DEPARTMENT OF MECHANICAL ENGINEERING (TOOL AND DIE)

2023-24

METD- MAGAZINE

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VISION AND MISSION

INSTITUTE

PMC TECH POLYTECHNIC COLLEGE SHALL EMERGE AS A PREMIER INSTITUTE FOR VALUED ADDED TECHNICAL EDUCATION COUPLE WITH INNOVATION, INCUBATION, ETHICS AND PROFESSIONAL VALUES

- TO FOSTER THE PROFESSIONAL COMPETENCE THROUGH EXCELLENCE IN TEACHING AND LEARNING.
- TO NURTURE OVERALL DEVELOPMENT OF STUDENTS BY PROVIDING QUALITY EDUCATION & TRAINING.
- TO PROVIDE INNOVATIVE ENVIRONMENT TO LEARN, INNOVATE AND CREATE NEW IDEAS FOR THE BETTERMENT OF ONESELF AND SOCIETY.

DEPARTMENT

TO DEVELOP EMINENT INNOVATIVE PROFESSIONAL TOOL AND DIE DIPOLMA HOLDERS BY IMPARTING VALUE ADDED EDUCATION EMBEDDED WITH EMPOLYABLE SKILLS.

- TO PROVIDE COMPETENCY BASED QUALITY TOOL AND DIE ENGINEERS BY STRONG THEORETICAL AND PRACTICAL TRAINING.
- TO PROVIDE BREEDING GROUND FOR INNOVATION A LEADERSHIP THROUGH SKILL DEVELOPMENT IN TOOL DESIGN.
- TO ENHANCE CONTINUAL CAREER DEVELOPMENT AND IMPROVE EMPOLY ABILITY SKILLS.

From the Chairman

It is the matter of pride to know the release of annual magazine "METD" of Mechanical Engineering (Tool& Die) Department. The name and fame of an institute depends on the competence and achievements of the students and the faculty. In addition to thenumerous achievements of the year is yet another mile stone in their curricular. I hope this magazine will bring out creative talents of the students of the institute. I congratulate the Principal, HOD, Staffs and Students for publishing "METD Magazine". My best wishesfor the success of the effort of the department.

Mr. KUMAR P
Chairman
PMC Tech Group of Institutions, Hosur

From the Secretary

I am happy that "METD" of Mechanical Engineering (Tool& Die) of our Er. Perumal Manimekalai Polytechnic College is releasing annual magazine "METD". Apart from achieving excellence in academics and sharpening technical skills it is important for students to develop leadership skills and capacity to innovate for social causes to make them resourceful and employable. I extend my best wishes to the team to make this magazine"METD" a memorable one.

Smt. MALLAR P
Secretary
PMC Tech Group of Institutions, Hosur

From the Director

I feel extremely amusement to observe that of Department of Mechanical Engineering (Tool& Die) is bringing out annual magazine "METD" with the dedicate and committed efforts of faculty and students of the department. This magazine is the reflection of the students, involved in various activities. I congratulate the HOD, the faculty members and the students of mechanical engineering (Tool and Die) department for their ingenuity and enthusiasm for this magazine and wish them all success.

Prof. SUDHAKARAN.N
Director
PMC Tech Group of Institutions, Hosur

From the Principal

It is always a pleasure to be a part of a team which strives to bring out the talents of students and staff. Mechanical engineering (Tool and Die)department has always been striving to keep itself ahead of the competition. The essential purpose of a magazine is to inform, engage, inspire and entertain a diverse readership including alumni, parents, students, faculty, staff and other friends of the college by telling powerful stories that present a compelling, timely and honest portrait of the college andits extended family. This Magazine has made an earnest attempt in this direction and brought out certain aspects to the eyes of the public so that they may understand and know the MECH(T-D) department even better.

Er.BALASUBRAMANIAM N
Principal
PMC Tech Polytechnic College, Hosur

From the HOD

I feel privileged in presenting the magazine "METD" of our department. This magazine is intended to bring out the hidden literary talents among the students and the facultyand also to inculcate leadership skills among them. I am sure it will be a source of inspiration for the budding poets and writers among the students and will direct their creativity to new dimensions of mature expression. I extend my sincere thanks to the editorial team for their constant effort and support in bringing out the magazine in the present form. I acknowledge my gratitude to our principal for their continuous support toprepare these issues of magazine. Last but not least, I am thankful to all the authors who have sent their articles

Er. PRAKASH C
Head of the Department
Mechanical Engineering (Tool and Die)

ABOUT THE DEPARTMENT

- **Department of Mechanical Engineering (Tool & Die) was established in the year 1999 to offer a quality education for the students hailing from rural area and meet the industrial demands.**
- **The Department consists of 216 students admitted as 90 intake.**
- **Mechanical Engineering (Tool & Die) is the branch of engineering that applies the principles of physics and material science for analysis, design, manufacturing and maintenance of mechanical system.**
- **It is the branch of engineering that involves the production and usage of making design for the tool production and operation of machines.**
- **The engineering field requires an understanding of core concept including mechanics, thermodynamics, material science, jigs and fixtures, press tools, forging dies and plastic engineering.**
- **Tool & die engineers use these core principles along with the tool like computer aided manufacturing, computer integrated manufacturing, product life cycle management to design and analyze plants, equipment's and machineries.**
- **Employment opportunities available for tool and die diploma holders are found across the entire spectrum of manufacturing industry.**
- **Different carrier opportunities available for a diploma holder in tool and die making are Tool room engineers, Tool designer, plastic mould maker, Quality control engineers, Production engineers, Maintenance engineers, and CNC programmer.**
- **Higher studies opportunities are they can go for Mechanical Engineering, Production engineering, Aeronautical engineering and Post diploma in plastic technology offered by CIPET and Post Diploma Tool Design offered by NTTF.**

ACHIEVEMENT

THE DEPARTMENT OF MECHANICAL ENGINEERING (TOOL & DIE) A P P L I E D NBA ACCREDITATION FROM NATIONALBOARD OF ACCREDITATION, NEW DELHI IN THE YEAR 2022.

Editorial Board

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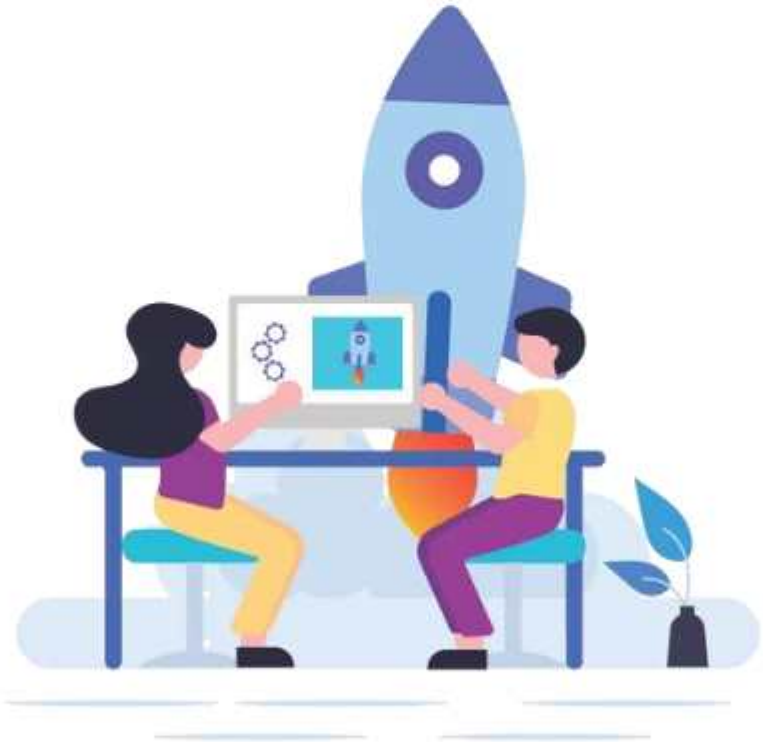
Content



CNC Lathe part programming

CNC part programming involves a series of coded instructions that are required to produce a part. The program controls the machine tool movements and controls auxiliary functions including spindle, coolant and rotation. The instructions may include numbers, letters, and symbols arranged in functional format blocks.

CNC part programming uses a program input device such as a keyboard, diskette drivers, pouched tape reader or serial ports among others. The program describes work that should be done on a part in the format required by CNC software. Programming is the point at which all the machining data is compiled and translated so that the control system can understand and implement the instructions.

Computerized numerical control machining is becoming more popular in computer aided design and computer-aided manufacturing (CAD/CAM) compared to conventional machining processes because of its high level of productivity and precision, coupled with ability to machine complex shapes in 2D and 3D. Computerized numerical control machining with CAD/CAM has evolved over the past three decades and has established itself as the most acceptable and preferable means of manufacturing complex parts because of its flexibility and capacity to replicate parts with high accuracy, especially in high volume manufacturing operation. CNC machining equipment operates on multiple axes, however standard CNC machine has three linear motions along X, Y and Z axes while five axes machine has two additional axes of rotation.

CNC machining operation has been employed extensively in the automotive industry largely

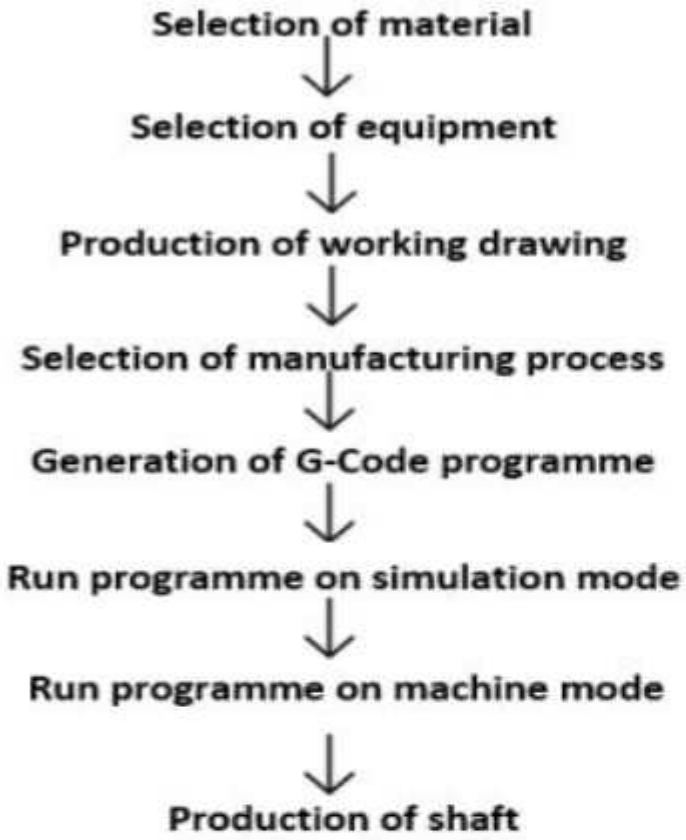
because of the high precision, product consistency and high productivity and efficiency associated with the process. The application of CNC machining in manufacturing has been identified as a feasible solution to problem associated with additive manufacturing

The application of CNC machining in manufacturing has been identified as a feasible solution to problem associated with additive manufacturing. Manufacturing method that produces components by adding or laying the material on each other to form a monolithic part. Furthermore, the possibility for automation and flexible manufacturing system has made CNC technology the best option to manufacture complex parts like transmission system and other intricate engineering parts.

PROCESS PLANNING:-

Generally, the production process begins with conceptualization of the product (shaft) and the starting point is the selection of the appropriate material and the type of equipment to be used. CNC lathe is the appropriate equipment for the production of the multiple steps shaft.

The process for the production of the multiple-steps shaft can be depicted in form of flow chart below:-



The machining operation was carried out at the CNC laboratory. The major parameters for machining such as cutting speed, feed rate, and the depth of cut were considered. The depth of cut was carefully considered because of the nature of the work-piece while the machining operation was carried out at room temperature of about 280 C, due consideration was given to the measurements to obtain desired result.

Mr.YUVARAJ.M

III TD

Cutting Edge Technologies in Mechanical Engineering

Cutting-edge technology refers to the most advanced and innovative developments in a particular field or industry. It represents the latest achievements and breakthroughs that push the boundaries of what is currently possible. Cutting-edge technologies often incorporate the latest scientific discoveries, engineering advancements, and creative solutions to address complex problems or enhance existing capabilities.

Additive Manufacturing (3D Printing):

3D printing technology has been revolutionizing the manufacturing industry by enabling the creation of complex geometries, rapid prototyping, and customized products. In mechanical engineering, it's being used to produce lightweight and high-performance components for aerospace, automotive, and medical applications.

Robotics and Automation:

Robotics and automation are being increasingly integrated into various industries, including manufacturing, logistics, and healthcare. Advancements in robotic technology are leading to more sophisticated, agile, and collaborative robots capable of performing complex tasks.

Advanced Materials:

The development of advanced materials with superior properties, such as carbon fiber composites, grapheme, shape memory alloys, and super alloys, is enriching the performance, efficiency, and safety of mechanical systems.

Internet of Things (IoT):

IoT is transforming the way mechanical systems are monitored and controlled. By

embedding sensors and connectivity in machines, engineers can collect real-time data, optimize performance, and predict maintenance needs, leading to improved efficiency and reduced downtime.

Computational Fluid Dynamics (CFD):

CFD simulations are becoming more powerful and accessible, enabling engineers to study fluid behavior, heat transfer, and aerodynamics with greater accuracy. This technology finds applications in designing efficient cooling systems, aerodynamic optimizations, and weather simulations.

Nanotechnology:

Nanotechnology is offering opportunities for mechanical engineers to create advanced materials, coatings, and nanoscale devices with unique properties, leading to improve- ments in strength, durability, and functionality.

Energy Harvesting and Storage:

The focus on renewable energy and sustainability has driven research in energy harvesting technologies. Mechanical engineers are exploring innovative ways to capture and store energy from vibrations, heat, and other mechanical sources

Biomechanics and Biomedical Devices:

Mechanical engineers are increasingly involved in developing cutting-edge medical devices, prosthetics, and implants. This field combines mechanical engineering principles with biology and medicine to improve healthcare outcomes.

Artificial Intelligence and Machine Learning:

AI and ML are being integrated into various aspects of mechanical engineering, such as design optimization, predictive maintenance, and autonomous systems, to enhance efficiency and performance.

Virtual Reality (VR) and Augmented Reality (AR):

VR and AR technologies are transforming the design and visualization processes in mechanical engineering, allowing engineers to create, test, and modify prototypes in virtual environments, leading to faster and more cost-effective product development.

These technologies are constantly evolving, and it's essential to stay up-to-date with the latest advancements to remain at the forefront of mechanical engineering.

Marvels in Mechanical Engineering

1.Hyperloop Technology:

Hyperloop is a proposed high-speed transportation system that uses magnetic levitation to propel passenger pods through low-pressure tubes at incredible speeds. Several companies have been working on prototypes and conducting successful tests, bringing this futuristic transportation concept closer to reality.

2. Floating Offshore Wind Turbines:

Floating offshore wind turbines are a groundbreaking technology that allows wind farms to be installed in deeper waters where traditional fixed foundations are not feasible. These turbines harness stronger and more consistent winds, opening up vast areas for renewable energy production.

3. Vertical Takeoff and Landing (VTOL):

Aircraft: Advances in VTOL aircraft technology are bringing us closer to practical electric flying

taxis and autonomous aerial vehicles. These aircraft combine aspects of helicopters and fixed-wing airplanes, enabling vertical takeoff and landing while providing the efficiency of winged flight.

4. Mars Rovers and Space Exploration:

Engineers have been continuously pushing the boundaries of mechanical design and autonomy with the development of Mars rovers like Perseverance. These robots are equipped with advanced instruments and capabilities to explore the Martian surface and conduct scientific experiments.

5. Supercritical Carbon Dioxide (SCO2) Power Cycles:

SCO2 power cycles are gaining attention as a more efficient and compact alternative to traditional steam cycles for power generation. This technology has the potential to significantly improve the efficiency of power plants and reduce carbon emissions.

6. High-Performance Electric Vehicles (EVs):

Mechanical engineers have been instrumental in designing and optimizing high-performance electric vehicles, with impressive advancements in battery technology, power electronics, and aerodynamics, leading to increased range and performance.

7. Self-Healing Materials:

Self-healing materials are a fascinating development in mechanical engineering. These materials have the ability to repair themselves when damaged, offering increased durability and potentially reducing the need for frequent maintenance and repairs.

8. Space Launch Vehicles:

The development of reusable rockets, like Space X's Falcon 9 and Falcon Heavy, has revolutionized the space industry. These rockets are capable of landing back on Earth after launching payloads into space, drastically reducing the cost of space missions.

9. Advanced Prosthetics:

Mechanical engineers have played a crucial role in developing cutting-edge prosthetic limbs that are more lightweight, responsive, and adaptable, significantly improving the quality of life for amputees.

10. Green Building Technologies:

Mechanical engineers are at the forefront of designing sustainable and energy efficient buildings. Advancements in HVAC systems, energy-efficient materials, and smart building technologies are transforming the construction industry

Mr.SATHYAPRAKASH.M

III TD

Gas Assisted Injection Molding

The manufacturing sector is one of the most innovative in today's fast-paced world, setting new standards with each stride. Gas assisted injection molding is one such novel plastic manufacturing technique that offers great product quality.

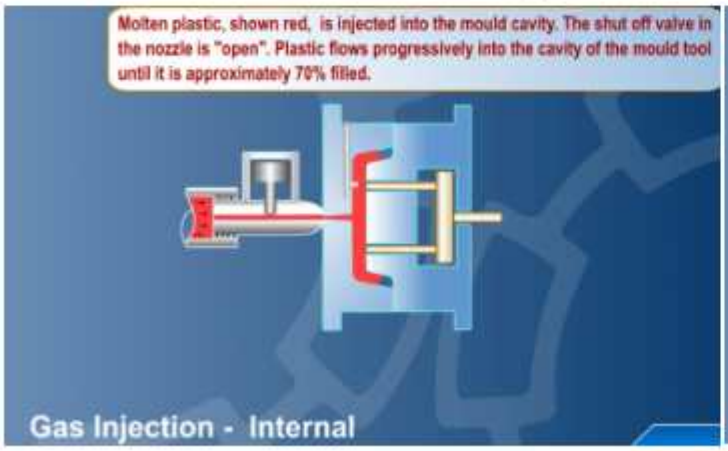
Gas assisted injection molding is a plastic molding process that combines principles of conventional injection molding with the application of pressurized inert gas. It uses mold cavities in the form of the product's shape. The mold is partially filled with ~70%-80% molten plastic raw material. Injecting Nitrogen gas fills the remaining volume to pack the plastic material against the mold's walls.

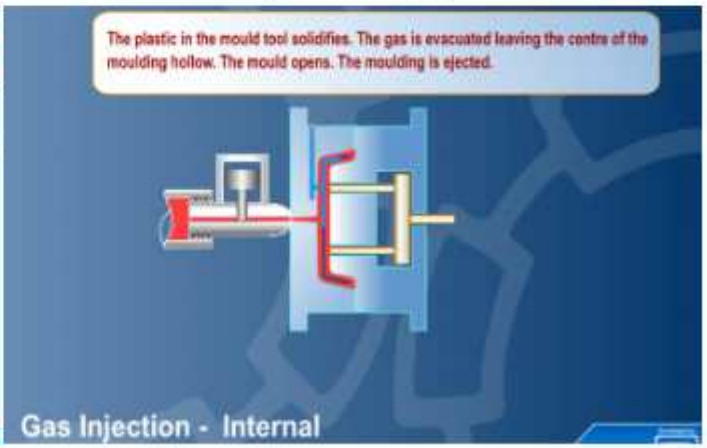
It is a very popular method to manufacture large, hollow molded plastic parts. It enjoys numerous advantages such as remarkable surface finish and geometric accuracy.

3 Stages of Gas Assist Molding

The gas assist injection molding process takes place in three stages (refer to the injection molding diagram below). Each stage constitutes an important step of the process and requires design sense and practical skill from the manufacturing Plastic Resin Injection At first, the mold clamps shut, and raw resin is fed into the hopper of the injection molding equipment. Just as in a regular injection molding process, the machine melts and pressurizes the resin in its screw-feed section.

The resin melts due to external heating and friction while the constantly decreasing pitch of the screw





compresses it to pressurize it. For gas assist

molding, pressure is lower than conventional injection molding as there is less material to pack into the mold due to hollow sections. Also, since the pressure comes from gas rather than a thick, viscous liquid, there are lower viscosity-based frictional losses inside the pressurized media itself.

This molten resin then enters the mold cavity. However, the resin injection mechanism does not fill up the mold since the product has hollow sections. The amount of injected resin material depends upon the volume of the part. It typically depends on geometrical factors like wall thickness, ribbed features, holes, etc. Usually, around ~70%-80% of the mold fills up with plastic material.

Primary Gas Penetration

After the required amount of resin enters the mold, the process of primary gas penetration begins. A pressurized gas source releases nitrogen into the spruce network, which forms a bubble inside the resin material.

The pressure and growing volume of the gas bubble push the molten resin to the boundaries of the mold. The pressure of the gas remains constant during this process, ensuring that the resin reaches all corners of the mold, filling it up.

Secondary Gas Penetration

Towards the end of the primary gas penetration phase, the resin starts to cool down and contract. Due to the gap created by this thermal contraction, the gas pressure slightly decreases. This can cause part deformations and induce geometric errors, which are never desirable.

Hence, there is a secondary gas penetration phase where more gas flows into the mold to fill up these gaps. This maintains uniform pressure and guarantees a neat fill.

Applications of Gas-Assisted Molded Plastic Parts

Gas assisted molded parts to have various applications. Generally, it is for injection molding hollow parts with ribbed/boss features and smooth surface finish requirements.

Automotive Panels/Handles: The door panels and handles of automobiles are a large part with a specific shape for structural integrity and aesthetics. This method is the perfect technique for this as it ensures a smooth surface finish and good strength.

- **Protective Housings:** Plastic enclosures for medical devices, computers, eyeglasses, etc. are mostly made from gas assisted injection molding. They need to have an aesthetically pleasing surface as they are end-user products and also require toughness due to their protection application.

- **Steering Wheels:** Steering wheels require plastics with high strength and temperature resistance. Plastic is also a lightweight material so the steering wheel is easy to turn.
- **Basketball Frames:** Basketball fans will know how sturdy the frame and hoop are. It gets its superior properties from the plastic material and manufacturing technique.

Advantages of Gas Assist Molding

Gas assist has several pros that make it the go-to technique for many manufacturers. Summarized below are all of its main advantages and disadvantages.

- **High Efficiency:** This is a clear advantage of gas assisted injection molding arising from its several gas channels. These channels allow the gas to penetrate easily and quickly to all parts of the mold, which is not possible with a viscous liquid. As a result, there is a uniform pressure distribution and lower internal stresses in the final part.
- **Less Plastic Material Used:** As mentioned before, the resin only partially fills the mold in this process. This means lower plastic material consumption for manufacturing, thus decreasing material and handling costs.
- **Smooth Surface Finish:** The uniformity of the pressurized gas maintains constant pressure at all points inside the mold. This helps to achieve a very smooth surface.
- **Lightweight Parts:** Plastics are generally lightweight materials. Furthermore, they only partially fill up the mold cavity. Both of these factors mean that the final part is lightweight.
- **High Dimensional Accuracy:** The uniform packing of the resin material achieves tight geometric tolerances. The outer surface gets its shape from the mold and the inner surface from the uniform pressure distribution of the gas.
- **Reduced Manufacturing Defects:** A common problem in injection molding is flow marks, sink marks and internal stresses induced by non-uniform pressures, and shrinkage during cooling. However, since the secondary gas penetration phase compensates for shrinkage, the final product is free from sink marks.
    - Mr.LOKESH. G
    - III TD

The Future of Forging

While there is no record of when or how the forging process was "discovered" by humans, we can imagine the origins of the process. Liquid metals smelted from crude ores needed to be fashioned into more useful objects. Hammering the lumps of metal was the means to change them into more useful shapes.

There are some who still think forging is nothing more than "heat it and beat it" to make crude end products. This may have been the original concept but working metal into high quality products has been a hallmark of civilization for thousands of years.

Metal smithing

Metal smithing, also called blacksmithing, was an important occupation. Those who could blacksmith would expertly ply the trade having positions of status in their communities. The number of people with the surname "Smith" and its counterpart name in other languages reflects the number of people once involved in metalworking, and the importance of those with special knowledge and skills.

When most people are asked to envision forging, the image is of a burly blacksmith in a dark and fiery forge, wielding a hammer to pound hot metal on an old-fashioned anvil – sparks flying. While blacksmiths and metal smiths still ply the trade, hammer forging has come far beyond those original processes. Our advanced technology and methods are some that no blacksmith of even 100 years ago could have ever imagined.

From Industrial Revolution era steam powered forges, the industry has advanced to highly automated equipment. The industry is continually evolving alloys and forgeable composites, and computational modelling and simulation to speed and assist design and engineering. Most forge shops, today, no longer resemble the dark caverns with flame belching furnaces.

"Factories of the Future"

Today, forging is performed in factories that may resemble any of the advanced manufacturing facilities often featured as "factories of the future". Forging has advanced with technology as the need for true wrought products are still in demand as the best forged parts on earth.

The deformation process of shaping and forming materials, especially metal alloys in a solid state, causes transformation to the microstructure in ways that no other process equals. The common analogy is kneading dough to mix and transform the constituent materials.

Working dough, like working metal, is not just to shape it into a specific form, but to improve the material for an intended use. The solid-state deformation of forging improves metal alloy properties. Toughness and durability, expressed as impact toughness and fatigue properties, are key benefits essential to any item to be used in safety critical application. Providing maximum metallurgical properties is the task forging will continue to provide well into the future.

The materials market, and the proliferation of new ways to process materials and produce products, has expanded significantly during the past several hundred years. Each process and type of material has come to occupy a product or process niche. The cost to provide a specific use benefit has proven successful in the marketplace. Many of these processes have displaced forged products, leading many to believe forging is becoming obsolete.

Evolution of Technology

More useful is to recognize this as the continuing evolution of technology. This affects not only products traditionally forged, but also items once carved from bone, wood, or stone, items cast in metal or made of glass, or demand for paper for books or newsprint. New manufacturing technologies take over wherever a function can be performed more effectively and efficiently. More commonly recognized forged products may have been supplanted over the years, but forging is still used to make the critical components that underpin the machines on which civilization relies.

Forging continues to be recognized as the premiere thermo-mechanical process. Not only to shape metals, metal matrix and metal composite materials, but to refine and transform the metallurgical structure as well. Forging achieves both durable, reliable component shapes and the need for engineered metallurgy to meet specific product requirements.

The variety of materials and processes available to design engineers for creating components and structures used in products has never been greater. That includes forging as well as all the other processes now available.

Forging has gone from being the way "anything good" was made or repaired to one of dozens of approaches in how to make a desired object. As the materials market expands, forging remains one of the critical techniques to turn raw materials into the most reliable, durable, metallurgically sound parts, pieces and components. Modern forging allows us to create and build products with confidence.

Mr.KISHORE

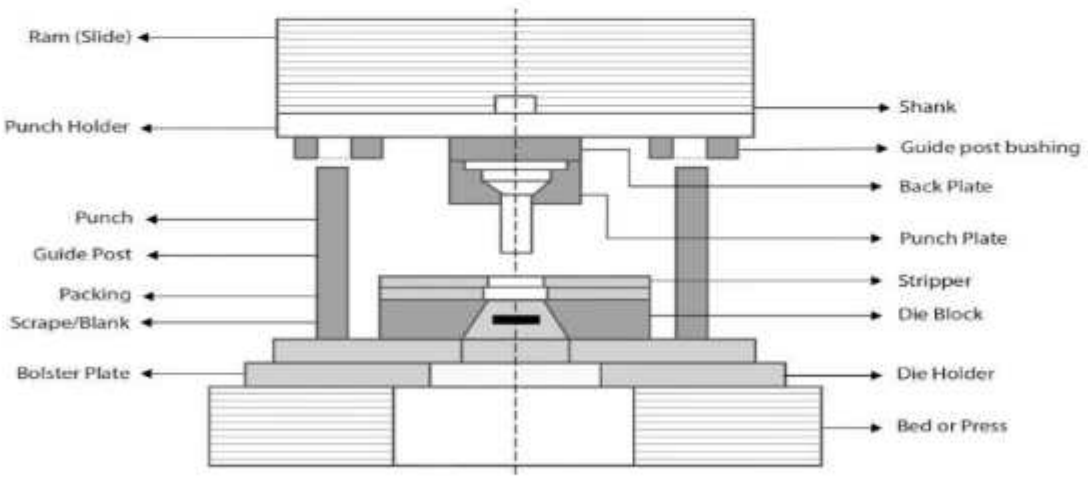
II TD

Press Tool Design in The Overall machining process

Press tool design is an integral part of the mold-making process and one that will help determine how well your plastic parts come out. Here are some of the basic elements to consider when designing press tools for your molds.

Press Tool Design Components

The major press tool die components are the punch and the die holder which help in fixing the die to the press machine. With regard to the manufacturing processes of press tools, it is necessary to utilize three main manufacturing methods: stamping/coining (sheet metal pressing), machining (metal shaping by using rotating cutting tools like mills or lathes), and wire-cut EDM (Electrical Discharge Machining). For the manufacture of special parts – rotor discs for axial turbines – you can apply other types of moldings with limited dimensional tolerances as well as the use of plasma spraying or powder metallurgy.



Press Tool Adjustment

Backing plates, punch plates and adjusting the height of the die are all important aspects of your tools. It is quite common for press tooling to work at extreme angles and that's why backing plates and punch plates made of cast iron are an industry standard. The material provides a durable, long-lasting backing that can

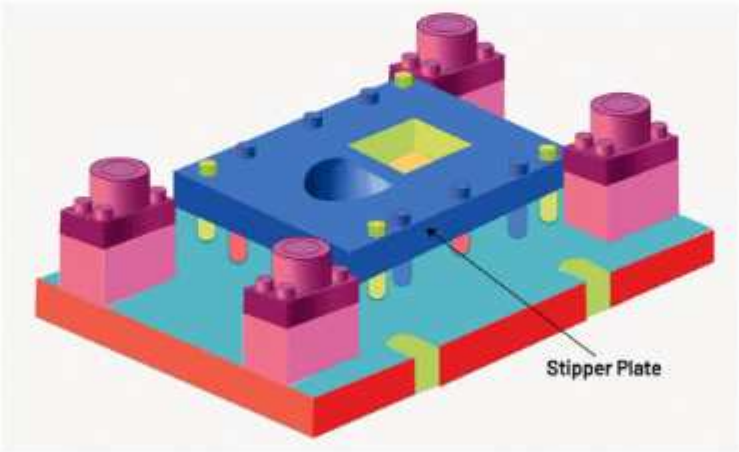
withstand any kind of stress when clamped down. An adjustable-height die allows you to test different depths and clearances without wasting expensive sheet metal punches or time on trial cuts. These features all make for a better-designed tool and ultimately make production more efficient because it cuts down on error and keeps products moving smoothly.

Selection of Materials

The most efficient way to select steel for press tools is to use a computer-controlled process that enables engineers, in a matter of minutes, to review all possible combinations of hardness, yield strength, elongation, tempering treatments, and surface finishes, etc. Thus software will help you sort through such materials as 17-4PH S73400 4140 or 4142 that come in various tempers. The right material selection results in tool life at least twice as long as normal as and usually three times longer than typical carbon steels.

Press Tool Efficiency

The accumulation of tool defects in die stamping, also known as punch cracking, occurs through press force and die tool-steel interaction. To minimize punch cracking you need an efficient press tool. This will help reduce excessive punch deflection while reducing tool wear due to crushing between steel punches. The steel type that you use for punch tools needs careful selection because not all types of steel can provide enhanced performance, toughness, and high yield strength, which are essential for effective press tool design. Steel grades that possess a high degree of impact toughness, such as HPM970 or HPM990 (Hitachi Press Steel), will help minimize tool wear by providing increased ductility at low temperatures. This property results in improved fatigue resistance, leading to longer life spans. At higher temperatures, such steels will offer higher impact strengths to resist punch cracking.



Analysis of Punch

A punch is an essential part of a press tool. It performs two functions, cutting and forming when it comes in contact with a material. With all punches, three factors are essential for accurate performance. This is valid or Compound Die, Material Selection, Die Design, Modeling (2D & 3D), Cost Estimation, Analysis of Punch, etc. Punch manufacturers always recommend compound dies to withstand demanding production requirements and to provide cost-effective life cycle costs. To maximize tool life an economic selection of materials are critical Take into account the hardness, durability, and wear resistance together with minimal distortion or deformation of the material. Designing die to get maximum productivity while maintaining accuracy can also help maximize tool lifetime thus optimizing overall production costs.

DRAWINGS

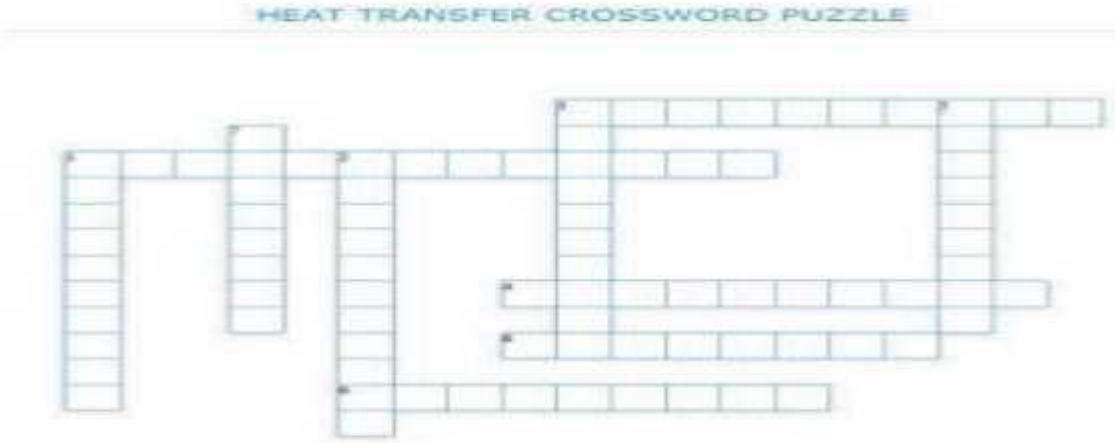
Mr.KEERTHIVASAN.M

III TD

Mr.HEMAKUMAR.V

II TD

CROSS WORD PUZZLE

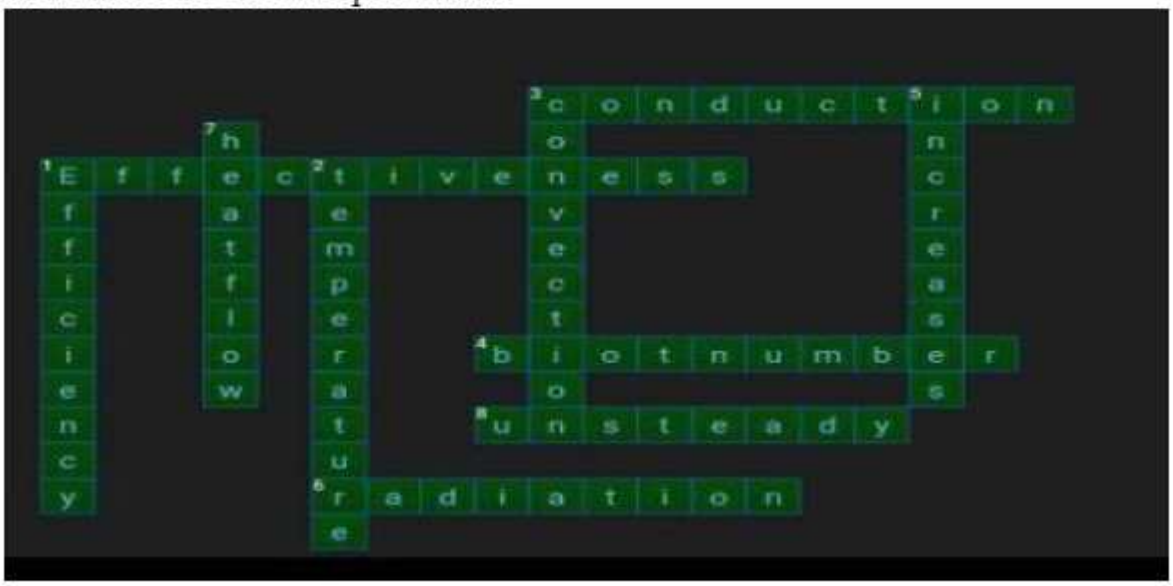


ACROSS

1. The ratio of heat transfer with fin to the heat transfer without fin is called as fin.
3. For solid applications which type of mode heat transfer used
4. On which number lumped parameter analysis depends.
6. For which mode of heat transfer the Stefan's Boltzmann's law is used.
8. The state in which there is a chance in temperature with respective time is called.

DOWN

1. The ratio of actual heat transfer to maximum possible heat transfer is called as FIN
2. Heat is closely related to
3. Heat transfer in liquid and gases takes place by
5. Thermal conductivity of air with rise in temperature.
7. Thermal insulation is used to prevent the



Interlocking Puzzles

DISASSEMBLING AN INTERLOCKING

Puzzle can be a robust challenge. Often, the pieces are so precisely fit together that taking them apart requires a reserve of patience as well as geometrical skill -and that's only half of the undertaking.

Putting an interlocking puzzle back together is the more difficult part of the solution. Interlocking puzzles, also called burrs because of some specimens' likeness to seed burrs, are made from wood, ivory, metal, or plastic.

They may form familiar shapes, such as dogs or fruits, or complex geometrical solids called polyhedral.

Some polyhedral interlocking puzzles are so visually appealing and so finely crafted that they are considered works of art in their own right.

Keychain puzzles, made from colorful interlocking plastic pieces, first appeared in 1939 and remained popular in America through the 1950s.

The molded shapes include airplanes, animals, and television and radio characters such as Schmooze and Howdy Doody.

Remarkably, many of the keychain puzzles in the Slocum collection have retained their original packaging.

POSTER

CASTING THE WORLD,
FORGING THE CAMPUS,
SHAPING THE UNIVERSE,
WELDING THE REST OF ALL BRANCHES,
BECAUSE WE ARE THE MEN,
WE ARE THE MACHINE,
AND WE ARE MECHANICAL ENGINEER'S.

2024 PASSOUT BATCH