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Automation of Vehicle Manufacturing

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***Abstract*- The compiled paper aims on giving an insight to the reader about the advancements of technology and how it has helped manufacturing of vehicles in the modern era. The 4th industrial revolution is a sharp turning point for the way things function around in any manufacturing unit. As mentioned specifically in the automotive industry.**

Keywords – *Automotive industry , automation , Robotics , Microcontrollers , feedback systems , smart factories , Industry4.0. , internet of things.*

I. INTRODUCTION

Recent advancements in manufacturing techniques include product engineering, where in similar products can be manufactured on the same work table. This process has been further simplified by automation of the assembly process , necessarily by replacing the parts that are to be put on the same holding points for different parts. The assembly methods used in Audi and Tesla manufacturing units have been described further in the paper.

Advantages include

- Reduced human effort
- Almost nil errors due to humans
- Faster manufacturing
- Increased overall efficiency of the manufacturing unit
- Precision

II. SMART FACTORIES

A.) Description

Smart factories as referred to commonly are nothing but cyber physical systems working to achieve a target . To further it can be explained with the concept of 'internet of things (IoT),' which is nothing but the interaction of various machines linked with each other .

B.) Functionality

A smart factory must function based on the following principles –

- Interoperability –Interconnection between any and all sensors , machines , devices and the people working in the particular manufacturing unit.
- Information transparency – this necessarily means that the factory makes a virtual version of its surroundings based on all the data collected by all the sensors working together in the manufacturing unit.
- Decentralized decision making – This requires the cyber physical systems to make decisions in order to make the products produced as precisely as possible.

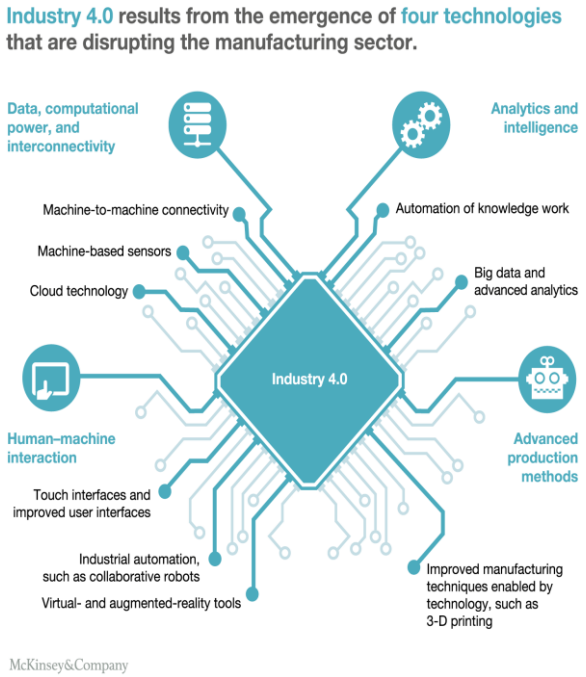

Fig. 1) Semi conductor diagram for smart factories

C.) Disadvantages

- Significant drop in the no. of employees hence , resulting in mass unemployment.
- Expensive installation and maintenance.

III. TESLA GIGAFACTORY

The concept of the giga factory recently announced by tesla co founder – Elon musk , revealed major details about the factory that is still under construction , partially.

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The giga factory will be powered by the electricity generated by the solar panels which will cover the entire roof of the unit.

The factory supposed to be completely autonomous will house all units of manufacturing and assembly , all under the same roof .

From manufacturing batteries to power their cars to the final assembly of the battery powered vehicle will all be done by automation of the various parts of the manufacturing process i.e. –

- Production of lithium ion batteries
- Production of outer body
- Production of battery run motor
- Electrical components
- Assembly .

Fig. 2) – Tesla giga factory layout

IV. AUDI SMART FACTORY

Audi is making its production fit for the future with the smart factory. In this factory of the future, big data – the creation and intelligent connection of large volumes of data – will facilitate data driven and thus highly flexible and highly efficient manufacturing. A method of production in which Audi might no longer build its cars on an assembly line but according to a radically new, disruptiveconcept is modularassembly. In addition to this major project, Audi is pursuing many other exciting projects for the production of the future – from the application of virtual reality glasses to metal 3D printing.

Fig. 3) – Audi AGV carrying load around the factory.

V. ADVANTAGES AND APPLICATIONS

Lately a study carried out by Deutsche Bank revealed that robots cut the standard time it took to find and pack items for shipment from 60-75 minutes to about15 mins. The same study also concluded that the useage of KIVA robots cut down on operation costs and helps improvise inventory hence helping achieve higher productivity by the company.

Amazon may be one of the most cited early adopters. In 2012, the commerce giant spent $775 to purchase Kiva, a company that makes robots made to speed up warehouse work and increase the turnaround time for e-commerce companies. The commerce giant began to utilize the robots in their warehouses two years later, and today, the machines are dramatically cutting the company's "click-to-ship" time.

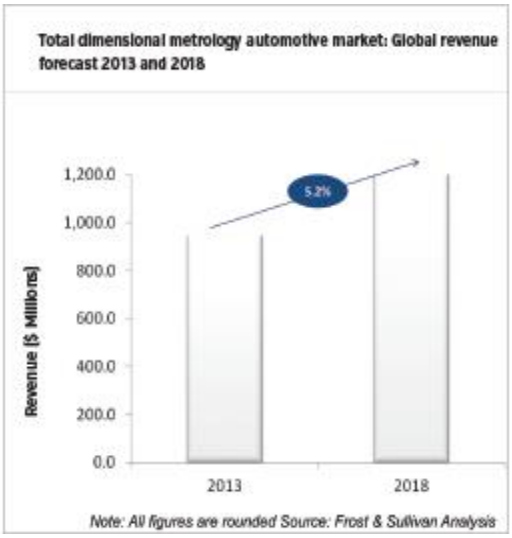

Fig. 4) growth in revenue shown due to automation.

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VI. CONCLUSIONS

Automation of industries has a lot of scope in the future by helping in cutting down errors in manufacturing, and increasing production capacity of any manufacturing unit.

Automation also has uses in the management of inventory which again results in faster process times and increased efficiency of the business.

These software based manufacturing processes require minimal vigilance that means that fewer individuals are required to a particular manufacturing unit that in turn adds to the reduction in cost prices.

The internet of things helps link all processes to each other and all divices and AGVs running in the factory , hence , helping them become smarter by recording errors and learning from them , by itself.

ACKNOWLEDGEMENT

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