



WHITE PAPER

Toward Real-Time Plant Floor Visibility: A View From Various Manufacturing Sectors

Sponsored by: Zebra Technologies Corporation

Lorenzo Veronesi
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IN THIS WHITE PAPER

This document extends and complements IDC Manufacturing Insights' recent white paper *Achieving Operational Excellence With Real-Time Plant Floor Visibility* (IDC #IDCWP04W, February 2014) discussing the results of our most recent research analyzing the trends of manufacturing operations management. We conducted a survey of over 240 European manufacturing enterprises across multiple sectors including consumer packaged goods (CPG), high-tech/electronics, discrete manufacturing, and process manufacturing. In this document, IDC Manufacturing Insights describes how achieving shop floor visibility to enable effective decision-making on the plant floor is becoming a central strategy for manufacturers. It also outlines the journey different manufacturing sectors are taking to achieve this target.

SITUATION OVERVIEW

The Emergence of the Global Plant Floor

What is emerging in our conversations with manufacturers is a trend toward a profound rethinking of production models and operational processes. The guiding principle is customer fulfillment. Companies must be customer-centric, agile, and able to manage increasing operational complexity to succeed today.

The overall evolution of operations management can be represented by the combination of two industry trends:

- **Product dynamics.** This is the trend toward product mass configuration, a call to the industry to move away from a make-to-stock (MTS) manufacturing approach and mass production, and embrace more of a make-to-order (MTO) or engineering-to-order (ETO) approach to meet specific customer needs. The final goal is to achieve what IDC Manufacturing Insights calls make-to-individual (MTI).
- **Production dynamics.** This trend is toward having a network of smaller manufacturing facilities closer to where demand is – again as a way to improve customer fulfillment. To achieve this, manufacturers are moving away from traditional manufacturing approaches by creating more modular products, based on common platforms and configurable options.

The need to move towards this requires what IDC Manufacturing Insights calls "the global plant floor." In short, the capability to:

- Harmonize, supervise, and coordinate execution activities across companies' and suppliers' manufacturing operations – with a greater level of real-time visibility.
- Manage a network of production facilities as a unique virtual factory that consolidates the number of different manufacturing plants in terms of resources, processes, and products.
- Combine design-for-capability with planning-for-capacity and accurate demand forecasting, achieving a high degree of production planning and level balancing.

While companies will operate a network of production facilities that blend into a single virtual plant, operations will allow for local variations in the production process that are required because of the different levels of automation, products, and regulations in the individual plants. Manufacturers will be able to provision plants centrally, applying changes and best practices consistently and, again, accommodating the necessary local variability.

In doing that, manufacturers will need a centralized coordination capability, based on real-time visibility and intelligence, to orchestrate execution capabilities across the whole fulfillment network. Plants themselves have to become more agile and capable of quickly changing production schedules according to central instructions and security process alarms.

The role of manufacturing IT and centers of excellence will be crucial to ensuring consistent standards across the global plant floor and to disseminate best practices. In fact the global plant floor will not just be a set of factories coordinated by a central headquarters, but a network of interoperating plants that share processes and coordinate activities flexibly between them.

The Journey Toward the Factory of the Future

Formidable challenges are driving a profound rethinking in the manufacturing industry. In this context, effective factory management is essential. More than 43% of manufacturers responding to our survey declared they have formal processes to look at how production plants will be organized in the future.

People will be at the center of the factory of the future as they provide the degree of flexibility and decision-making capabilities that is required to deal with increasing market complexity and demand variability. The end goal is to improve customer fulfillment by linking plant floor operational processes with customer needs.

The people-intensive factory of the future is underpinned and supported by IT and operations technology that can create real-time decision-making environments that will enable plant floor people to improve and speed up their decision-making capabilities.

- Plant floor IT systems are the centerpiece of today's factory of the future strategies for the majority of manufacturers in developed economies. We expect large global manufacturers to invest significantly in this area over the next two to three years. Companies will standardize production processes by implementing multi-plant manufacturing execution systems (MES) and create more visibility and integration by implementing enterprise manufacturing intelligence (EMI) platforms.
- We see continued interest in new operations technology capabilities such as advanced robotics, radio frequency identification (RFID), machine to machine (M2M), and the Internet of Things. Operations technology is the essential base for building the factory of the future as it provides real-time information.

We estimate that leading manufacturers are already in a position to put people at the center of their factories. This people-intensive idea can be counterintuitive to what is generally believed to be the journey toward the factory of the future, which is usually associated with past investments in automation that raised productivity and eliminated jobs. The next level of transformation is unlikely to eliminate jobs or add to them. Rather, it will elevate the role of factory workers from mundane task workers to knowledge-based decision makers.

FUTURE OUTLOOK

Importance of Plant Floor Visibility

It is no surprise then that among the most relevant initiatives manufacturers are putting forward to achieve operational excellence, gaining better plant floor visibility takes a central role.

- They understand that enabling plant floor personnel to have a better understanding of the status and performance of plant floor operations in an optimal timeframe would be the essential capability they need to acquire to flexibly manage complex operations.
- Therefore they are investing in modern IT that can create a real-time decision making environment for plant floor employees that will play an essential role in achieving better levels of operational excellence.
- At the same time manufacturers will continue to invest in factory automation to standardize production, increase quality, and reduce operational costs. Automation will also enable enterprises to gather essential data from their plant floors in real-time. They acknowledge automatic data collection tools are more reliable than human beings, who are often unwilling to enter data at the right time and in the right format.

Definition of Plant Floor Visibility

To gain a definitive position of plant floor visibility and its positive impact on manufacturing we created a set of five incremental definitions for plant floor visibility that are shown in Figure 1. Each definition describes a different level of maturity of plant floor visibility and supersedes the previous one in terms of business benefits (e.g., expected impact on business performance) and technology enablers (e.g., frequency of data collection, type of data collected).

FIGURE 1

Incremental Definitions of Plant Floor Visibility

Level of maturity	Definition	Expected impact on business performance	Operational Driver	Frequency of data collection	Type of data collected	Enabling Technology
Limited	Plant floor visibility is not considered relevant or required	No impact	Cost reduction	Data is manually collected from time to time	Limited	Paper, spreadsheets
Basic	Basic visibility of production data that is gathered in some areas of the plant floor	Low impact	Cost reduction	End of each shift or day	Data from fixed assets (e.g. CNC Machines, PLCs, controls)	Factory automation, ruggedized hand held devices, barcodes, MES, ERP
Integrated	Production data is gathered across all areas of the plant floor, including receiving, warehouse, production and shipping	Medium impact	Cost reduction	Event-driven (e.g. at the end of batches, work orders, production phase)	Data from fixed assets (e.g. CNC Machines, PLCs, controls)	Factory automation, ruggedized hand held devices, barcodes, MES, ERP
Extended	Real-time dashboards enable to understand the status of most critical KPI	High impact	Increase productivity	Real-time	Data from moving assets (e.g. bins, pallet, racks, parts, finished goods, AGV, tracks, fork-lifts, tools)	RFID/Sensors
Advanced	Plant floor visibility is fundamental to achieve faster decision-making capability on the plant floor. This enables autonomic or self-healing processes, teams and production systems	Very high impact	Increase productivity	Real-time	People knowledge and collaboration	Big Data Analytics, Social Business, Cloud, Internet of Assets

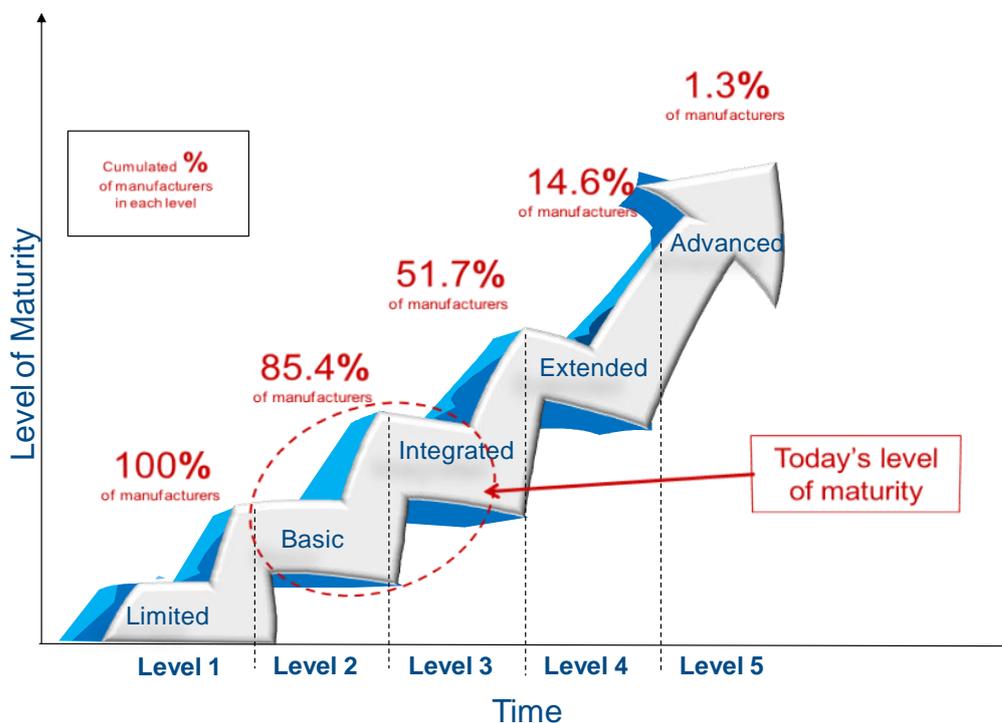
Source: IDC Manufacturing Insights, 2014

Plant Floor Maturity Framework

The five incremental definitions in Figure 1 represent the base for our maturity framework for plant floor visibility. We have segmented survey results by identifying homogeneous groups of manufacturers that share the same definitions and qualifying attributes of plant floor visibility. The results are shown in Figure 2, which shows the percentage of European manufacturers that are currently at each maturity level.

FIGURE 2

Maturity Framework – Current Situation



Source: IDC Manufacturing Insights, 2014

With an average level of plant floor visibility between "basic" and "integrated," the framework highlights how many European manufacturers are still immature in their understanding of plant floor visibility. The vast majority of companies in Europe have a "basic" level of plant floor visibility and slightly more than 50% have implemented plant floor technologies that enable an "integrated" level of plant floor visibility. However, less than 15% of organizations in our survey have an "extended" level of plant floor visibility formed around real-time KPI calculations and the use of RFID. Just a handful of companies can boast an advanced level of plant floor visibility based on Big Data analytics, social business, cloud, and Internet of assets.

A View From Different Industries

Survey results show that over the next three years, manufacturers in Europe will invest to increase their plant floor visibility and they will gradually and consistently move up our plant floor visibility maturity framework. Towards their journey in achieving more plant floor visibility, different sectors are facing different challenges.

Consumer Goods

Consumer goods companies – such as food & beverage or health & beauty – are generally lagging behind in terms of plant floor visibility capabilities with respect to other industries. In fact, more than half of the companies in our panel have limited or basic visibility on their plant floors. This is mostly generated by the relatively low budgets dedicated to this area so far and the relative low cost of produced items, which makes use of advanced technologies such as RFID more challenging. The need for quick changeovers in lines – companies in this sector tend to have quite diversified

product ranges – also makes the ROI for plant floor visibility investments longer. However, leading companies do realize the business case for better plant floor visibility, especially when it comes to the need to secure efficient traceability along the supply chain to comply with customers' evermore challenging requests and with regulatory mandates. In particular, they acknowledge that plant floors are often the weakest areas in this process and need to be instrumented to be able to keep up with business challenges. These organizations have made or are making focused investments in plant floor technologies such as factory automation, ruggedized handheld devices and barcodes, because they have to be able to gather production data from "fixed assets" (e.g., CNC machines, PLCs, controls) in a time-based fashion (e.g., at end of each day or end of each shift).

Process Manufacturing

Organizations in the chemical, petrochemicals, rubber, and plastics business are typically able to gather production data from across the entire plant floor through widespread automation investments and end-to-end MES applications. These companies have now established practices of automatic production data collection as a way to save workers from time-consuming data entry activities, reduce overall operational costs, and improve quality, timeliness and reliability of data input. Therefore today almost half of companies in this sector are at an "integrated" stage of maturity. The major challenge for process manufacturers will be to convert the enormous amount of data generated by their factory controls into actionable information to drive effective decision making. This will imply fostering investments to link their automation layer with enterprise systems, and achieve a real-time decision making environment.

High Tech

Companies in the high tech sector typically have to deal with externally rapid demand cycles. At the same time, they operate along extended and complex supply chains. This requires a synergic coordination and decision making through a seamless flow of information along the value chain. Companies in this sector typically have high-automation/low complexity production processes that make it possible to achieve significant returns from automation and visibility investments. Leading companies in this sector are able to measure plant floor performance in real-time by measuring dashboards of critical KPIs and being able to translate this into decision making. These companies believe that plant floor visibility has a high impact on business performance and strive to increase productivity rather than just looking for cost cutting opportunities. On top of that, a few selected, leading organizations are also adopting advanced technologies such as Big Data analytics, social business, cloud, and Internet of assets to create a real-time, collaborative decision-making environment that enables their plant floor employees to make informed decisions faster.

Discrete Manufacturing

Companies manufacturing complex and highly-customized engineered products such as cars, machinery, and airplanes are probably facing the biggest challenges on their shop floor, where a complex mix of automation, labor, and robotics is at play. Companies in the sector need to have full visibility to assembly line performance and quality and traceability of data, to analyze differences, and identify best practices that should be applied across different lines and plants. They need to be able to provision plants centrally, applying changes and best practices consistently and, again, accommodating the necessary local variability. Most organizations in this sector understand that plant floor visibility has a very high impact on business performance and is a fundamental enabler for faster decision making on the plant floor. These organizations have already extended their plant floor visibility capabilities through the use of RFID or other location-based technologies that enable real-time gathering of information, particularly from "moving

assets" such as bins, pallets, racks, parts, finished goods, and tools. Over the next few years, they will continue to invest in advanced tools to provide real-time and intelligent event monitoring and control for their plant floor employees. This will be essential to respond to unplanned events through complete visibility across the network and operational intelligence, enabling continuous update, planning and execution.

ESSENTIAL GUIDANCE

As manufacturing operations management processes are coming back to the core of the industry's value proposition, 2014 will be an exciting year for manufacturers willing to invest in people-intensive factories of the future.

Along their way towards future factories, manufacturers from every sector should fully address the following areas:

- Standardize processes across the network of factories, creating a common operational platform and work to enable a higher level of production visibility and intelligence.
- Overcome key barriers on this journey by instrumenting production processes with the most appropriate technology to gather instant data from production equipment and deliver actionable information to key decision makers.
- In particular follow leaders and invest – where it makes business sense – in automatic data collection technologies such as RFID and big data/analytics tools and methodologies to provide a real-time and intelligent event monitoring and control for plant floor employees.

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Global Headquarters

5 Speen Street
Framingham, MA 01701
USA
508.988.7900
Twitter: @IDC
idc-insights-community.com
www.idc.com

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