INDUSTRY 4.0 : OVERVIEW

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Abstract: Industry 4.0 introduces concept of "SMART FACTORY",in which physical process of the factory is monitored by cyber-physical systems.Cyber-physical systems are the integration of physical processes,computation and networking.Embedded computers and networks control as well as monitor the physical process.A factory or a system can be consider as industry 4.0 if it includes : Interoperability,Information Transparency,Technical Assistance and Decentralized Decision Making.Industry 4.0 provides manufactures advantages like improved efficiency,lower costs,higher revenues and increased innovation.In manufacturing industry,Industry 4.0 includes 3D printing, Big Data, Industrial Internet of Things,Smart Factory, Cloud Computing,BIM and more, into a single concept.The challenges in implementing industry 4.0 conceps are, Identifying and Correcting Misconfigurations, Preventing Operational Disturbance and network security from cyber threats.The industry 4.0 will introduce complete new phase of industrial and system automation.[1][2]

Index Terms: **Smart factory,Industrial Internet of Things,Big Data,Cloud Technology,Cybsecurity,Advanced Analytics,Augmented Reality.**

I. INTRODUCTION

Manufacturing industry has gone through many eras of changes since the first industrial revolution(Use of water,steam power for production),to the second(Use of mass production and electricity) and the third era included increased automation in manufacturing process using information technology(IT).INDUSTRY 4.0 is the fourth era of industrial change which is driven by connectivity,advanced processing technology and materials,service orientation and collaborative advance manufacturing networks.INDUSTRY 4.0 provides design principle which can be used to organize industry.This can happen because ability of interoperation between manufacturing networks is increased through increased connectivity, manufacturing processes virtualization can be done from collecting sensor data by monitoring physical processes with simulation models and virtual plants,real time ability to analyse and collect data,decentralized decision making,flexible adaptation to changes by reconfiguring individual modules.[3][4]

II. INDUSTRY 4.0 BUILDING BLOCKS

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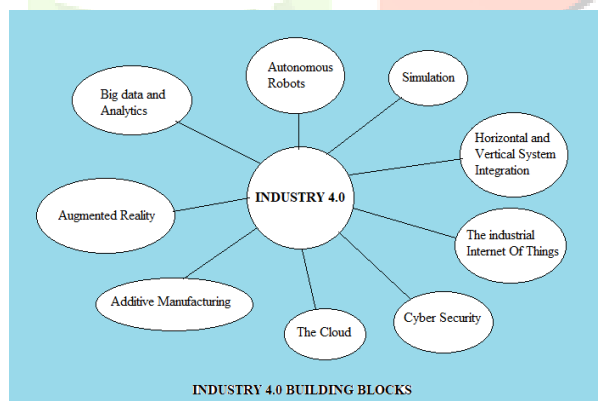
1. **Big Data and Analytics**
   In industry 4.0 the evaluation and collection of data coming from different sources will support decision making of real time.

2. **Autonomous Robots**
   Robots can interact with one another and can work nicely with humans and they will also learn from humans.The cost of robots will be less and will have more capabilities.

3. **Simulation**
   Simulation will be used in operations performed in plants which will support real time data and to mirror physical world into the virtual model,these includes machine,products and models.This will allow operators for testing and optimizing machine settings for the another product inline in virtual environment before physical changeover.

4. **Vertical and Horizontal System Integration**

With Industry 4.0 cross-company,universal data integration network enable and produce automated value chain so the companies,departments,functions and capabilities will begin to be more cohesive.

5. **The Industrial Internet of Things(IOT)**

Industrial Internet of Things(IOT) incorporates machine leaning as well as big data technology,controlling and using sensor data,machine to machine communication,automation technologies.The philosophy behind industrial internet of things is that smart machines will be better than humans sources for consistency and accuracy.

6. **Cybersecurity**

With Industry 4.0 because of the increase in connectivity and use of standard protocols for communication the need to protect industrial systems and the manufacturing from the threats of cybersecurity increses gradually.So the reliable and secure communications,identity and access management of macines and users are required.

7. **The Cloud**

With Industry 4.0,more production related operations will require more sharing of data across sites.The cloud technologies performance will improve.As a result data and functionality of machine will be deployed in the cloud which will enable more data driven production services to the production systems.

8. **Additive Manufacturing**

In Industry 4.0 additive manufacturing methods such as 3D printing will be used in wide range to produce customized products small batches that will offer advantages of construction like complex and lightweight designs.High performance and decentralized additive methods for manufacturing will reduce stock on hand and distances of transport.

9. **Augmented Reality**

With Industry 4.0,companies will make augmented reality use to provide workers the real time information which will improve work procedures and decision making.For example,workers may get repairing instruction for repairing the system as they will be actually looking at system which need to repair.[5]

III. INDUSTRY 4.0 ADVANTAGES

1. **Cloud Technology**

With industry 4.0 information gained from data can be analyzed to well organize the process.As a result industry 4.0 requires a powerful and robust platform for storing,sorting and retrieving large amount of detailed information and reporting.Cloud technology and its capability to store large data amount with many access points is useful for enhanced communication and collaboration across supply chain.Cloud technology has a large amount of information storage space,capacity to view and manage data in real time.

2. **The Internet Of Things**

The capability of systems to work in conjunction with one another fosters greater productivity and accuracy and it provides better visibility for overall supply chain of company.The IOT becomes core factor for creating great insigt into company's demand planning, inventory practices and production.

3. **Advanced Analytics**

Advanced analytics gives managers and planners the data driven insights for making decisions about planning techniques and already planned programs of production.Industry 4.0 uses Advanced Analytics for getting greatet end-to-end visibility and increased agility in supply chain, both are important for avoiding bottlenecks and creating stable value chain.

4. **Increased Customization**

In current supply chain managers and planners requires different solutions to challenges,so the product customization is big challenge for manufacturers.Industry 4.0 uses additive manufacturing which enhances customization capability to meet the specified customer needs.Because of enhanced customization companies will become more responsive.

5. **Improved Communication**

Industry 4.0 relies mainly on the communication and coordination of planning platforms and solutions so the managers and planners are able to gather,sort,share and cooperate on data for increased productivity and efficiency.Industry 4.0 gives more amount of data to the people who works with it which helps beakdown of planning and functional processes which helps company's ability to work as efficiently as possible.[6]

IV. INDUSTRY 4.0 DISADVANTAGES

1. Data security is major concern in IOT.
2. Skills as well as education of workers working on industry 4.0 based processes need to be improved.

3. In machine to machine communication reliability and stability are required.
4. Integrity of production processes need to be improved.
5. Need to educate staff for adopting industry 4.0,This will require more time and efforts across industries. [7]

V. INDUSTRY 4.0 CURRENT STATUS IN INDIA

1. "Make in India" initiative is spreading wider adoption of industry 4.0 which involves combination of industry and current Internet Of Things technology.
2. The Government of India's "Smart Cities Mission",the project to build 100 smart cities all over the country will be done under the environment of industry 4.0.
3. Indian Institute of Science(IISc) is building indias first smart factory in Bengaluru where digitally interlinked supply chains, servicing units and distribution network from parts of intelligent ecosystem will be used.
4. The industry 4.0 concept will change the method of how india manufactures and designs the products.[8]

VI. CONCLUSION

The paper contributes to the overview of what industry 4.0 is all about.It also focus on how india adopting industry 4.0 and what all projects are going to use concept of industry 4.0.Design principles given in this paper are helpful for understanding the basic concept of industry 4.0.Also advantages and disadvantages are more helpful to know about the challenges in implementing industry 4.0.Limitations of paper result is it has not included the status of current implementation of industry 4.0 in other countries.Also it has not included any practical implementation test cases or output as this is only overview based paper.[9]

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