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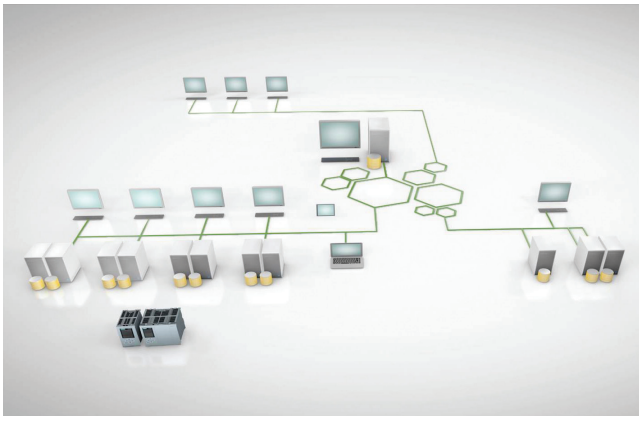
Improving Information Flow Improves Production Flow

Understanding and managing how material moves around a plant is basic to good manufacturing. Now, information is becoming just as important.

White Paper

Executive Summary

With field devices getting smarter and controllers more sophisticated, the operational networking layers that keep plants running have more things to do. This is where SCADA systems function, and their responsibilities are growing as manufacturing processes become more sophisticated. Digital factories depend on these systems to shorten time to market and enhance production flexibility.



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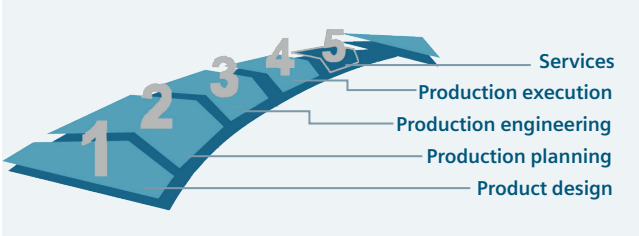
The world is becoming more competitive for manufacturers every day. The only way for a company to remain profitable is to drive efficiency relentlessly, taking advantage of every possible opportunity to remove cost from products, shorten time to market for new developments, and enhance production flexibility. Automation can be a major contributor to such efficiency, but it has to be approached in a way that is, in itself, efficient. Automation, applied haphazardly, may be some help but not nearly as much as it can when fully integrated.

How should a well-designed automation project proceed? Consider the lifecycle of a product:

- Product design
- Production planning
- Production engineering
- Production execution, and
- Service



Traditionally, these steps follow a predictable path, one after the other, moving from department to department. The marketing department puts together a new product's requirements: what it needs to do and the attributes necessary to be competitive. The product is then designed in a way to fill as many of those as possible. The production planning group makes sure it can be built as required and it works with production engineering to consider the actual manufacturing steps, what can be done in-house vs. what should be farmed out, what new manufacturing processes might be needed, tooling, fixtures, and so on. Prototypes might be made and sent back to the earlier stages for evaluation, and another iteration or two or three might be needed with various compromises before everyone is, hopefully, happy. Then actual manufacturing begins which might involve another design tweak or two. Once units are in the field, service comes into the picture.

It is a predictably slow process, more often than not. Steps in the process happen in a serial manner and sometimes move backwards as much as forward. There is an alternative.

Digital Factories

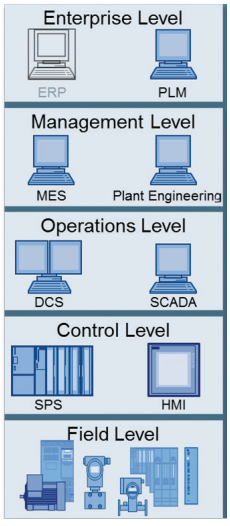
Consider this approach: when marketing brings its product idea to the design department, it is developed virtually. This isn't merely 3-D modeling, virtual design involves a much wider range of product characteristics and attributes. It's collaboration, where all manufacturing departments can participate in the process at the same time, examining the product on the screen without having to make any prototypes. Each department can make its comments:

- "The handle will be difficult to mold like that, can we change the shape at this point?"
- "We can make the assembly easier if we do this component in two parts."
- "Are we sure there will be adequate battery life?"
- "This surface is going to be subject to wear, so maybe we should consider a tougher material."

All of these discussions can happen at the same time so that when the first prototype is produced, it will be much closer to the ideal envisioned at the outset. Once the product has moved into full-scale manufacturing, production happens in a predictable way because all the aspects of the product were anticipated. The design process considers the available manufacturing capabilities and constraints, even down to cycle times and production rates.

Information Flows with Material

In most manufacturing environments, the biggest concern is material flow: how do products move through the process? Increasingly, information flow is just as important. Controllers and field devices have grown in sophistication, increasing their capabilities and ability to generate data. Getting that data to the parts of the process or people that can use it can be a challenge, and success can make or break the value of automation.



Think of the levels of communication in most manufacturing environments, discrete or process. They separate nicely into five divisions from the top down:

- Enterprise
- Management
- Operations
- Control
- Field devices

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Traditionally, while control efforts flow down, information flows up. Each level gathers data from the level below, coalesces and maybe interprets it, and moves it up to the next level. But that picture is changing. More intelligence has been pushed down so lower levels have to be more sophisticated. This puts more pressure on the middle – the operations level – and makes its function all the more important. This is where SCADA (supervisory control and data acquisition) systems do their work, and the nature of that work is changing.

With all the data coming from the plant floor, how do we make it into smart data and use it to create smart reports? Much of that processing takes place at the operations level by the SCADA system. SIMATIC WinCC is Siemens' SCADA system, which includes a family of products, each with its own capabilities and applications. With all its parts working together, WinCC is the glue that joins all the different parts of the manufacturing process into one effective whole supporting efficiency from engineering to operations.

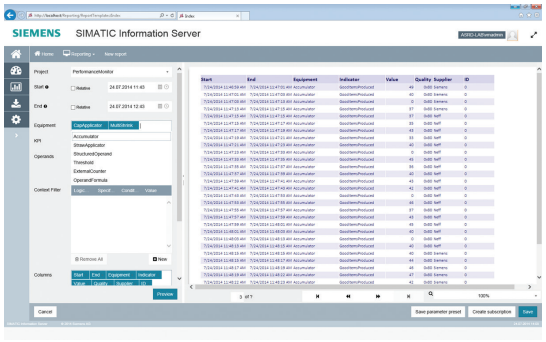
Consider some of the functions it performs:

- Brings data from multiple sources to one place in real time, avoiding lags and clumps of information isolated around a plant
- Interfaces with control platforms from various manufacturers in process or factory automation environments
- Scales easily with requirements
- Provides visualization, control, alarming, messaging, trending and archiving of all the plant level data

Looking at the Parts

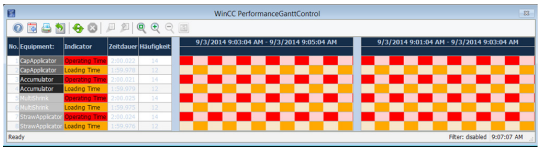
WinCC is indeed a family of products that can be fitted and assembled to provide the capabilities needed for any specific situation.

- WinCC V7.3 is the main platform and has been evolving over the last 20 years. Most recent refinements have been additions to make it function seamlessly with TIA Portal. It is suitable for most applications, but has a maximum limit of 256,000 tags. Multiple engineers can work on the same project at the same time, using many of the same techniques of familiar software platforms such as Microsoft Excel.
- WinCC OA (Open Architecture) is particularly suited for those large-scale, widely-distributed applications, scattered over large geographic areas or those with thousands of servers and millions of tags.
- WinCC Runtime Professional supports HMI applications when all the equipment is close together, and it can even run a single packaging line or machine when a full SCADA system is not necessary.
- SIMATIC Process Historian can collect any data imaginable about a process and make it accessible for analysis and report writing.
- SIMATIC Information Server interfaces with WinCC and Process Historian to create reports. It uses an Internet interface with a reporting framework and mechanisms to create a variety of formats.



- WinCC Performance Monitor is a data analysis and reporting tool that helps users monitor production capabilities, establish baselines and break through bottlenecks. It uses diagnostics from field devices to help identify constraints that might be slowing production or locates where problems are developing with machinery before an outage disrupts production.

- WinCC Web Navigator and WinCC WebUX are mechanisms to provide remote information access. Web Navigator is the earlier platform and interfaces using Microsoft Internet Explorer. It permits mobile control along with data analysis. WebUX (User Experience) is a newer tool more aimed at reporting. It can operate with any browser and any type of device using HTML 5.



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Common Elements

All of these parts are designed to work together seamlessly using a high level of consistency for functions and look-and-feel. Operator familiarity with one part of the system will support new parts, minimizing the need for training. These elements also interface with TIA Portal and can be integrated into larger complex automation systems, even across multiple plants.

Infrastructure for a Digital Factory

Digital factory technology is bringing new capabilities to manufacturers in all industries, allowing them to increase efficiencies, reduce costs and shorten design times for new products. The combination of smart devices with sophisticated controllers all working together under a SCADA system that can support and integrate the highest functionalities can unleash a higher level of manufacturing potential for any facility. Siemens can provide the full range of products, from digital design platforms to all the equipment necessary to automate your manufacturing processes. Built on one common and thoroughly integrated platform, it shortens your path to a new manufacturing environment.

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