Scope of Digital Manufacturing in India after Covid-19

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Abstract: Digital Manufacturing has got wide Scope after COVID-19pandemic Digital Manufacturing is a wider term .in new age of manufacturing, where material and digital innovations makes the industry to achieve the desired design and quantity in shorter time period compared to conventional method. It comprise of ergonomics, human factor analysis, visualization, manufacturing simulation, product design to process and process design. After pandemic there is increase in demand of many commodity for which high rate of production is required to overcome this digital manufacturing can play vital role in overcoming this.

Keywords: Digital Manufacturing, Virtual reality, Smart factory COVID-19

INTRODUCTION

In Indian Scenario after COVID-19 Pandemic, Digital manufacturing can play vital role in balancing the demand and supply of Products as by increasing the Production the required products. Digital manufacturing is basically design centered, control centered, manufacturing centered and management centered. Further if we again go in details of the manufacturing, we can have virtual manufacturing and rapid prototyping. In this century, which is been analysed by network and information, it will change the way of processing, obtaining, transferring and using proper information and high knowledge by human that will propel an significant improvement of human well being, production patterns and social structure.[1] The network manufacturing, E-Commerce manufacturing can be done by information sharing and collaboration. In digital manufacturing all are interconnected digitally by internet, intranet, and extranet. After the manufacturing process has to be checked in digital condition, also control data is loaded to NC machine to start production process.

Manufacturing to digital manufacturing

Digital Manufacturing is nothing but it is use of an integration of computer integrated system comprised of 3 D visualization, Simulation analytic and collective tool to produce product and manufacture the product simultaneously. Conventional way to manufacture where there is line process and in which the design of product and drawing is shared with highly skilled worker in the machine shop for creating the prototype. Whereas in Digital manufacturing we make use of Computer aided design software [2]. These design and process are simulated for checking its feasibility for the manufacturing of the product.

The product is inspected at every level of operations by using computer oriented quality control methods. Digital Supply chain management is very effective in getting the customized product and which helps in reducing the inventory. Social media is involved for digital marketing in order to improve profitability.[3]

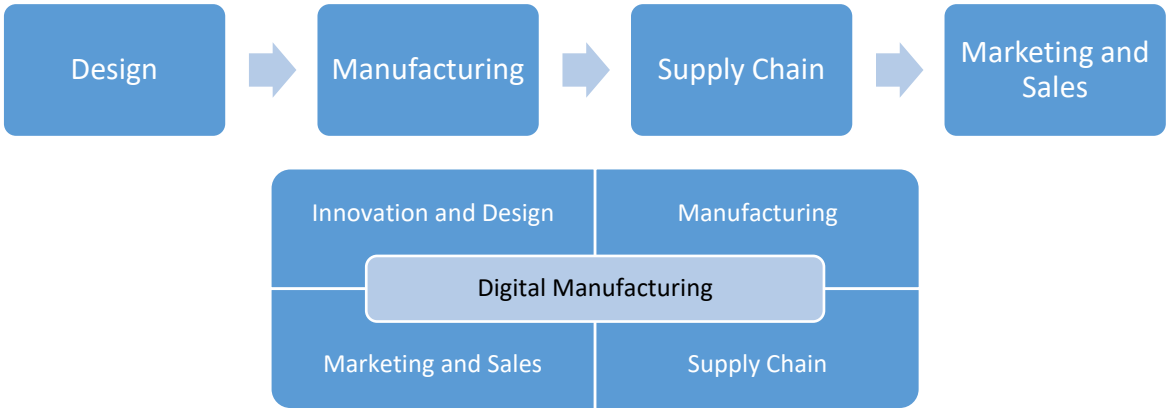

Figure 1 Basic Concept of Digital Manufacturing

DIGITAL MANUFACTURING Unit and its concept

In Digital Manufacturing the manufacturing process is done with the help of advance technology, namely virtual reality, computer networks, rapid prototyping, and the database associated with it is to be shared digitally based on the demand of customer which has to be further analysed ,recombined and organized the information in order to get desired process, product and the recourses required for manufacturing it. Depending on demand of the customer needs for quality and requirement simulation as well as rapid prototyping is done. As a advance version manufacturing engineering, it gives emphasis on the amalgamate various manufacturing branches and helps in providing the innovative development in the direction of Advanced Manufacturing Technology.

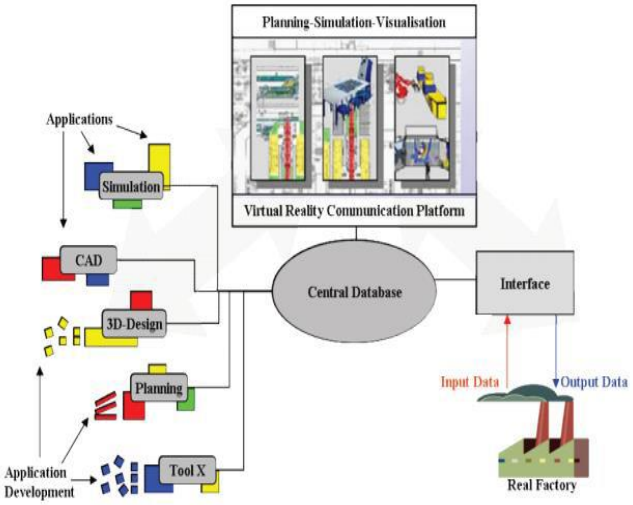

Figure 2 Digital Manufacturing Unit

After COVID-19. Pandemic there is total paradigm shift to health care industry, Food Processing Industry, Automotive industry and Construction Industry. The Scope of Digital Manufacturing is very important in this industry to full fill the increase in the demand of the product related to these industries. It is necessary to setup a unique intelligent model, which will process, analyse, process, optimise and control the flow of data and information in the whole manufacturing system and manufacturing process, and to realize the optimisation of the manufacturing process.

The increase in the performance of manufacturing equipment, the increase in the reliability of product quality and production, as well as customer satisfaction, which makes the digital manufacturing to take centre stage.

Digital manufacturing systems allow manufacturing engineers to establish the consummate definition of a manufacturing process in a virtual environment, including: Tooling, Assembly Lines, Work Centers, Facility Layout, Ergonomics and Resources.[4]

Digital manufacturing in industry based the stand up the bridging pillars, and these pillar are Product design, engineering and production.

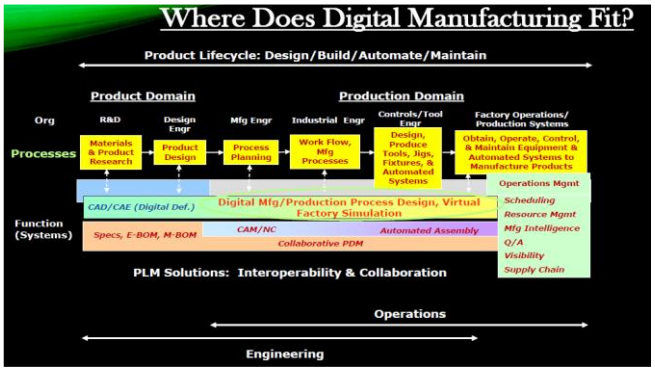

Figure 3 Where does Digital Manufacturing fit

To reduce lead time to product development and to increase production to reduce production lead time can speedup manufacturing process.

The manufacturing and cost of quality of the product are determined by design phase and production phases. These are significant need to bridge the difference between production and digital manufacturing aim to play vital role in it.

But it is possible now a day to find the flaw in design much earlier by the engineer and can be rectified quickly.

Number of industries is using digital manufacturing in the pieces without knowing it.

Digital manufacturing is to be leveraged in order to reduce the gap between product definition and actual manufacturing of the product. Virtual reality and simulation can reduce the cost and time to the market. As in manufacturing cost which is incurred is only 30% of actual cost, and remaining 70% is product development Cost, marketing, design. By exploiting digital manufacturing, company can achieve

Reduction in manufacturing cost

Improved quality of product

Reduction in error

Shortened product development

Faster time to market

adapting to changes in a covid-19 environment

After COVID-19, as it is known that Flexibility can provide the industries plenty of advantages in innovations in orientation of customer and market. But the industries are adaptable to it in very low extent, due to the structures of the industries. After COVID -19, the internal and external factors in the manufacturing sector are changing very fast which is the demand of the day that requires the dynamic change in structure of organization and operations. The problems are time base transformation, when altering structures concerning possessions and property, personal resources and established methods in the information system.

Adaptability has a temporal aspect. Whether the management is willing to change or not is not the question, this is being strived by permanently by all responsible persons in management. After COVID-19 , the crucial factor is the time required and expense involved when carrying out an alteration

research in digital manufacturing up till now

The developments in digital manufacturing up till now are as follows. With in digital industry framework number numerous Computer supported methods is developed which has been aimed at. The aspect of digital manufacturing and its vision to make it in reality is also the contribution of many researchers. [5].

The new simulation developed in digital makeup during 1990 is the main reason behind the success of Virtual Reality and simulation in Digital Manufacturing. These new technologies had very important role in combining product, process, and resource, knowledge, and simulation models within the digital makeup module. [6]

The discussion regarding the human motion is the key aspect for combining the Human aspect in simulation which makes it more interesting. [7]

Integrating design in digital condition is new field of research, as the system is virtual so the data sharing and making the data to reach every concerned departments for making the significant firm decisions to make everything available to every concerned on highly protected internet web link.[8]

Research is going on for defining and implementing the Virtual Reality and the integration with digital manufacturing by inculcating the human aspect in production system. [9]

In the digital environment the use of software for monitoring all aspect of manufacturing such as machine, buffer labour etc is suggested but for sudden breakdown internet based framework is suggested for help in product development and production also for distribution. [10]

The Emerging technologies like Internet of Things and 3 D printer are used for experiment. Where belt conveyor system with automated quality check is done in assembly line only. Internet of Thing is basically use for positioning of fixture with ultra high frequency.[11]

digital green manufacturing

After COVID -19, Digital green manufacturing is going to play important role as it is been combined organically for manufacturing green revolution and for manufacturing digitalization, which is been providing an effective unique model in solving the design, manufacturing for green digital manufacturing which provides very a breakthrough in avoiding the bottleneck of green manufacturing. Green digital manufacturing uses latest advance manufacturing technology, digital technology, management technology, information technology, environmental technology and control technology for the effective use of different resources, for proper utilisation of information, material, energy, capital and to maintain the flow smooth, in process to achieve the global optimization of industries and ecological environment.

Current manufacturing unit will be Sustainable if the development is the motto for development, the future trend in digital manufacturing industry is green manufacturing.

To make sustainable development for human being in the society, to achieve development it is to be done in digital manufacturing unit by using tremendous change in technology. As digital green manufacturing improve the competition in market, to get quality products.

advantages of digital manufacturing

Main advantages of Digital manufacturing are that it can help manufacturing companies to improve their productivity in both production processes and manufacturing planning.

Digital manufacturing enables process, product, , plant and resource information to be viewed, associated, and taken through change processes, with a comprehensive and consistent approach to production design.

The simulation capabilities of digital manufacturing help reduce commissioning costs by validating robotics and automation programs virtually.

Digital manufacturing allows part manufacturing processes to be optimized within a managed environment. It can produce flexible work instructions capable of displaying 2D/3D part information, along with the machining and tooling instructions.

Digital manufacturing can be used to support lean initiatives and Six Sigma, by providing a graphical environment to analyze dimensional variation and so on.

Using digital manufacturing, it is possible to create factory models of good quality faster and ensure that they are operating under optimal material flow, layout and throughput before production ramp-up.

application of digital manufacturing

Automotive Industry

India is emerging to be trend setter in Manufacturing of Vaccine for COVID-19, Transportation of Vaccine for COVID-19, where there is requirement of refrigerated trucks is very high due to demand so, digital manufacturing will make this possible. The automotive industry which has been using rapid prototyping now has advanced in the technology in manufacturing, making the design, clearer, lighter and safe product at low cost and reduces lead time.

3D printers are used to make customized jigs fixtures, with low volume for end use product also for making concept models also for reproducing parts.

Medical Application:

After COVID-19 total shift of the paradigm, the medical care industry has to play very important role. The demand for Surgical items, PPE kit, Sanitizer, , Mask, hand gloves are in demand to fulfill the demand digital manufacturing, in which 3D printing, rapid prototyping which can be useful in manufacturing of refrigeration system for vaccination.

Food

After COVID -19, Food industry has seen remarkable increase in demand, the reduction in the cost of 3D printers and emerging technologies which leads to application of Digital Manufacturing in the food related industry. As processing of food requires high skill labour where the operations are repetitive, if it is automated in food manufacturing which can increase efficiency as well as the quality of the food.

Food printing, a digital food manufacturing process allows different shape, colour, texture, flavor etc to a biscuit. A 3D Food printer can print sweet and savory dishes like spaghetti, pizza, mini burgers, and chocolates etc. of desired calorie and the portions where the concerned can cook the food which shows the advancements in 3D food printing processes. The main advantage of edible printing is that it take less shelf space, time to make food compared with conventional way of doing it.

Conclusion and future aspect

After Covid -19 digital manufacturing is going to manage information about manufacturing process which is fully digital product overview. It will also take into consideration manufacturing simulation, visualization, product design, ergonomic factor and its analysis. The main feature of Digital manufacturing include reusability and ambiguity by describing digital product in detail, predicting the product performance, predicting product development process also the manufacturing activities which is time independent, location and distance in network system.

There is very wide scope after Covid-19 to achieve Customized manufacturing for any product especially in Medical, Food and automotive industry that helps in product optimization.

Digital manufacturing improves quality, reduces lead time, cost to meet customer satisfaction.

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