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Modern Manufacturing Methods: A Review

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Abstract: ***Due to rise in the industrial revolution in UK, modern manufacturing emerged in 18th to 19th century. The design of steam engine gave rise to development of mechanized system in several fields such as transportation, mining and textiles. The economic and social impact of this developed a new social order in words of income, longevity and purchasing ability of population. It also had many effect on environment and health. Hence all the developed countries have found their wealth on selling the manufactured products to the consumers. Thus in today's world there is an extensive use of modern manufacturing methods. It is the process of removal of extra material by several techniques like mechanical, electrical and many. This modern manufacturing includes new technologies like IIOT, automation, machine learning, artificial intelligence etc. This paper aims to provide idea on modern manufacturing technologies that are trending.***

Keywords: machine learning, IIOT, artificial intelligence, impact, application

1. Introduction

Manufacturing methods has been one of the matter of contention in the current decade. The old and traditional methods of manufacturing faced huge drawbacks such as need of huge number of employees, lack of energy, lack of man power, lack of overall efficiency of the firm, troubling operations, less precision of the products obtained, etc.... In order to overcome the drawbacks in the old and traditional manufacturing methods, there was a need to develop or incorporate new technologies in the manufacturing methods. This incorporation of new technology to the old manufacturing method can be done in many new ways such as IIOT (industrial internet of things), artificial intelligence, automation, machine learning, etc… all these new technologies are helping the employer in one or the other way. These technologies have proved their worth efficiently in large scale industries, but have shown less profit in small-scale and medium-scale industries.

These new technologies can be used in many different ways; some of them are listed below. Nowadays, the costumers expect some of the products to be in grain size i.e. in the nanometer range. Here machine learning technology can be used to produce such products with high dimensional accuracy. In many large industries, there are many things to be done and decisions to be made by the machines at different levels of the production, then artificial intelligence and IIOT works as an effective guiding technology. Also in the identification of flaws and damage pieces, the sensors which are the part of artificial intelligence helps in doing the job. Rather than these, there are also certain circumstances where these trendy technologies can be used and reputation of the firm is maintained.

All these technologies involve merging up of the mathematics and software in the mechanical manufacturing domain. However, using up of the principles of these vast fields in the manufacturing practice is a quite complicated process. As it involves many software, theorems, algorithms, theories, etc… in it. But the integration of these technologies in manufacturing field has proved its dominance over the others several times. All these technologies mainly work on the basis of stored data. These modern manufacturing technologies have advantages as well as disadvantages, when compared with the humans. When it comes to managing of machines and work, in decision making, identification of defaults then these can be better than humans. Whereas, in creative thinking, reuse of remaining waste materials, etc… they lack behind humans. The main theme of this review paper is to concentrate on the idea about 'how these technologies are unified with the manufacturing methods? And what are the consequences of using them?' The detailed versions of some of them are studied and review is written below.

2. Machine Learning and Artificial Intelligence

It is very difficult process and the cost is more for those manufacturing products that do not contain proper tools and resources to make quality products.

In today's world, machine learning and artificial intelligence plays a leading role in assembling and producing items, and helping in reduction of time of production and the cost involved. Moreover, about 40% of the products developed come from AI and ML.

In the past 5 years, it has been known that these technologies can help in building rapid models and robust that give way to functional improvements. Machine learning is the leading role to improve product quality and production yield. This ML will help to develop smarter manufacturing in which the robots will help to put their items together with detailed precision. Thus the analytics identify the upcoming situations and thus an error free output can be developed by automated processes.

A view of trend force is that smart manufacturing is directly proportional to rapid growth rate. Many predictions are made that includes, by 2019 the smart manufacturing market will worth around $200 billion and it grew to @320 billion by 2020. Many ML companies developed these smart solutions to help their business.

3. IIOT (Industrial Internet of Things)

The use of smart sensors and actuators to improve industrial and manufacturing processes is the industrial internet of things. IIOT is the important part of industry 4.0. To utilize the power of smart machines, IIOT provides opportunities and it advantage in real time analysis to provide data that machines have developed in industrial settings. The driver behind IIOT is better at communicating important data that is useful to make business more accurate and faster.

The connected sensors and actuators help the companies to find problems and to save money and time. Within manufacturing, IIOT has great advantage for development of efficiency, sustainability, traceability and safety. In manufacturing products, IIOT is also important one to the zero failure visions and to provide improved efficiency products.

4. Some of the ways that are impacting machine learning and AI are listed

1) Process Improvement
Manufacturers are being succeeded in involving machine learning and AI into the 3 business aspects that is production, operations and post production. Fanuc, a Japanese manufacturer is one of the organizations that included industrial robotics and automation technology. Fanuc uses one type of machine learning that is deep reinforcement developed by Preferred Networks that enables its robots to teach themselves with new skills effectively and quickly without the need of complex and precise programming.

2) Development of product
Information has brought huge opportunities for manufacturing companies in words of product development. This information helps the businesses to understand the customers in better way to meet their demands and to satisfy their needs. In this way a new and better products can be developed for customer base.

With valuable information, the manufacturers can minimize the risks of introducing a new product to the market and can develop a product with extensive customer value. Many methods are taken while strategizing, planning and modeling the product and helping to strengthen its decision making process. To optimize the operational process, CRM application implementation is taken into account.

3) Robot
In manufacturing, robots can change a lot. Robots help in performing the dangerous tasks and also the complex one. Thus the manufacturers invest more money on robotization to reduce human errors and meet the demand. For quality product manufacturing, these industrial machines contribution is more.

4) Security
Machine learning has involved platforms that have made mobility secured in a company. ML algorithms has developed security in mobile apps, data and device is safety protected with empower in business. On any Android or IOS device it lets on device security and network threats.

5) Quality control
To improve the quality of the manufacturing process, machine learning plays an important role. Deep learning neutral networks help in performance, quality, availability and weakness of the machine. To improve the overall efficiency in steel manufacturing, Siemens has been using a neutral network.

6) Supply Chain management:
Machine learning helps in maximizing the value of company by improving the inventory, logistic process, asset management and supply chain management. The total of AI, ML and IIOT devices helps in producing high level quality. ML companies have developed this supply chain management that suite the monitors each and every step of the manufacturing, packing and delivering.

Conclusion

The big digital transformation phase for the manufacturing players is the core algorithm developed through machine learning and AI enabled products. In general, these industries are tending to develop difficult design process by including more sophisticated prototypes. To improve the manufacturing process, the data captured from the products and processes is fed into ML model through a continuous feedback loop. As a range of machine learning and robots transform the industrial operations, the industries will need to be reskilled to operate beside the newly originated equipment, while traditional machines will need a makeover to give a stay in the industry.

Machine learning is important one in advanced predictive Maintenance by monitoring, identifying and analyzing the critical system variables during the manufacturing process. Through ML, machines can be altered before failure of system and in some cases avoids costly unplanned downtime and without operator interaction addressed.

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