



## EMBRACING INDUSTRY 4.0: THE FUTURE OF HEAVY MACHINERY MANUFACTURING

HEAVY MACHINERY MANUFACTURERS WHO ARE ON THE VERGE OF DIGITAL TRANSFORMATION ARE UNLOCKING RAPID AND SUSTAINABLE CHANGE WITH INDUSTRY 4.0

**THE GLOBAL MANUFACTURING INDUSTRY IS** going through a serious digital transformation called Industry 4.0 and the heavy machinery manufacturing sector is undergoing a profound transformation. According to Epicor, Industry 4.0 is "A new phase in the industrial revolution that focuses heavily on interconnectivity, automation, machine learning and real-time data. Industry 4.0, which encompasses IIoT and smart manufacturing, marries physical production and operations with smart digital technology, machine learning and big data to create a more holistic and better-connected ecosystem for companies that focus

on manufacturing and supply chain management."

"Industry 4.0 is expected to play a significant role in the heavy machinery manufacturing industry, enabling creation of smarter and more efficient factories. With Industry 4.0 technologies such as the IoT, AI, and analytics, the heavy machinery manufacturers can optimise their manufacturing processes and make informed decisions in real time," says Shubhankar Chatterji, Chief Supply Chain Officer, Cummins India

Manufacturers in the heavy machinery industry are harnessing the power of automation, data analytics, and connectivity to optimise their operations and de-

liver superior products. The adoption of smart manufacturing practices brings three key advantages to the sector:

- 1. Cost reduction through connectivity:** Increasing connectivity within the heavy machinery and equipment industry yields significant cost-saving benefits. By monitoring smart tools and tracking their usage, managers can implement proactive measures to replace tools before they malfunction or break down, preventing downtime and reducing maintenance expenses.
- 2. Enhanced efficiency and quality:** Minimising human errors and ensuring the reliability of tools and equipment greatly improves efficiency and product quality on the production line. This not only reduces downtime but also provides manufacturers with the flexibility to adapt their processes. Additionally, the abundance of data enables the replication of factories in new markets, expanding market reach.

- 3. Predictive maintenance and downtime reduction:** As data transparency increases, predictive maintenance becomes applicable to everyday operations. By using smart tools and software in manufacturing, heavy machinery and equipment companies can proactively address maintenance needs, minimising downtime and associated costs in the field.

### THE ROLE OF IIOT IN INDUSTRY 4.0 IMPLEMENTATION

The Industrial Internet of Things (IIoT) plays a crucial role in facilitating the implementation of Industry 4.0 by enabling data capture and processing for industrial automation. In the context of heavy equipment manufacturing plant floors, IIoT hardware and software provide solutions to overcome communication challenges posed by legacy systems. Smart devices like human-machine interfaces and Edge hardware enable capturing data from these legacy systems.

"Industry 4.0 solutions offer substantial benefits for heavy machinery manufacturing industries, fostering a connected ecosystem of people, machines, processes, and information. Real-time data access empowers quicker decision-making and even autonomous operations. Energy-intensive heavy engineering units can leverage Industry 4.0 for real-time energy monitoring, yielding significant energy and carbon footprint savings. Through data-driven manufacturing, machine utilization, predictive maintenance, and quality management are optimised seamlessly. Stakeholders gain real-time visibility into the entire manufacturing process, from material origins to production activities. Industry 4.0 enables remote monitoring and control, driving high flexibility and productivity," says Subash



"AI being infused into an IIoT setup on production equipment could enable the equipment to independently examine data, analyze it, make decisions, or alert the manager to take necessary steps to keep the equipment and process efficient. It will also enable instantly updating and revising the SOPs and training documents, making them more meaningful and valuable to the user teams. It will be a key enabler to Do More with Less."

**Subash Ramdoss,**  
General Manager  
— ME and Machine  
Building Division, ELGI  
Equipment.







"Cummins India, our in-house developed analytics solution for inventory optimization helps our supply chain teams across various distribution centers and plants to effectively predict safety stock level requirements based on current inventory and expected customer demand. This has improved product availability while reducing the inventory carrying costs for the company."  
**Shubhankar Chatterji**, Chief Supply Chain Officer, Cummins India.

Ramdoss, General Manager – ME and Machine Building Division, ELGi Equipment.

IIoT brings computing capabilities closer to heavy equipment manufacturing processes on shop floors, allowing specific data processing tasks to be accomplished efficiently. A significant advantage of successful IIoT implementation is that it helps bridge the connectivity gap between legacy systems and industrial IoT platforms or cloud platforms.

Implementing IIoT as part of Industry 4.0 is a preferred option compared to other alternatives. For instance, replacing existing legacy systems with new brownfield equipment is a capital-intensive endeavour many enterprises in the heavy equipment manufacturing industry cannot easily pursue. Equipment replacements are typically expensive and come with ongoing costs. Given the industry's narrow profit margins, replacing legacy assets becomes challenging.

Adopting "plug and play" IIoT solutions tailored for heavy equipment manufacturers means there is no immediate need to replace manufacturing equipment until the enterprise is ready. IIoT solutions, encompassing hardware and software components, offer affordable options for implementing Industry 4.0. Choosing the right IIoT solution simplifies implementation and empowers enterprises to obtain vital data for optimising specific manufacturing operations.



#### IMPLEMENTATION

Implementing Industry 4.0 solutions effectively on the factory floor will benefit heavy machinery manufacturing enterprises significantly. These advantages encompass leveraging data-driven manufacturing processes to optimise machine utilisation, enabling predictive maintenance, and integrating regulatory standards into manufacturing operations. However, achieving these substantial gains requires heavy equipment manufacturing enterprises to navigate through a successful implementation phase of Industry 4.0.

#### CONFRONTING THE CHALLENGES OF LEGACY MACHINES

For many heavy machinery manufacturers, executing a successful implementation is easier said than done. There are numerous challenges faced by heavy machinery manufacturers and original equipment manufacturers (OEMs), which include:

**1. Widespread use of legacy equipment:** A significant portion of factories, approximately 90% in the industrial space, still rely on legacy assets for specific operations. The heavy equipment industry exemplifies this trend with the continued utilisation of equipment that is 40 or 50 years old. These legacy assets often possess analogue features and







proprietary communication protocols that impede seamless integration into enterprise networks or cyber-physical environments.

**2. Difficulties in capturing plant floor data from complex processes:** Complex processes within heavy machinery manufacturing pose challenges when it comes to effectively capturing data from the plant floor. The intricate nature of these operations necessitates robust solutions to collect and utilise relevant data for Industry 4.0 implementation.

**3. Diverse communication protocols in systems or machines:** Another obstacle faced by heavy machinery manufacturers is the presence of systems or machines with diverse communication protocols. This heterogeneity further complicates the integration process, requiring comprehensive strategies for seamless communication and interoperability.

To successfully implement Industry 4.0 models, the limitations imposed by legacy systems' input/output features must be addressed. Although efforts have been made to develop unifying solutions and standards, such as the OPC Unified Architecture, to facilitate data capture and transfer, the challenges posed by integrating legacy equipment must be resolved beforehand.

#### SECURITY MATTERS

Industry 4.0 will face traditional cybersecurity issues and new security and privacy challenges. IoT and AI

systems will be a complex IT ecosystem connected with multiple software and protocols from different suppliers, making it challenging to implement standardised safety protocols. Organisations must be able to identify, monitor and protect digital assets in the Industry 4.0 era. Subash says, "We will need to prevent ransomware and malware from spreading by automatically enforcing policies to isolate infected systems and enable network segmentation. Several security challenges related to authentication, access control, trust, confidentiality, and privacy can come up. Strong cybersecurity practices and processes will help protect the organisation's assets and information."

In the age of Industry 4.0, heavy machinery manufacturers have a unique opportunity to embrace digital transformation and unlock new levels of efficiency, productivity, and competitiveness. Companies can optimise their operations, streamline supply chains, and deliver high-quality products by harnessing automation, data analytics, and connectivity. However, embracing this paradigm shift requires careful planning, investment in technology, cybersecurity measures, and upskilling the workforce. As heavy machinery manufacturing continues to evolve, Industry 4.0 will play a pivotal role in shaping the future of the industry, driving innovation, and enabling sustainable growth.

"Overall, I feel that Industry 4.0 has the potential to revolutionise the heavy machinery manufacturing industry by increasing productivity, improving quality, and reducing costs," concludes Shubhankar. ■