PRO-MAG

MADRAS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF PRODUCTION TECHNOLOGY
THE ASSOCIATION OF PRODUCTION ENGINEERS
BATCH: 2016-2017

QUALITYCONTROLTOOLS

QUALITY CONTROL: Quality control (QC) is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer.

QC TOOLS: There are 7 basic QC tools which comprises of simple graphical and statistical techniques helpful in solving critical quality related issues.

1. Stratification (Divide and Conquer): Stratification is a method of dividing data into sub–categories and classify data based on group, division, class or levels that helps in deriving meaningful information to understand an existing problem. The very purpose of Stratification is to divide the data and conquer the meaning full Information to solve a problem.

2. Histogram: Histogram introduced by Karl Pearson is a bar graph representing the frequency distribution on each bars. The very purpose of Histogram is to study the density of data in any given distribution and understand the factors or data that repeat more often. Histogram helps in prioritizing factors and identifies which are the areas that needs utmost attention immediately.

3. Check sheet (Tally Sheet): A check sheet can be metrics, structured table or form for collecting data and analysing them. When the information collected is quantitative in nature, the check sheet can also be called as tally sheet. The very purpose of checklist is to list down the important checkpoints or events in a tabular/metrics format and keep on updating or marking the status on their occurrence which helps in understanding the progress, defect patterns and even causes for defects.

4. Cause-and-effect diagram: ("Fishbone" or Ishikawa diagram): The very purpose of this diagram is to identify all root causes behind a problem. Main cause is the eye of the fish and others form the sub-branches (fins) which forms the bone structure of a fish.

5. Pareto chart (80 – 20 Rule): In any process, 80% of problem or failure is just caused by 20% of few major factors which are often referred as Vital Few, whereas remaining 20% of problem or failure is caused by 80% of many minor factors which are also referred as Trivial Many. The very purpose of Pareto Chart is to highlight the most important factors that is the reason for major cause of problem or failure.

6. Scatter diagram: Scatter diagram or scatter plot is basically a statistical tool that depicts dependent variables on Y – Axis and Independent Variable on X – axis plotted as dots on their common intersection points Y = F(X) + C, where is C is an arbitrary constant. Very purpose of scatter Diagram is to establish a relationship between problem (overall effect) and causes that are affecting.

7. Control Chart (Shewhart Chart): Control chart is basically a statistical chart which helps in determining if an industrial process is within control and capable to meet the customer defined specification limits. The very purpose of control chart is to determine if the process is stable and capable within current conditions.

NAME : ABHISHEIK DEV V

REG NO.: 2017507001

EVOLUTION OF CAD

Computer Aided Designing, commonly referred to as CAD, is used in a wide variety of fields to accurately design and edit structure, components, and other applications. Over the time what had been done using pen and paper was replaced with the development and adoption of computers. Most CAD programs we use today can actually be traced back to over 50 years ago. In 1957, Patrick Hanratty, “the father of CAD/CAM” developed PRONTO the first CNC programming system. Ivan Sutherland developed Sketchpad as a part of his thesis at MIT in 1963. Users could interact with the program through a screen, a light pen to draft and a set of buttons to set parameters and constraints. Though the program was primitive in design by today’s standards, but it was highly complex for its time. The start of the 1970s saw research slowly turn from 2D to 3D. ADAM, a CAD software used as a basis for commercial CAD software systems, was released in 1972. CATIA was released later in 1977, bringing engineers into the world of 3D modelling. By the 1980s, commercial CAD systems began to appear in the aerospace, automotive and shipbuilding industries. The Introduction of the first IBM PC in 1981 truly marked the beginning of the large-scale adoption of CAD. The founding of Autodesk and AutoCAD marked a bigger milestone in CAD history. It was a huge success for Autodesk with AutoCAD winning “The best CAD product” award from PC world magazine in 1986 and continued to do this for next 10 years. AutoCAD was revolutionary but it was still predominantly 2D-based. This all changed with the release of Pro/ENGINEER in 1987. This program was based on solid geometry and parametric techniques for defining parts and assemblies. It ran on UNIX workstations, as PCs still didn’t have the capabilities required by CAD programs. By the 1990s, the PC was finally capable of computations that 3D CAD required. CAD software slowly became accessible to millions of engineer and consumers who previously could not afford the technology. In 1995, the first significant modeler for Windows was released-SOLIDWORKS by Dassault Systemes. In 1997 Autodesk released their first 3D modelling software Mechanical Desktop. This was a great success and they continued their success with their release of Autodesk Inventor in 1999. This decade saw the products of four competitors: Autodesk, Dassault Systems, PTC and UGS(now Siemens PLM). The beginning of 21st Century marked the release client-side CAD tools and web enabled CAD. Alibre released by Alibre Design in 2000 was the first client server 3D modelling over the Internet. AutoCAD2000i was the first web enabled CAD software. The next decade saw the growth of other popular CAD programs like Revit, Creo, Solid Works and many more. The future might see much evolution in CAD. Technology like Augumented reality and Virtual reality may be present in CAD software to assist the designers and the future would see more and more development in this field.

NAME: CHETAN GUPTA.K

REG NO: 2017507006

MACHINE DESIGN

Machine design is one of the important core subject of production engineering since it deals with analyzing the strength of material and accordingly the components are designed.

Theories of failure:

There are two types of loading; Static and dynamic loading. Depending on the type of loading the components to be designed because in static loading only at yield stress the material fails where as in fatigue loading due to drastic variation in load direction and magnitude even before yield stress the material fails. Depending upon the type of loading theories of failure are to be applied and corresponding safe stress values can be found. For static loading the theories of failure are Maximum Normal Stress Theory, Maximum Shear stress theory, Distortion energy theory, Maximum strain energy theory, Maximum strain theory. For dynamic loading Theories of failure can be done with Gerber's parabola, Goodman line, Modified goodman line, Soderberg line.

Design of weld, rivet, and bolt joints:

Most of the engineering components consists of weld, rivet and bolted joints,. Upon loading, the load carrying characteristics change individually, This load carrying capacity of these joints are to be known and accordingly if the joints are designed then the strength of the component increases. Usually both parallel welds and transverse welds are designed based on parallel weld theory. This is because the theoretical stress concentration value obtained from parallel weld theory is more so if we design for parallel weld then it is sufficient enough for transverse. Apart from that, rivet and bolt joints both are similar in designing provided that the asthetics, parts and purpose of rivets and bolts individually varies. For design purpose, eccentric loading conditions are considered. The primary forces and secondary forces on individual bolts or rivets are calculated and critical bolt or rivet is found. In addition to this, Rivets are subjected to three types of failure and they are tearing of plates, Shearing of rivets and Crushing of rivets. Based on these, Strength of the plate can be calculated and minimum efficiency of the joint can be found.

NAME: GIRISH.R

REG NO: 2017507013

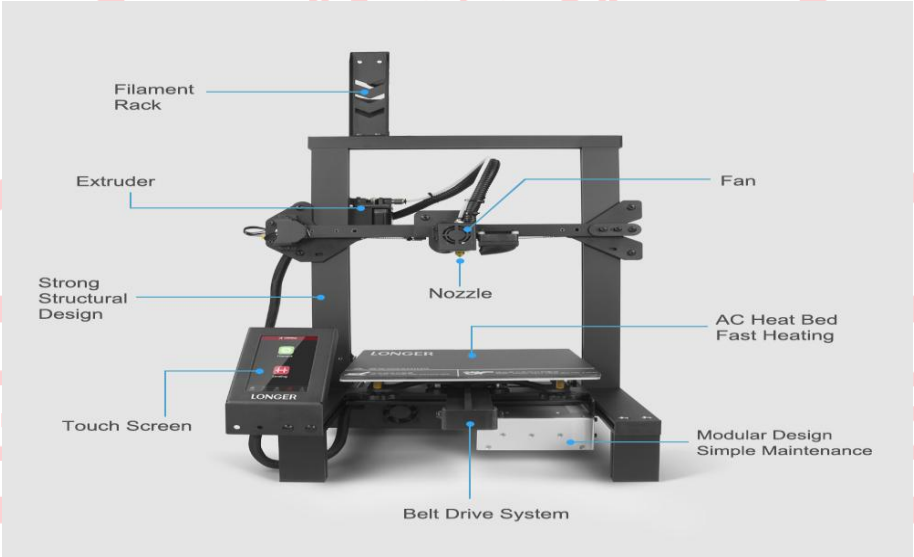
3D PRINTING IN MANUFTURING SECTOR

The manufacturing industry is always looking at new and innovative ways of working and in recent years, 3D printing has been at the forefront. Advancements in the 3D printing technology, equipment and materials has resulted in the costs being driven down, making it a more feasible option to general manufacturing use.

Traditional manufacturing is being able to match with the current demands only to some extent. One of the recently advanced technologies in industry is 3D printing. It is an additional manufacturing process of producing three dimensional objects from CAD models. Materials that is used nowadays for 3D printing is plastics. But metal additive manufacturing is also currently emerging. Many aerospace propellers and engines are being produced by metal additive manufacturing but they are in initial stages. It is being seen that many automobile parts which are made up of plastics are produced by 3D printing technologies and has increased the production rate in the automotive industries. There are seven types of processes used in 3d printing technologies namely vat polymerization, material jetting, binder jetting etc.

The main advantage of using 3D printing process are no limitations in geometry, reduction of cost, good time to market, reduced storage space and most importantly very minimal waste is produced as no material is removed.

Though there are challenges in this new 3d printing technology like more expensive machine setup, software requirement and material availability, it has a large wider scope to emerge as a growing sector in manufacturing and can take the manufacturing process to next level.



3D Printer Setup

NAME: GRACE HEPHZIBAH P

REG NO: 2017507015

QUALITY TOOLS - FAILURE MODE AND EFFECTS ANALYSIS

FMEA is the process of reviewing as many components, assemblies, and subsystems as possible to identify potential failure modes in a system and their causes and effects. For each component, the failure modes and their resulting effects on the rest of the system are recorded in a specific FMEA worksheet. There are numerous variations of such worksheets. An FMEA can be a qualitative analysis but may be put on a quantitative basis when mathematical failure rate models are combined with a statistical failure mode ratio database. It was one of the first highly structured, systematic techniques for failure analysis. FMEA is often the first step of a system reliability study.

FMEA is an inductive reasoning single point of failure analysis and is a core task in reliability engineering, safety engineering and quality engineering.

A successful FMEA activity helps identify potential failure modes based on experience with similar products and processes—or based on common physics of failure logic. It is widely used in development and manufacturing industries in various phases of the product life cycle. Effects analysis refers to studying the consequences of those failures on different system levels.

Functional analyses are needed as an input to determine correct failure modes, at all system levels, both for functional FMEA or Piece-Part FMEA. An FMEA is used to structure Mitigation for Risk reduction based on either failure effect severity reduction or based on lowering the probability of failure or both. The FMEA is in principle a full inductive analysis, however the failure probability can only be estimated or reduced by understanding the failure mechanism. Hence, FMEA may include information on causes of failure to reduce the possibility of occurrence by eliminating identified root causes.

NAME: GURURAJA S

REG NO: 2017507016

WHY CNC MACHINING?

This article is about the CNC machines and its technology development from conventional lathes and milling machines and how CNC machines can be used in this competitive world and also use of integration of CAM software in it.

Starting from conventional machines (lathe and milling) the machines which are used to machine various jobs according to the drawing which is given by the client. For machining process of job for client the machine has to undergo various setting and calculation such as work holding device, installation of tool, angle of tool post, RPM and calculation for implementing the values given in drawing on the hand wheel of table, tool movements etc,. Like this CNC machines also undergo several setting but installation is not that much time consuming on comparing with conventional machines and also not that much difficult to get job according to the drawing of clients. By using CNC machines in production will make great difference in productivity and quality of the products. Nowadays the conventional lathe and milling machines are integrated into one machine as machining center, mill turn.

Developments on the CNC machines is not stopped even it came after the conventional machines. In early days, CNC machines are called as NC machines because it is controlled by magnetic tapes by punching holes but now it is replaced by MCU (machine control unit)by giving set of instructions which already predefined to do certain functions (machine code and preparatory code). By that quality of job keeps on increasing and again developments on other machine elements to make the machining process more productive.

Vertical Milling Machine VMC

The developments are as follows;

Tool installation: To minimize the time consumed for replacing the tool or installation of new tool. Tool magazine /turret are made into CNC machines where we can load number of tools which has to be used to get the final product. The changing of tool in tool magazine also done automatically.

Loading/Unloading: loading and unloading also made easy by using pneumatic circuit controlling by foot pedal instead of doing it manually by loosening the chuck/vise.

Tooling: Now inserts are mostly used on CNC machines instead of one solid tool. Because of the development on inserts which have four cutting edges by this tool can be used in four ways. This helps in the expenses that spend on the machines.

Fixturing: Conventional machines also have fixturing but using on CNC machine is different by using this fixture, the machine can machine number of products in one cycle.

Offsetting: Offset on CNC machine is used to make the machine to know where the job is in machine and also for tool length. Earlier this offset is done by jogging a tool or edge finder but now it is done by probe from this manual offsetting time also reduced.

Multi axis: Introduction of this feature on CNC machines made the machines to be more productive and accurate. This feature made into CNC machine by using rotating working table and both rotating and swinging working table. By this feature more complex jobs can be machined in one job setting. Most commonly used multi axis machines are 4, 5 axis machines and some manufacturers are Haas, Hurco, and Makino.

CAM software Integration: By this programming on CNC machines are easy to make complex part and calculation for the profile on drawing. Time consumed on programming lesser when we comparing on doing manually. This CAM software program can be transferred to the machines via Ethernet cables and flash drives instead of writing thousand lines of code manually by typing it on MCU to reduce time consumption on that also.

These are all some developments and implementation of new technologies for manufacturing. There are more developments keeps on coming now and some earlier ones like interchangeability of tool holders, on fixturing, and APC (Automatic Pallet Changer).

NAME: S.JAYACHANDRA BALAJ

REG NO: 2017507020

ALUMINIUM- CERIUM ALLOY FOR CASTING

New development work has taken place since 2010 in the Al-Ce system because of a potentially large impact on the economics of rare earth mining if large amounts of cerium could be consumed.

The alloys generally do not require thermal treatment. The alloys are primarily solid solution and intermetallic strengthened and do not require heat treatment to develop properties. Homogenization has proved to be beneficial in some alloys. It has a eutectic composition at about 10 wt% Ce with a eutectic temperature of 640°C.

Castability of the Al-12Ce alloy met or exceeded the castability of commercial Al-Si casting alloys. Addition of 0.4% Mg had no adverse effect on casting castability. However, addition of 4 wt% silicon greatly inhibits the fluidity of the alloy.

Most heat-treating processes for aluminum require a water quench where significant distortion can occur. This distortion then needs to be corrected by a straightening operation, which can be time consuming and risks damage to the casting. The rapid quench can also induce residual stress into the casting, which reduces its performance or causes difficulty for machining.

Applications:

- Complicated thin wall castings and airfoils that require moderate room temperature properties without heat treating.
- The second group of applications focuses on high temperature products that operate above the aging temperatures of standard aluminum alloys of about 150°C. These applications include turbocharger components, cylinder heads and pistons.

NAME : JAYASRI

REG NO: 2017507021

MARKETING

Marketing plays an important role in making the customers to get interested in our products thereby increasing the sales. It is concerned with customers perspective to understand their minds, needs and delivering products or services that matches customers requirement in the best possible way resulting in customer satisfaction and hence maximization of profit. There are some essential **Functions of marketing** which helps us to connect to the customers effectively.

The company must have sufficient **Financial resources** to advertise their product. As soon as the product begins to gain popularity, the company should spend more to make its product easily accessible. Fixing the Price of a product requires extensive market research, since this can lead to large losses of the firm. The growth and fall in prices is directly related to the economy of the country and the growth in demand for the product.

The company must have sufficient **financial resources** to advertise their product. As soon as the product begins to gain popularity, the company should spend more to make its product easily accessible. Fixing the Price of a product requires extensive market research, since this can lead to large losses of the firm. The growth and fall in prices is directly related to the economy of the country and the growth in demand for the product.

Distribution is the process of deciding how to distribute the manufactured goods in customers hands. Distribution is very much essential such that without distribution, the value does not end where you intend it to be.

The goal of **Promotion** is to increase demand and increase brand awareness. Promotion plays a vital role in gaining popularity of the product and so the profit increases. Selling is concerned with the prospective buyers to actually complete the purchase of an article. It means the transfer of ownership of goods to the buyer.

Marketing Information Management includes understanding your target audience, which involves understanding the interests of customers, and their needs. Marketing decisions rely on rich information about customers, trends, and competing products. **Product management is** obtaining, developing, and improving a product or a product mix in response to market opportunities. Marketing research guides product management towards what the consumer needs and wants. In the fast moving world, marketing is very much important for the product to sustain in the market.

NAME : MOHAN PERMESHWER R

REG NO: 2017507031

MANUFACTURE OF TIRES

Pneumatic tires are critical components of the vehicles on which they are used. They are used on automobiles, trucks, farm tractors, earth-moving equipment, military vehicles, bicycles, and aircraft. A tire is an assembly of many parts, whose manufacture is unexpectedly complex. A passenger car tire consists of about 50 individual pieces; a large earthmover tire may have as many as 175. Tire manufacturing can be summarized in three steps: (1) preforming of components, (2) building the carcass and adding rubber strips to form the sidewalls and treads, and (3) moulding and curing the components into one integral piece.

PREFORMING OF COMPONENTS

The carcass consists of several separate components, most of which are rubber or reinforced rubber. These, as well as the sidewall and tread rubber, are produced by continuous processes and then pre-cut to size and shape for subsequent assembly. The other components, and the preforming processes to fabricate them are:

Bead coil: Continuous steel wire is rubber-coated, cut, coiled, and the ends joined.

Plies: Continuous fabric (textile, nylon, fibre glass, steel) is rubber coated in a calendering process and pre-cut to size and shape.

Inner lining: For tube tires, the inner liner is calendered onto the innermost ply. For tubeless tires, the liner is calendered as a two-layered laminate.

Belts: Continuous fabric is rubber coated (like plies) but cut at different angles for better reinforcement; then made into a multi-ply belt.

Tread: Extruded as continuous strip; then cut and preassembled to belts.

Sidewall: Extruded as continuous strip; then cut to size and shape.

BUILDING THE CARCASS

The carcass is traditionally assembled using a machine known as a building drum, whose main element is a cylindrical arbour that rotates. Pre-cut strips that form the carcass are built up around Arbor in a step-by-step procedure. The layered plies that form the cross section of the tire are anchored on opposite sides of the rim by two bead coils. The bead coils consist of multiple strands of high-strength steel wire.

Other components includes various wrappings and filler pieces are combined with the plies and bead coils. After these parts are placed around the Arbor and the proper number of plies have been added, the belts are applied. This is followed by the outside rubber that will become the sidewall and tread. At this point in the process, the treads are rubber strips of uniform cross section. The building drum is collapsible, so that the unfinished tire (tubular form) can be removed when finished.

MOLDING AND CURING

Tire moulds are usually two-piece construction (split moulds) and contain the tread pattern to be impressed on the tire. The mould is bolted into a press, one half attached to the upper platen (the lid) and the bottom half fastened to the lower platen (the base). The uncured tire is placed over an expandable diaphragm and inserted between the mould halves.

The press is then closed, and the diaphragm expanded, so that the soft rubber is pressed against the cavity of the mould. This causes the tread pattern to be imparted to the rubber. At the same time, the rubber is heated, both from the outside by the mould and from the inside by the diaphragm. Circulating hot water or steam under pressure are used to heat the diaphragm. After curing is completed, the tire is cooled and removed from the press.

NAME: MUJAHIDKAMAL H

REG NO: 2017507032

VIRTUAL MANUFACTURING

Virtual engineering is an emerging technology which integrates geometric models and related engineering tools such as design, analysis, simulation, optimization and decision making tools within computer-generated environment .It has the ability to interchange models between their use in simulation and control environments. It is nothing but manufacturing in computers.

Problems inside manufacturing:

Companies are responsible for reuse/recycling and safety of waste. The long term employment of labour became more and more difficult.

Problems in manufacturing with respect to social circumstances:

New product must fit to new climate, environment, culture and style.

Types of VM:

Types of product and product design:

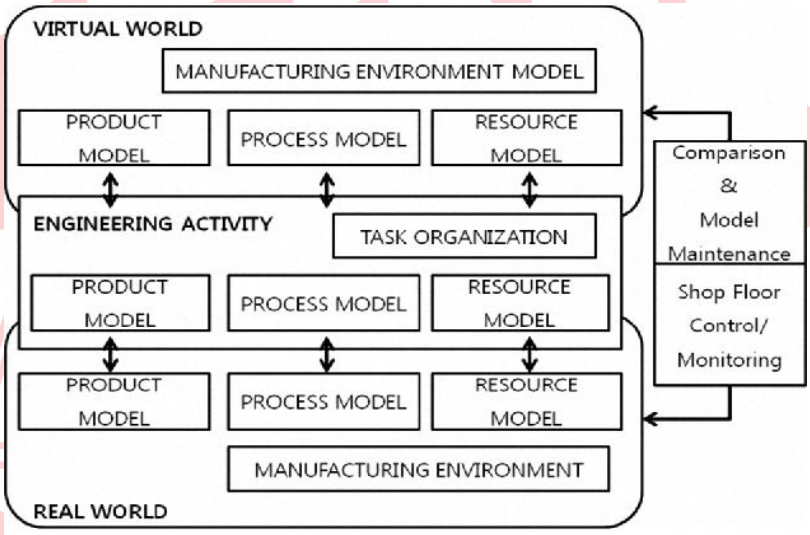
- Design oriented
- Production oriented
- Control oriented

Types of system integration:

- Real physical system
- Real Information system
- Virtual Physical system
- Virtual Information system.

Types of functional usage:

- Virtual Prototyping
- Virtual Machining.
- Virtual inspection
- Virtual Assembly.



Flowchart of Virtual Manufacturing

Vision of VM:

The vision of Virtual Manufacturing is to provide a capability to make it in the computer. VM provides a modelling and simulation environment such that the design, analysis and fabrication/assembly of any product including the associated manufacturing processes which can be simulated in the computer.

Benefits of VM:

From product point of view, it will improve quality of the product, reduce number of physical prototype models, and from production point of view, it will improve the confidence in the process, reduce material waste, reduce tooling cost, lowers manufacturing cost and optimizes manufacturing process. Implementing VM contributes several benefits

such as ensuring higher quality of the tools, lesser cycle time for production of parts without false start, optimize the design for manufacturing

Stages of virtual manufacturing:

1. **Reality:** Real manufacturing operation
2. **Augmented reality:** Manufacturing system control is augmented by the use of electronic hardware and computer software
3. **Augmented virtuality:** Consist of higher level of virtuality than augmented reality.
4. **Virtuality:** Encompasses immersion in a completely synthetic environment. The integration of virtual reality technology into the conceptual design and process planning stages reduces design time and cost

Draw backs of VM:

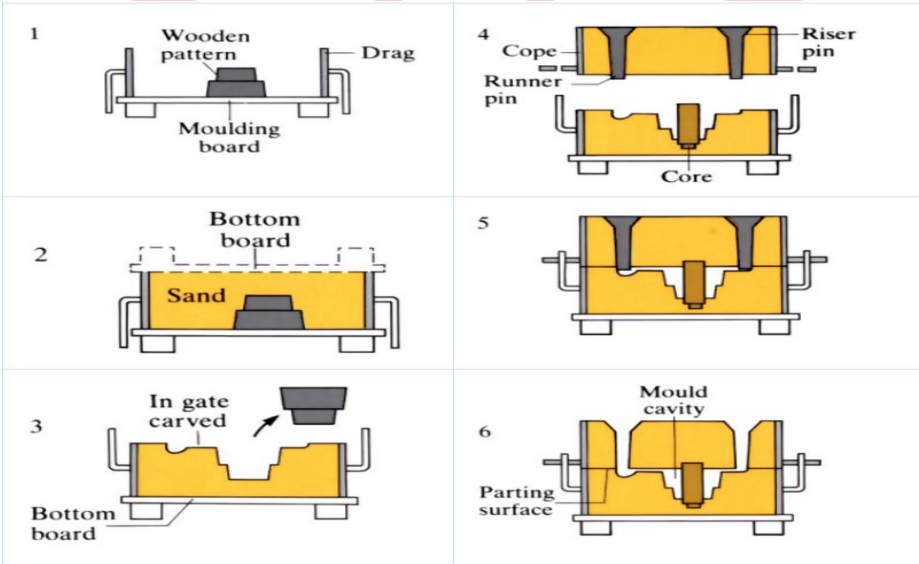
- Setup of VM system requires huge capital investment for material, simulation software and human.
- Secondly with respect to availability of simulation model, each time at each level a new model has to be built even though the previous model has been already done.
- Thirdly compatibility of VM software and hardware is essential for better effectiveness.
- In human-computer interfaces users expect to interact with the computer in a human like manner.
- Development of good interfaces not only graphical but also mixtures of text, voice, visual interface are required.

NAME: SABARI PRASANTH N

REG NO: 2017507039

CASTING

Casting is a manufacturing process in which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting, which is ejected or broken out of the mold to complete the process. Casting materials are usually metals or various time setting materials that cure after mixing two or more components together; examples are epoxy, concrete, plaster and clay.



Steps Involved in Casting

Sand Casting:

Sand casting, also known as sand molded casting, is a metal casting process characterized by using sand as the mold material. The term "sand casting" can also refer to an object produced via the sand casting process. Sand castings are produced in specialized factories called foundries. Over 60% of all metal castings are produced via sand casting process

Patterns:

From the design, provided by a designer, a skilled pattern maker builds a pattern of the object to be produced, using wood, metal, or a plastic such as expanded polystyrene. Sand can be ground, swept into shape. Paths for the entrance of metal into the mold cavity constitute the runner system.

Pattern Allowances:

- Shrinkage allowance
- Draft or Taper allowance
- Distortion allowance
- Machining allowance
- Shaking allowance

NAME: SANJAY KUMAR S

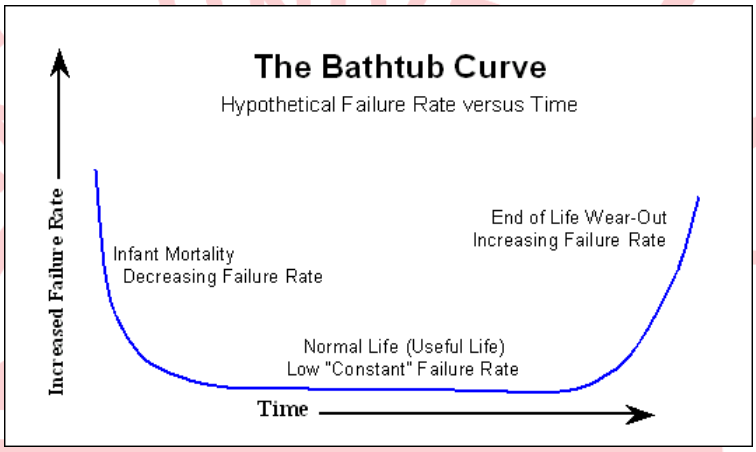
REG NO: 2017507040

RELIABILITY -LIFE CYCLE CURVE

Reliability is the probability of a product performing its intended function for a stated period of time under certain conditions.

Life cycle curve is a visual representation of the failure rate of a product or group of products over time. This curve is often referred to as the **Bath tub curve.** The curve in which the failure rate is plotted as a function of time. By plotting the occurrences of failure over time, a bathtub curve maps out three periods that an asset experiences within its lifetime: Infant mortality period or phase (debugging phase), Normal life period or phase (chance-failure phase), Wear-out period or phase.

Debugging phase – exhibits a drop in the failure rate as initial problems identified **during** prototype testing are ironed out.



Reliability -Life Cycle Curve

Chance-failure phase – failure occur randomly and independently. This phase, in which the failure is constant. It shows the useful life of the product**.**

Wear out phase – an increase in the failure rate is observed. At the end of their useful life, parts age and wear out.

NAME: SHAKTHIMUTHU N

REG NO: 2017507043

BSVI ENGINE

I am pursuing my final year in the department of production technology. Even though I had studied many core subjects related to my field like solid mechanics, fluid mechanics, thermodynamics, design, manufacturing, metrology etc I found prior interest in the study of automobile engines. The working of 4-stroke engine and 2-stroke engine drives me crazy, then I started learning about automobile engines and updating with recent trends.

The governing body, Bharat Stage Emission Standards (BSES) regulates the output of pollutants from vehicles plying in the country. The Central Pollution Control Board which falls under the Ministry of Environment, Forest and Climate Change sets the standards to regulate emissions from vehicles in India. For a cleaner environment and to address the growing concerns about global warming, the Indian government has fast-forwarded from BS4 to BS6 pollution norms on 1 April 2020. Under the BS6 norm, the limit of pollution has been drastically reduced, for diesel engines the amount of nitrous oxide is reduced to 80mg/km from 250mg/km while in petrol engines it is reduced to 60mg/km from 80mg/km. Sulphur content in BS4 fuel is 50parts per million while in BS6 it is 10 parts per million which is five times lower in the BS6 fuel. The HC+NOx has been reduced from 300mg/km in the BS4 to 170mg/km, while the Particulate Matter(PM) level has been decreased from 25mg/km to 4.5mg/km.

With the BS6 norms, Selective Catalytic Reduction (SCR) and Diesel Particulate Filter (DPF) were included to assess the emission levels of the BS6 motor vehicle, Onboard Diagnostic (OD), Real Driving Emission (RDE) to make sure the emission from the motor vehicle is measured on a real-time basis which are not present in BS4 engines.

NAME: SHARATHKUMAR S

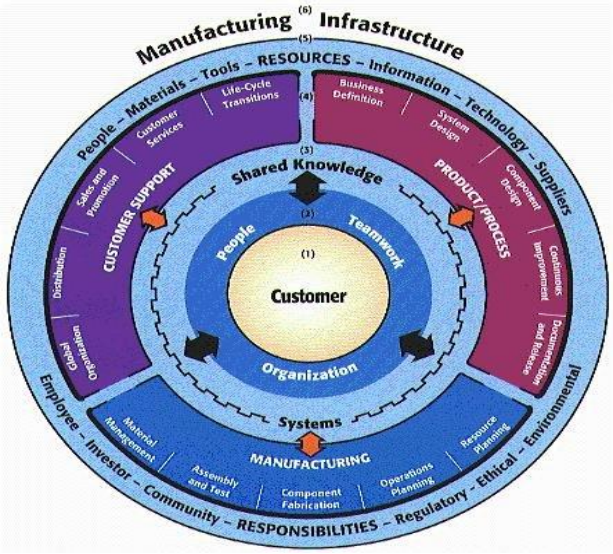
REG NO: 2017507044

COMPUTER INTEGRATED MANUFACTURING

The swiftness of technology is rapid with the power to transform manufacturing. Automation, digitalization and connectivity along with management gives the means to many manufacturing facilities. Manufacturing is the creation and assembly of components and finished products for sale on a large scale. The utilization of computers to control the entire production process is called computer integrated manufacturing (CIM). This technology is mostly used by factories to automate functions such as analysis, cost accounting, design, distribution, inventory control, planning and purchasing.

CIM refers to the use of computer-controlled machines and automation systems in manufacturing products. By this approach a complete automation is provided for the manufacturing facility. All the operations are controlled by computers and have a common storage and distribution. CIM combines various softwares like computer-aided design (CAD) and computer-aided manufacturing (CAM) to provide an error-free manufacturing process that reduces manual labor and automates repetitive tasks. Automated storage and retrieval system, Flexible manufacturing system, Robotics, Automated Guided Vehicles and Automated convergence system are some of the technologies used in CIM.

Over the last five years, there has been a steep rise in the number of manufacturing industries adopting full computer-based integration of the overall system of manufacturing. The rapid development of computer technology has created new opportunities for automation. This has paved the way for the development of flexible technology. It is clear that the management of modern production systems requires the necessary use of information technology - software. Factories must be trained to implement the new production philosophy.



CIM Wheel

NAME: VAISHNAVI SIVA P S

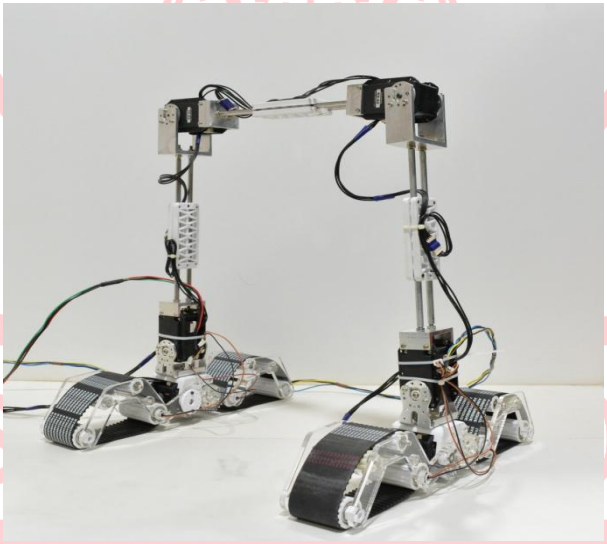
REG NO: 2017507051

BIOLOGICALLY INSPIRED MULTI-MODAL ROBOT LOCOMOTION

Robot locomotion is the collective name for the various methods that robots use to transport themselves from place to place. The major role in this field is in developing capabilities for robots to autonomously decide how, when, and where to move. The desire to create robots with dynamic locomotive abilities has driven scientists to look to nature for solutions. Multiple animals have provided inspiration for the design of several robots. One among them is the modelling of a multi-modal jumping and gliding robot after the Vampire Bat.

The design of the robot called Multi-Mo Bat involved the establishment of four primary phases of operation: energy storage phase, jumping phase, coasting phase and gliding phase. The energy storing phase essentially involves the reservation of energy for the jumping energy. This energy is stored in the main power springs. This process additionally creates a torque around the joint of the shoulders which in turn configures the legs for jumping. Once the stored energy is released the jump phase can be initiated. When the jump phase is initiated and the robot takes off from the ground, it transitions to the coast phase which occurs until the acme is reached and it begins to descend.

As robot descends, drag helps to reduce the speed at which it descends as the wing is reconfigured due to increased drag on the bottom of the airfoils. At this stage, the robot glides down. The anatomy of the arm of the vampire bat plays a key role in the design of the leg of the robot. In order to minimize the number of degree of freedom, the two components of the arm are mirrored over the x-z plane. This then creates the four-bar design of the leg structure of the robot which results in only 2 independent DOFs.



Multi-Modal Robot-Graspman

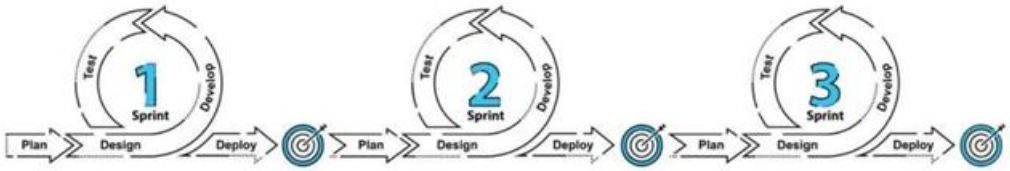
NAME: VIGNESH RV

REG NO: 2017507053

PRODUCT DEVELOPMENT LIFECYCLE- AGILE METHODOLOGY

AGILE methodology is a practice that promotes continuous iteration of development and testing throughout the software development lifecycle of the project. In the Agile model, both development and testing activities are concurrent, unlike the Waterfall mode.

The Agile software development methodology is one of the simplest and effective processes to turn a vision for a business need into software solutions. Agile is a term used to describe software development approaches that employ continual planning, learning, improvement, team collaboration, evolutionary development, and early delivery. It encourages flexible responses to change.



AGILE METHODOLOGY

In general, there are four central tenets of the Agile Manifesto that are important for testers to remember: Individuals and interactions over processes and tools, Working software over comprehensive documentation, Responding to change over following a plan, Collaborating with customers over contract negotiation

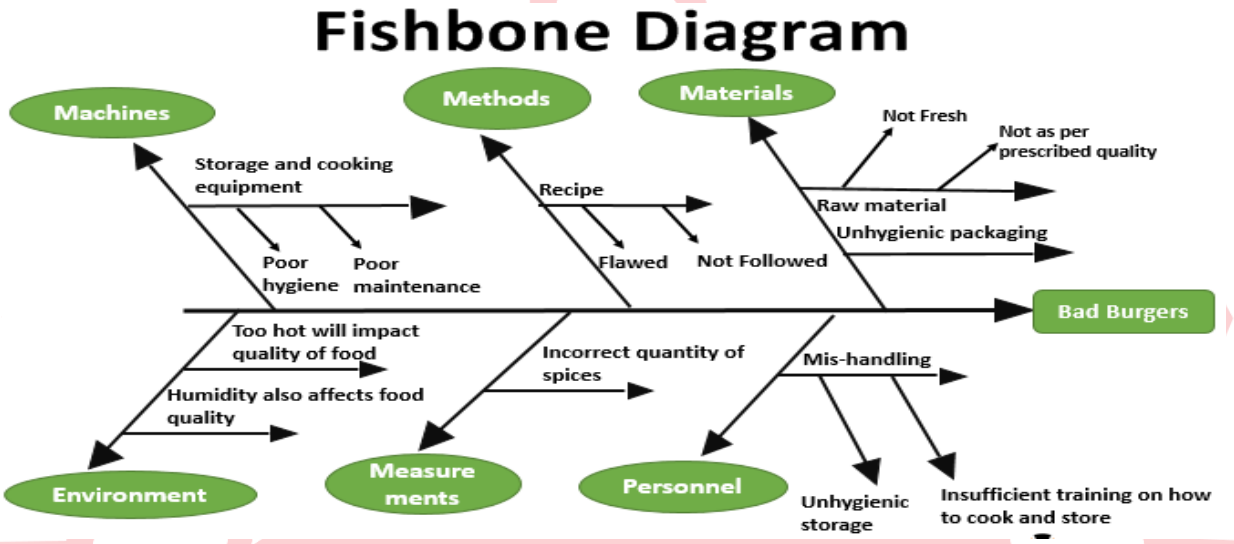
It all started in the spring of 2000, when a group of 17 software developers, including Martin Fowler, Jim Highsmith, Jon Kern, Jeff Sutherland, Ken Schwaber, and Bob Martin met in Oregon to discuss how they could speed up development times in order bring new software to market faster.

NAME: VISHAL K

REG NO: 2017507055

QUALITY TOOLS – FISHBONE/ISHIKAWA DIAGRAM

The fishbone diagram or Ishikawa diagram is a cause-and-effect diagram that helps managers to track down the reasons for imperfections, variations, defects, or failures. Once all the causes that underlie the problem have been identified, managers can start looking for solutions to ensure that the problem doesn't become a recurring one. This diagram can also be used in product development. Having a problem-solving product will ensure that your new development will be popular – provided people care about the problem you're trying to solve.



Fishbone/Ishikawa Diagram

The fishbone diagram strives to pinpoint everything that's wrong with current market offerings so that you can develop an innovation that doesn't have these problems. Finally, the fishbone diagram is also a great way to look for and prevent quality problems before they ever arise. Use it to troubleshoot before there is trouble, and you can overcome all or most of your teething troubles when introducing something new.

A fishbone diagram is useful in product development and troubleshooting processes to focus conversation. After the group has brainstormed all the possible causes for a problem, the facilitator helps the group to rate the potential causes according to their level of importance and diagram a hierarchy. The design of the diagram looks much like a skeleton of a fish.

Dr. Kaoru Ishikawa, a Japanese quality control expert, is credited with inventing the fishbone diagram to help employees avoid solutions that merely address the symptoms of a much larger problem. Fishbone diagrams are considered one of the seven basic quality tools and are used in the "analyse" phase of Six Sigma's DMAIC (define, measure, analyse, improve, control) approach to problem solving.

NAME: AADRIKA U

REG NO: 2017507056