surface texture. By encoding information into the texture itself, manufacturers can have a bigger data payload than just the serial number. This is one way to tag a part either overtly or covertly so that both people and machines are able to read it based on the shape or orientation of the bumps. HP can also put hundreds of copies of a serial number spread across the surface of a part so that it's both hidden and universally apparent.
- **Universities and training programs will build a new set of thought processes to liberate designers from old thinking and allow them to tap into technologies of the future.** 3D printing's biggest impact to manufacturing job skills lies on the design side. There is a world of designers who have been trained in and grown up with existing technologies like injection molding. Because of this, people unintentionally bias their design toward legacy processes and away from technologies like 3D printing. To combat this, educators of current and soon-to-be designers must adjust the thought process that goes into designing for production given the new technologies in the space. We recognize this will take some time, particularly for universities that are starting up degree programs. New software design tools will guide designers to make better use of 3D printing in manufacturing. One example of this is Oregon State University where they're using 3D printing to design and build combustion, electric and driverless cars.
- **Advances in software and data management will drive improved system management and part quality leading to better customer outcomes.** Companies within the industry are creating API hooks to build a fluid ecosystem for customers and partners. HP is expanding upstream to use data to enable ideal designs and optimized workflows for Multi Jet Fusion factories. This data comes from design files, mobile devices, or scanning technology and is applied to improve production efficiency and deliver individualized products purpose-built for their end customers.

Working with wearables



The mention of wearables often recalls a Star Trek like image. However, not all wearables are futuristic in nature—nor are they all gimmicky single-use technologies. When looking at how wearables can positively impact the manufacturing space, the key is to move beyond the formfactor to focus intently on the application.

"Wearables are not restricted to eye-based units, with today's smart watches capable of monitoring medical metrics serving as a perfect example," says Parsable CEO Lawrence Whittle. "These smart devices are coming down in price, and with a little creativity they can prove valuable in a lot of ways. For instance, when a wearable detects fatigue, it can ping a supervisor to say that you need to make sure an employee is okay."

The goal with wearables is to identify applications capable of enhancing worker safety and production efficiency. The right formfactors can augment and enhance the human's ability work. Of course, companies need to be conscious of their use since some of the features like voice recognition are not yet optimized for noisy industrial environments.

"As each year goes by the ability to connect workers is clearly there. VR and AR are proven use cases for training. What we believe is the valuable role for wearables is around work execution. If you go back to the sensor on a piece of machinery to know if its overheating. You can have sensors on humans to understand better how they are augmenting work," says Whittle. "They can play a key role in detecting what the environment is like including the temperature, smoke in the air or any number of factors that could impact people or processes."

Recognizing growing need for 5G

As the list of technologies impacting today's production environments multiplies including the expansion of the Industrial Internet of Things and the number of connected devices, the bandwidth demands are intensifying as data creation and utilization constantly compounds. The latest generation of network technology, 5G satisfies the need for high speed, reliable and secure connectivity that supports a new highly mobile reality. With speeds of up to 100 gigabits per second, 5G is roughly 100 times faster than 4G.

Imagine for instance, a drone transporting a device within the facility entering a dead zone and suddenly losing its connection. While built-in software programming can provide some levels of redundancy and consistency to keep the drone in flight until it reestablishes a connection, the time in the dead zone could understandably have significant negative consequences.

While the U.S. has yet to realize its benefits, the technology needed for 5G exists with firms like Ericsson, Qualcomm and Huawei leading the way in its development. Unlike previous generations, 5G leverages multiple input multiple output digital technology using targeted beams to follow users, making it possible to consistently improve coverage and capacity. Of course, its widespread availability remains questionable at best including the need for extensive investments in new network installations and sweeping software upgrades.

Continued IoT investments

As the pipeline connecting and collecting mountains of data from an entire spectrum of equipment and devices, IoT continues steady progression as more companies embark on their journey.

According to the PwC's 2019 Internet of Things Survey, manufacturers are optimistic about IoT with 93% believing its benefits exceed its risks. In fact, 68% plan to increase their investment over the next two years.

"Manufacturers need to know that if they haven't already implemented IoT, they're already behind their competitors — 81% of

industrial manufacturers have applied IoT to increase operational efficiency and almost two-thirds plan to increase their IoT investment

over the next two years," says Rob Mesirow, leader of the PwC Connected Solutions/IoT practice. "It's also important to note the most popular IoT use cases so manufacturers can better guide their own deployment plans. The main use cases are in logistics (50%), supply chain (47%), employee and customer experience (46%), and predictive maintenance (41%)."

However, Mesirow notes there are cybersecurity concerns when implementing IoT. Specifically, more executives in manufacturing are extremely concerned about IoT and cybersecurity than in any other industry PwC surveyed. "With this knowledge, manufacturers should look closely at the IoT devices and partners they're considering to ensure they aren't implementing poorly secured devices or networks," he says. "A few approaches to consider are better managing ecosystems and developing more robust data management policies."

Mesirow tells IndustryWeek he was surprised more manufacturers hadn't implemented IoT to help prevent equipment from malfunctioning (44%), especially as the cost of these devices continues to go down.

"Any time equipment on the floor goes down, it can drastically impact operations and even bring them to a halt," he says. "Since manufacturing relies so heavily on the equipment, I thought more manufacturers would have already either implemented IoT to track for repairs or planned to implement the tech, but only 27% of manufacturing executives expect to do so within two years."

INDUSTRY 5.0



1. [AUTOMATION & IIOT](#)

Yes, Industry 5.0 is Already on the Horizon

The next manufacturing revolution aims to bring back the human touch.

We are still in the midst of Industry 4.0, where manufacturing has taken on the label of “smart” through the integration of the IoT, AI, cyber-physical systems, and Cloud and cognitive computing. The basic principle behind the fourth industrial revolution is that by chaining machines, intelligent devices, and systems, manufacturers are creating smart networks throughout the value chain (from materials to production) that can control each other.

With that being said, it's amazing that technological advancements continue to grow at an incredible speed—so much so that Industry 5.0 can already be seen on the horizon, which according to some tech visionaries, will bring an increased human touch back to manufacturing.



Therefore, where Industry 4.0 put smart technology at the forefront of manufacturing, 5.0 will be increased collaboration between humans and smart systems. Marrying the two will merge the high-speed accuracy of industrial automation with the cognitive, critical thinking skills of humans.

According to Universal Robots Chief Technology Officer Esben H. Østergaard, Industry 5.0 is necessary due to consumers high-demand of individualization in the products they buy, meaning they prefer a degree of “hands-on” personalization and customization with their products. To back up his statement, Esben cites an article from Bloomberg detailing auto manufacturer Mercedes’ decision to give more space to humans in the production factories, noting that customization is an important factor with modern consumers.

More and more manufacturers are increasing the human component



Universal Robots polishes Paradigm to 50% increase in production

not only for the customization, but also for increased efficiency on the production line. One example is Toronto's Paradigm Electronics, which manufactures high-end loudspeakers. The company uses Universal Robots' UR10 robotic arm to polish the

speaker cabs to a high-luster sheen, but it takes considerable time to do so. By adding a human counterpart, however, it increased its production efficiency by 50%.

This isn't to say robots will eventually be phased out of the production cycle. On the contrary: Industry 5.0 will enhance both machine and human roles in the manufacturing industry, leaving the monotonous, repetitive tasks to the mechanical and opening up the creative side to the biological. This will allow staff to take on more responsibility and increased supervision of systems to elevate the quality of production across the board.

The idea of collaboration between humans and robots on the assembly line is not a vision of the distant future. In fact, consulting firm Accenture recently released an outlook from a survey they conducted with 512 manufacturing execs from all over the globe, revealing that 85% of them envision a collaborative production line between humans and robots in their plants by 2020. It's quite the impressive outlook, considering that target date is just three years away.



That projection may be alarming to some manufacturers who have only begun to adopt Industry 4.0 standards, but it doesn't need to be. Human/robot collaboration is already taking place on the production line, as mentioned earlier. It's a natural evolution that will take place within the smart manufacturing industry,

and robotics producers have already developed collaborative robots that are safe to use around human workers to prevent injuries in the workplace.

Although Industry 4.0 is still the foremost revolution on most manufacturers' minds, it's also important to keep an eye on the future. Technology is constantly advancing, and production must evolve with it to remain competitive. With the increase in demand for quality hands-on custom-made products, manufacturers will undoubtedly

benefit from what Industry 5.0 has to offer, and perhaps it will reduce the inherent fear most production workers have concerning being replaced by automation. New skills are necessary, but the collaborative workplace will be beneficial for all in the long term. All we need to do is keep an open mind.

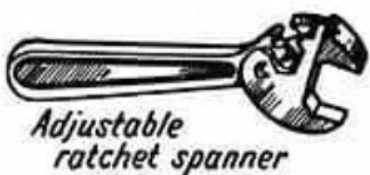
Industry is being “versioned” way too willy-nilly. We need versioning control! Without a better way of describing innovation in industry, we are doomed to see more “upgrading” of industry, since it is an attention-grabber. So, let me now coin the term “Industry 6.0,” where we never interface with any machine, person, or drafting table/setup. Instead, it’s all done in an app. We take a picture of a rough sketch and click “make it.”



Looking for parts? Go to SourceESB.com



Double bar coach wrench



Adjustable ratchet spanner



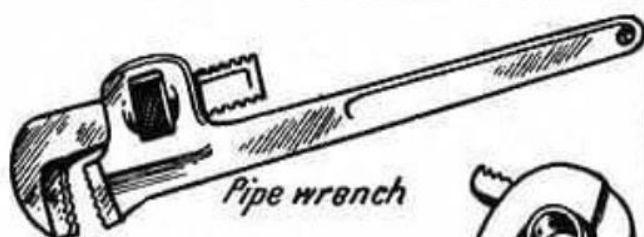
Crocodile pipe wrench



Budding or MacMahon Spanner



Chain pipe wrench



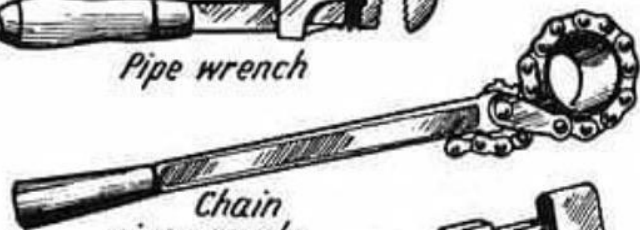
Pipe wrench



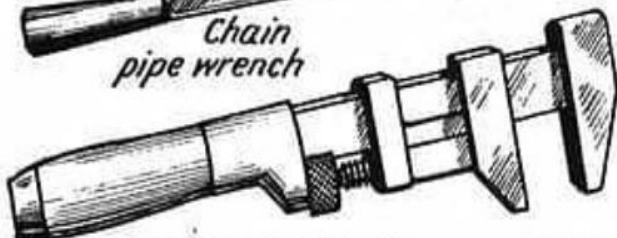
Parrot-nose pipe wrench



Pipe wrench



Chain pipe wrench



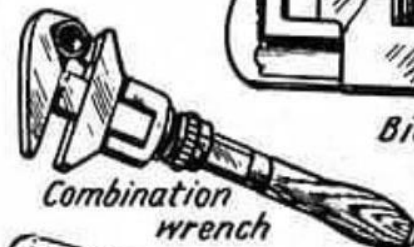
Agricultural wrench



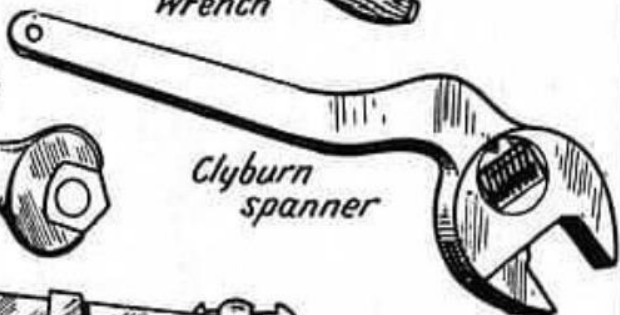
Hexagon box wrench



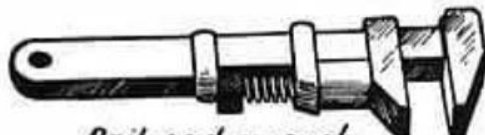
Bicycle wrench



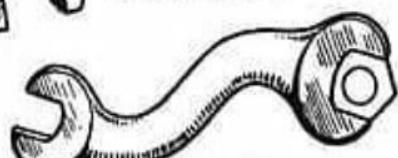
Combination wrench



Clyburn spanner



Railroad wrench



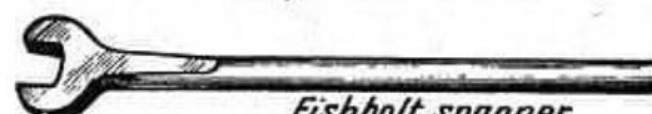
S-wrench



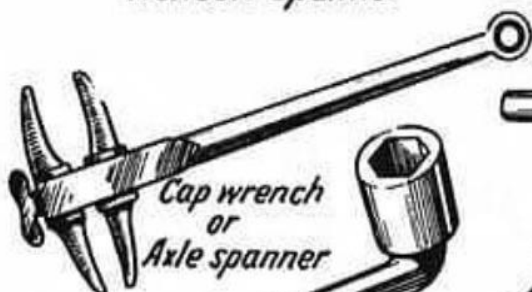
Key model wrench



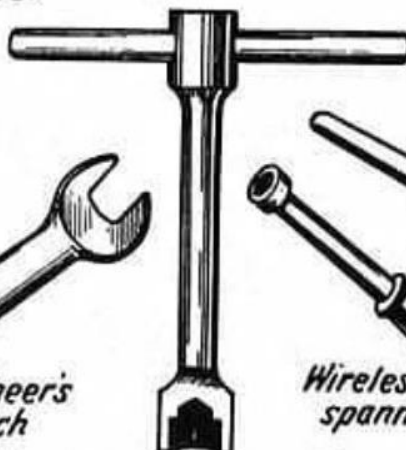
Fishbolt spanner



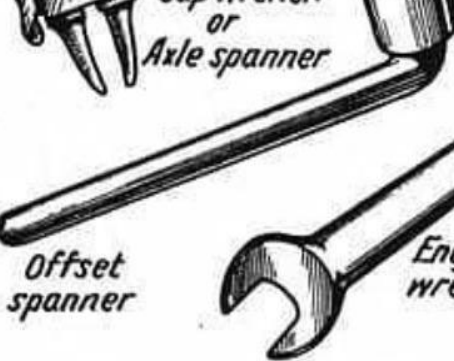
Fishbolt spanner



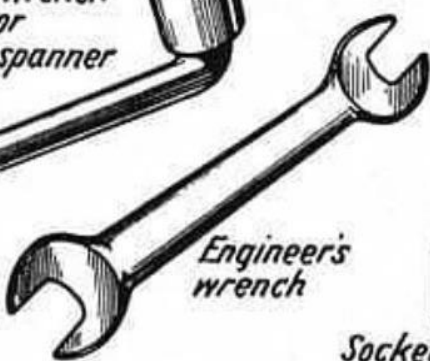
Cap wrench or Axle spanner



Socket wrench



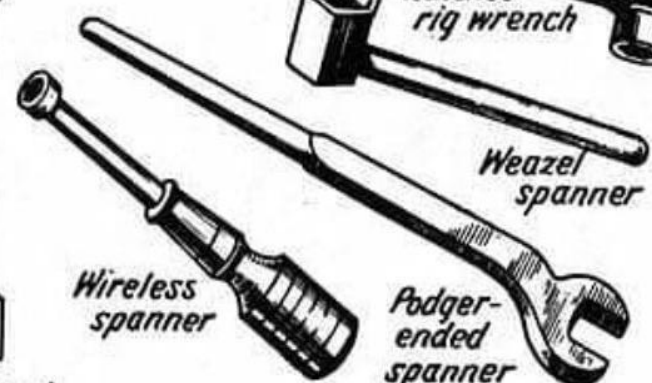
Offset spanner



Engineer's wrench



Ratchet rig wrench



Weazel spanner



Wireless spanner



Podger-ended spanner



Bespoke designs impose new challenges to the materials applied in 3d concrete printing setup at Teknologisk Institut. Through a set of material characterization methods, we can design sustainable concrete compositions that are fit for 3DCP. This time, we explored the use of colored concrete and layer overhangs to create a very jolly wall with a faceted pattern.

China just built a 250-acre solar farm shaped like a giant panda



China Merchants New Energy/Panda Green Energy

The Panda Power Plant in Datong, China.

Most solar farms align their solar arrays in rows and columns to form a grid.

A new solar power plant in Datong, China, however, decided to have a little fun with its design. [China Merchants New Energy Group](#), one of the country's largest clean energy operators, built a 248-acre solar farm in the shape of a giant panda.

The first phase, which includes one 50-megawatt plant, was completed on June 30, [according to](#) PV magazine. The project just began delivering power to a grid in northwestern China, and a second panda is planned for later this year.

Called the Panda Power Plant, it will be able to produce 3.2 billion kilowatt-hours of solar energy in 25 years, [according to](#) the company. That will eliminate approximately million tons of coal that would have been used to produce electricity, reducing carbon emissions by 2.74 million tons.



China Merchants New Energy/Panda Green Energy

The Panda Power Plant in Datong, China will stretch 1,500 acres when complete.

China Merchants New Energy Group worked with the United Nations Development Program (UNDP) to make the Panda Power Plant a reality. The project is part of a larger effort to raise awareness

among young people in China about clean energy, the UNDP [wrote](#) in a statement.

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