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Role of SCADA Systems in Digital Manufacturing Operations

The data revolution is firmly underway within today's manufacturing industry. Those companies that capture their "big data" and leverage that analyzed data as a framework for making faster, better decisions will lead the industry in productivity and time to market.

Let's put into perspective the scale of this data revolution. Consider the following: In just one manufacturing site, an estimated 3 billion sensor-related events occur during a 24-hour period. Each of those sensor-related transactions represents a piece of data, and most of that data can and should be used to improve operational efficiency.

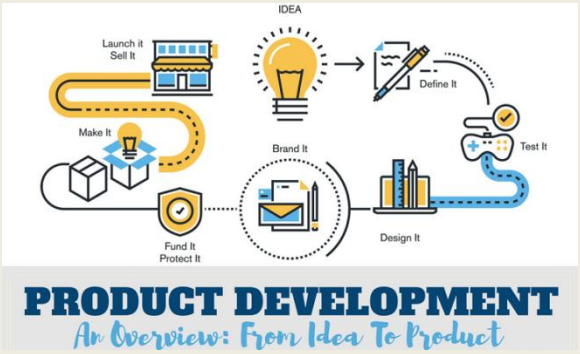
As greater numbers of smart field sensors and actuators deploy across manufacturing sites, these formerly "dumb" devices are now "connected" and begin to add to the data stream. Like tributaries flowing into a giant pool of data, those data elements are converted into useful information, which serves to aid in the decision-making process and ultimately, results in improved production.

But all of this does not happen automatically and some sophisticated tools are required. The good news for manufacturers is that most operators are already familiar with the core tools that provide this data capture and analysis service. The industry calls them supervisory control and data acquisition (SCADA) systems. However, in this new era of full-fledged digitization, traditional SCADA systems have improved and their business value have taken on a new meaning.

Vendors have recognized that SCADA is now a critical solution for connecting a plant's distributed assets in order to generate actionable intelligence. To support this role, vendors are evolving their SCADA applications for deployment on a smaller and more condensed scale. For instance, in traditional applications system nodes might have been physically located miles apart. In the new connected and data dense environments, these nodes may now be inches apart. Newer SCADA platforms, have the ability to tie together data from both closely coupled and widely deployed assets. The result is a more flexible, reliable and transparent environment with more intelligent automation and the ability to collect and analyze big data in real time for actionable information and better business decisions.

What is the digital manufacturing big picture?

The way products are made is the same within both a traditional factory and in digital manufacturing. Holes are drilled, parts molded, batches prepared, bottles filled—but the difference is information. In the case of digital manufacturing, the "smart" devices work together, and the control system interconnects the disparate processes all with one objective in mind--to build competitiveness. Increased efficiency, reduced time to market, and enhanced manufacturing flexibility are now enhanced because of an underlying system that is optimized to process data.

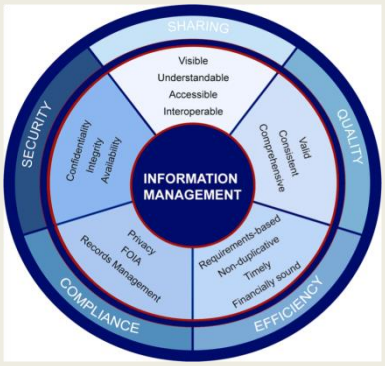


The digitized approach of data gathering, data centralization and data analysis helps to integrate the five basic stages of the product lifecycle: design, production planning, engineering, production, and services. While the product is being designed, all the subsequent stages are already planned so that the overall process operates more efficiently. For example, manufacturing offers feedback on product design from the earliest stages to ensure smooth production. Using simulated modeling through every phase of manufacturing, it is easy to identify critical elements and potential risks and address issues as early as possible for maximum efficiency.

The SCADA contribution to the data flow

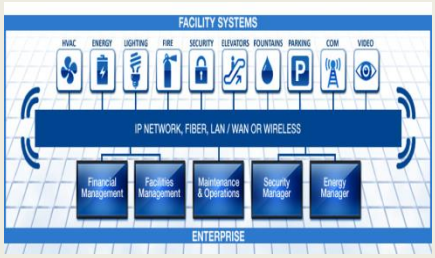
Smart devices throughout the plant become part of the SCADA network facilitating the data flow. Listed below are five areas where SCADA systems add value to a functioning digitalized plant :

1. **Data management**—The enormous variety of field devices each generate their own data. To make this incoming data useful, data formats need to be consistent. That's where the data management component comes in. The output of a good data management system is the rationalization of data so that it is both comparable and storable. A system such as SCADA presents data in real time and also archives it for subsequent analysis. The system can then identify trends or engage in troubleshooting. If a problem occurred in one section of the packaging line at 3:00 pm last Tuesday, what information was being generated by devices up- and down-stream of that problem area during that time period? The SCADA system can provide such information in a quick and straightforward manner.



2. **Information management**—Data needs to be translated into production information so it can help optimize manufacturing. SCADA's Information Server tools can create dashboards that provide real-time displays and visibility to plant operations. Managers can access the dashboards either locally, or remotely. Automated reports are generated that monitor critical process elements across any desired time interval.

3. **Energy management**— Energy management has emerged as both a regulatory and cost control issue. Adhering to standards such as ISO50001 helps to conserve resources, tackle climate change and lower electricity, gas and water costs.



In order to reduce energy consumption, the first step is to be able to measure how much energy is being consumed. SCADA can act as a mechanism for capturing energy consumption data from devices such as transformers, meters, circuit breakers and motor drives, compressors — all places where power consumption can be measured. Then, understanding these energy use patterns, operations teams can avoid utility peak charges by reducing consumption during the times of the day when rates are expensive.

4. **Diagnostics management**— Tools within the SCADA environment allow users to view system and device diagnostic information. The easy access to this information speeds up the process of troubleshooting and repair. Everyday issues such as identifying shorts, wire breakage, missing voltage load, limit violations and other system defects can be quickly identified and addressed, avoiding long delays in both locating the problem and identifying the solution. SCADA provides alarms for immediate notification when problems emerge, and displays clear-text information pertinent to all devices, including sensors, PLCs, HMIs and servers. If a programming error exists within a PLC, the system identifies which line of code caused a trip.

An Integrated Automation Environment provides a consistent look and feel as users navigate across plant functionality areas including process and component diagnostics. Simulation tools within the integrated environment allow for more proactive approaches to both diagnostics and energy management functions. In essence, the integrated environment acts as a gateway to the automation within digital manufacturing.

5. **Open communication** — Digitalization is driving a merger of automation systems with the IT world, so more systems, even those traditionally considered incompatible, are interconnected. System such as SCADA serves as a data bridge between the core Operations Technology (OT) and Information Technology (IT). To access even more operational data through the value chain, SCADA leverages cloud-based, open IoT operating systems, which enables powerful industry applications and digital services to drive business success.

First steps, and a path to digitalization payback

Digitalization is a competitive manufacturing advantage that can be adopted over time. As a manufacturer works to modernize a plant, adding a SCADA system is a critical first step in establishing interoperability. The advantages of interoperability aid in facilitating a more competitive manufacturing environment. Some of the benefits include:

- Plant and IT systems begin to communicate - A more direct exchange of information can occur as plant-level functions connect with MES, ERP and other management platforms.

- Management can make decisions more quickly - More up-to-date and detailed information allows management to drive more optimized plant processes.

- Energy savings - Energy use can be measured and reduced as consumption data becomes more transparent. Implementation of ISO50001 standards becomes simpler.
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- Improved production uptime - Effective use of diagnostic information allows for more streamlined maintenance, and resources spend time where it's needed most.

- Synergistic improvement - Initial successes encourage wider deployment of smart devices at all levels, increasing the flow of information to support better decision-making.

As the digitalization process evolves, SCADA systems expand easily to accommodate and support new integration and communication phases. As digitalization intensifies, the system maintains its role as the primary facilitator of networking and information flow for a more connected and competitive plant.