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SMART FACTORY IN THE AGE OF BIG DATA AND IoT

THE SHAPE OF THINGS TO COME

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Industrial Revolution 4.0 is here. Where are you?

Compared to the acres of floor space once given over to mechanical and electric systems, today's factories are practically unrecognizable. Walk into a plant manufacturing washing machines, automobiles, paints or petroleum products and you'll notice they look quite different. They are humming with hardware, sensors, microprocessors, robots and monitors connected to one another. These plants are getting increasingly connected to external systems and actual users in real time. Thanks to the wide availability of processing power, the miracles of miniaturization and growing connectivity (wired and wireless), factories, production plants and mills are unleashing a new era in industrialization – it is an era of Big Data generated and transmitted by millions of devices on a backbone called the Internet of Things (IoT).

In a global study conducted by the Economist Intelligence Unit (EIU) and commissioned by Wipro in 2014 called Manufacturing and the Data Conundrum – Too much? Too little? Or just right?[i] 44% of manufacturers said they understood the value of shop floor data. Manufacturers are beginning to realize they can capitalize on their data to increase shop floor efficiency, reduce waste, impact quality, re-engineer their supply chains for higher effectiveness and to improve warehousing, shipment and logistics.

GE, one of the leaders of the smart factory concept, has crammed its US$170m Durathon battery plant in Schenectady, New York, with 10,000 sensors. All of them are linked to the company's 400 global factories. The sensors capture 10,000 variables from manufacturing process, building information (energy use, temperatures and humidity), and even extend to the rooftop weather station. The data is captured with a frequency of an astonishing 250 milliseconds. Using Wi-Fi links staff members are alerted to anomalies and deviations. The plant is a test bed into how Big Data and IoT can deliver a smart factory – or, what GE calls, the "Brilliant Factory"[ii].

In other words, Industrial Revolution 4.0 is here[iii]. And its central quest is to free the intelligence that lives with zettabytes of data related to your factory and its products.

Some interesting smart factory use cases

What can factories do with their data? Industries are using it in different ways, shining a light into the future.

Defense: In one defense equipment manufacturing plan, the number of times a screw must be turned to tighten it is specified (say 12 times). If the screw turns an additional time, it is flagged as an anomaly and signaled for rectification. The example serves to show the depth to which the pursuit of quality can go using sensors and the data they generate.

Automobiles: A growing number of cars equipped with intelligent systems like navigation systems, trip computers and on-board diagnostics systems are becoming smarter with IoT. Sensors are getting better in identifying other cars, objects or people and avoiding accidents.

Pharma: IoT in Pharma is driving cost savings with applications like 'Organ in a Chip' which drastically reduce the R&D cost by running rapid trials running multi-stage diagnostics, Clinical Development through faster subject screening and analysis using sensors, and Supply Chain by reducing operations and maintenance cost.

Oil & Gas: The industry is using data for preventive maintenance. The returns are forecasted to be huge. For example, a well-known fact is that a 1% improvement in the performance of all Electrical Submersible Pumps (ESPs) currently in use to pull oil from wells can deliver over half a million additional barrels of oil each day. At US$100 per barrel, that translates to over US$50 million a day. Real-time monitoring of data from the ESPs can help prevent downtime and improve asset performance.

The gains from smart factories

The benefits of data to factories is across several vectors. These include:

- Improved compliance to environmental guidelines; a major challenge for industries at the moment
- Heightened and improved security, reducing loss due to sabotage, pilferage, leakages and human error
- Giving your MES system an efficiency boost from process improvement and reduced down time of equipment realized through real-time alerts and predictive analytics
- Insights into new product demand from markets thus directly driving R&D spends and design programs
- Reduced cost through better demand forecasting, sourcing, supply chain management and inventory control

Let your imagination soar

The primary task before realizing a smart factory is to identify equipment and processes that generate valuable data and take the network to the very point where the data is being generated. In other words, where is the tip of your data? What is the format of the data – is it structured, unstructured or semi-structured? Can your network transmit the data coming in from -- and being sent to -- millions of devices? Can your data management system ingest the growing data? Once the answers to those questions are 'yes', you can put the data to practically any use, limited only by imagination. Smart factories are the future. But they don't have to mean abandoning your current investments in technology, data management and monitoring. If your plant has operational expenses of US$100 million a year, a 5% improvement using smart factory technologies can deliver savings of US$5 million a year. That itself should be compelling to consider making data a strong ally in the age of IoT.

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[i] http://www.economistinsights.com/sites/default/files/Manufacturing_Data_Conundrum_Jul14.pdf

[ii] Ibid.

[iii] Industry 4.0 is a reference to Smart Factories that leverage data and digital technologies. Steam engines marked the First Industrial Revolution; mass production techniques marked by assembly lines powered by electricity marked the Second Industrial Revolution; automation and electronics marked the Third Industrial Revolution.

About The Author

Narendra Ghate

Narendra is a Senior Manager (Data Platform Engineering practice) at Wipro Analytics.

Narendra has more than 25 years of experience in Product Engineering in New Technology areas that are at the leading edge of the Technology and Market trends. His experience spans working on High End UNIX Servers hosting SMP and NUMA architectures, Wireline Products from CPE to Metro Edge, and Radio Network Controllers in the Wireless Networks. He is currently involved in consultation and building of the Big Data and IoT Platforms for different domains and industry segments like Retail, Manufacturing, Healthcare, Medical devices and Banking/Financial Services.

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