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RECENT TRENDS IN FOUNDRY IN CONTEXT WITH INDUSTRY 4.0- A PERSPECTIVE

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Abstract-

This paper focus on Prerequisites of understanding of Industry 4.0 in context with Indian foundries. Authors collected the information which is used or being used by Foundrymen or planning for it. By referring various primary and secondary sources such as articles by various companies and personal discussions with various foundrymen at various events since last one year, such as Indian foundry congress ,IIF chapters Newsletters etc., authors conclude that Industry 4.0 is a need of current industry and must be understood by all the concerned foundry men and concerned people.

Keywords—Industry 4.0, Foundry

1. INTROUCTION

Industry 4.0 is a name for the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, IIoT, cloud computing and cognitive computing. Industry 4.0 creates what has been called a "smart factory". It is called Industry 4.0 because it is the fourth industrial revolution (figure1).

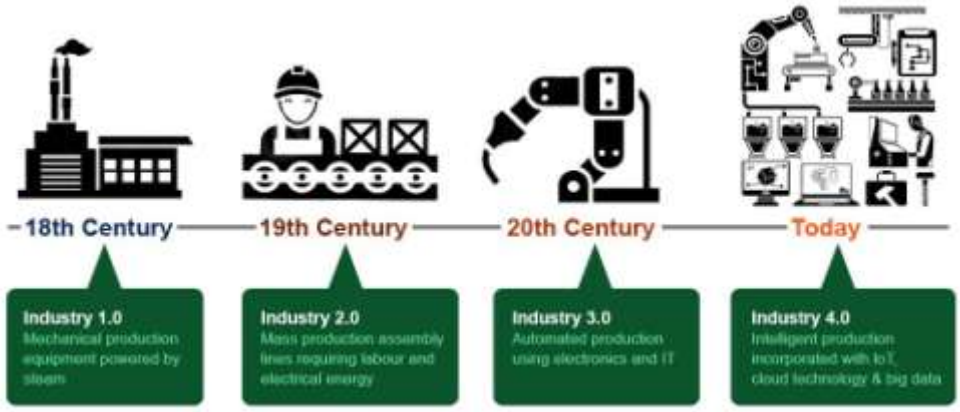

Figure 1: Evolution of industrial revolution 4.0.

The three prior revolutions of the modern era are:

1. Mechanization- water power, steam power
2. Mass production- assembly line, conveyors, electric power
3. Electronics & computers based- IT, CAD/ CAM, FMS, CIM, multi-axis industrial robots

Modern information and communication technologies like cyber-physical system, big data analytics and cloud computing, will help early detection of process defects (scrap) and production failures (downtime), thus enabling their scope as in (figure 2)

To speed up production processes the Industry 4.0 promotes the connection of physical items such as sensors, devices and enterprise assets, both to each other and to the Internet. The enormous amount of information gathered and generated by ICT systems and sensors installed at the shop-floor immediate reaction to issues and shortcomings.

Figure 2: Scope of Industry 4.0

2.Today's foundary requirment in industry 4.0

Foundry engineer of Industry 4.0 is now required professional knowledge concerning the specific production process and proper engineering skills as well as widely comprehended IT skills. The Industry 4.0 idea will also cause increased importance of psychosocial skills. The engineers will be required to be more open to changes, flexible in operations, subjected to continuous training and to learning elements of other fields. Work in virtual, often multicultural teams causes a need for the design and teamwork approach to work, as well as interpersonal skills and the efficient communication ability. To achieve success in the enterprise transformation to the fourth industrial revolution standards the Integration of customers and business is required for reliability for greater planning dependability and environmental protection such as heat recovery systems and exhaust air from dust extraction (figure 3)

Figure 3: Integration of customers and business

Work orders need to be electronically sent to the production line. Display of the incoming and outgoing work orders at each workplace. Quality assurance is therefore a central issue in all the companies. This involves product quality, adherence to delivery dates, appropriate product prices, communication, competence and reliability. Various systems such as Energy Management ISO 50001:2004, Environmental Management ISO 14001:2004, Health and Safety Management OHSAS 18001, Quality Management DIN EN ISO 9001:2008 needs to be incorporated

As this process is automated it use of RFID (radio frequency identification) for this the systems are very dependent on connectivity and the Internet, if the factory were to lose its internet connection it would have no means of communicating with the outside world. However, these issues are easily overcome with clear planning and preparation. The plant must be able to continue operating if connectively is lost and the systems also need to have robust security and protection. When undertaking the task of installing a SMART foundry it is important to understand all the limitations and minimize their impact. .There is no point creating an automated process if the current supply chain is not on board or capable of working with Industry 4.0.

The main goal of foundry is centralized control system and by using integrated MRP/ERP systems the foundry manages its supply chain and production needs automatically. Machines communicate with each other and the supply chain placing orders for raw materials and planning production needs to meet lead times. The equipment then works together in the most efficient manner to achieve the customer's requirements. This doesn't indicate the end of human involvement but it does necessitate a different skill set, so it is important to have a workforce able to understand and cope with this technology.

Stability is one of the key pre-requisites for smart manufacturing for this preventive maintenance program with software tool will be a very successful approach. Preventive maintenance can be performed based upon calendar, usage or other methods by using various components like vibration sensors. The Electronic Maintenance Management Software (EMMS) helps with accurate data regarding equipment problems and solutions. The machine status monitoring system (MSMS) network architecture is an electronic system. Customer quality issues can be predicted and prevented. The manufacturing self-audit system (MSA) prevents any quality incidents from happening. Thus the Manufacturing Execution System (MES) is beneficial for Better understanding of equipment utilization and OEE and More accurate/meaningful manufacturing and engineering data. Along with Better product traceability for Real time, believable data about your factory, leading to data driven decisions for paperless foundry process.

This is achieved with-

1 Digitization

2 Standardization

3 Intelligence and control

4 Smart manufacturing

which leads to follow smart mobility, power, building, logistics, etc. by using , such as analytics, big data, IoT, cloud, etc., In Industry 4.0, the industrial order placed should be self-organized, as well as self-maintaining assets for Self-directing materials for the period of 24x7x365. Role of Artificial intelligence (AI) is very important here so that system that can reconfigure and decide the improvement program for a particular production line, these can be integrated with Lean: Six Sigma: TPM: MTBF, MTBA and OEE. Thus ERP can be designed even for small and medium (SME) manufacturers in managing and controlling their manufacturing activities from shop floor to shop floor as a single integrated solution with economic justification. It can be installed and used anywhere, on any device. The general product mix also considers both core and non-core items. The optimal sand parameter requirements for these components are different for example less S: M ratio component will require more strength in mold.

Figure 4: Industry 4.0 is the vision of future.

Today, more and more often advanced systems supporting the work of operators are installed, such as, for instance, SCADA system (Supervisory Control and Data Acquisition)

For a foundry or system to be considered Industry 4.0, it must include:

1. Interoperability.
2. Information transparency
3. Technical assistance.
4. Decentralized decision-making.

Implementing a Smart Foundry 4.0 is to follow sequence of Process Automation – Machine Automation – Machine Learning – Up skilling Human Resources through systematic Machine & Process Automation in Green Sand Process Sand Handling System and Moulding System Machine & Process Automation in Sand Reclamation Process Green Sand Reclamation and Core Sand Reclamation Asset & Process Management with Industry IoT & Analytics Melt Shop Optimisation and Motor and Transformer Analytics (figure 4)

3. CONCLUSION

Indian Government's focusing on "Make in India" In true sense it can be possible if we see globally for quality, cost and ability and prompt delivery. Pertaining to Industry 4.0 in foundries for optimization at all levels .Digital transformation is taking importance in all sectors thus Industry 4.0 is the digital version of industry.

Commerce and Industry Minister Nirmala Sitharaman has constituted a Task Force on Artificial Intelligence (AI) for India's Economic Transformation. The Minister said with rapid development in the fields of information technology and hardware, the world is about to witness a fourth industrial revolution.

So it is very essential for academics, researchers and industry leaders to come forward for Industry 4.0 to digitize the foundry sector which has a large share in manufacturing in India as well as world.

Foundry men cannot do things by "rule of thumb" anymore today. Cost transparency, material and energy efficiency and process security in real time, have become essential .Thus Manufacturing will have to compete with Industry 4.0, which is the fourth industrial revolution and is about synchronizing physical world with virtual world with never before opportunities for improved productivity and efficiency

Industry 4.0 is aiming for efficiency, adaptability and productivity. But There are some other areas that need to focus such as world class quality products, alignment of required jobs, adequate skilling, right supply chain and innovation to benefit the economy within a country.

This can be the tool for Indian manufacturing to make India a global hub. This requires significant economic and social change along with political and institutional frame work.

We are in the year 2019 there are several foundries in India which are at 1.0 level. The foundry needs management of a complex set of processes pre-casting, during casting and post casting to ensure an industry 4.0

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