Electrolux Utilizes PROFINET Component Based Automation in the Production of Washing Machines

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Figure 1: Transport line, one of the autonomously automated modules in the new paint shop

Washing machines painted different colors are the trend! In its most state-of-the- art paint shop, a well-known washing machine manufacturer is taking advantage of the benefits of Component Based Automation to produce colored instead of white washing machines. With Component Based Automation, the washing machine manufacturer can quickly and efficiently satisfy the wishes of its customers.

Although washing machines typically fall into the category of "white" electrical household appliances, consumer preferences appear to be changing. While there were no colored washing machines until a few years ago, 5% of all washing machines sold are now of a color other than white, and it is assumed that color models will find even greater interest among consumers in the future. In order to produce the metal shells which form the housing for the colorful washing machines, the Electrolux Company implemented a new, technologically advanced paint shop in its factory in Porcia, Italy, the largest production plant for washing machines and dryers in all of Europe. The automation system for the plant was planned and converted by Siemens on the basis of Component Based Automation.

Fully Automated Production of Metallic-Colored Washing Machines

Total automation is an important characteristic of the paint shop for using colored metallic powder. The basis is formed by a monorail airlift system on which the sup- port arms travel while transporting the half-shells for the washing machines from the load station to the drying ovens, as shown in Figure 1. From the load station, the half-shells are first transported to a painting cubicle, where a robot covers them with colored powder. They then dry in a polymerization oven after going through a paint cubicle in which the fixing agents and burnishing compounds are applied. Finally, they are placed in the appropriate drying oven. At the end of the cycle, the half-shells are taken to the unloading station.

Modular Design

The new paint shop is of modular design. Each individual module is designed as an intelligent unit which performs its technological function and communicates with other modules over a network - a typical model of an automation system based on the principles of Component Based Automation. Every macro-block of the painting system has its own intelligent control system, which is based on a programmable controller. A PROFINET-capable Simatic S7- 300 (CPU 317-2 PN/DP), which functions as coordinator for the entire system, is responsible for the transport system. Five additional S7-300 programmable controllers (each with a CPU 315-2 DP) control the two painting cubicles, the two painting robots and the drying ovens. The system architecture is shown in Figure 2. The coordinator PLC controls not only the transport system, but communicates with the visualization system. The coordinator PLC also communicates with the integrated factory management system. It receives its work instructions from this system, and updates it in real time of the progress made.

Successful Network Integration

"The integration of PROFINET in the paint shop simplified data interchange between the plant sections as well as visualization, and also paved the way for problem-free integration in the company intranet", says Vincenzo Peresson, responsible for system integration in European Electrolux production facilities. "All signals having to do with the paint shop are exchanged in the

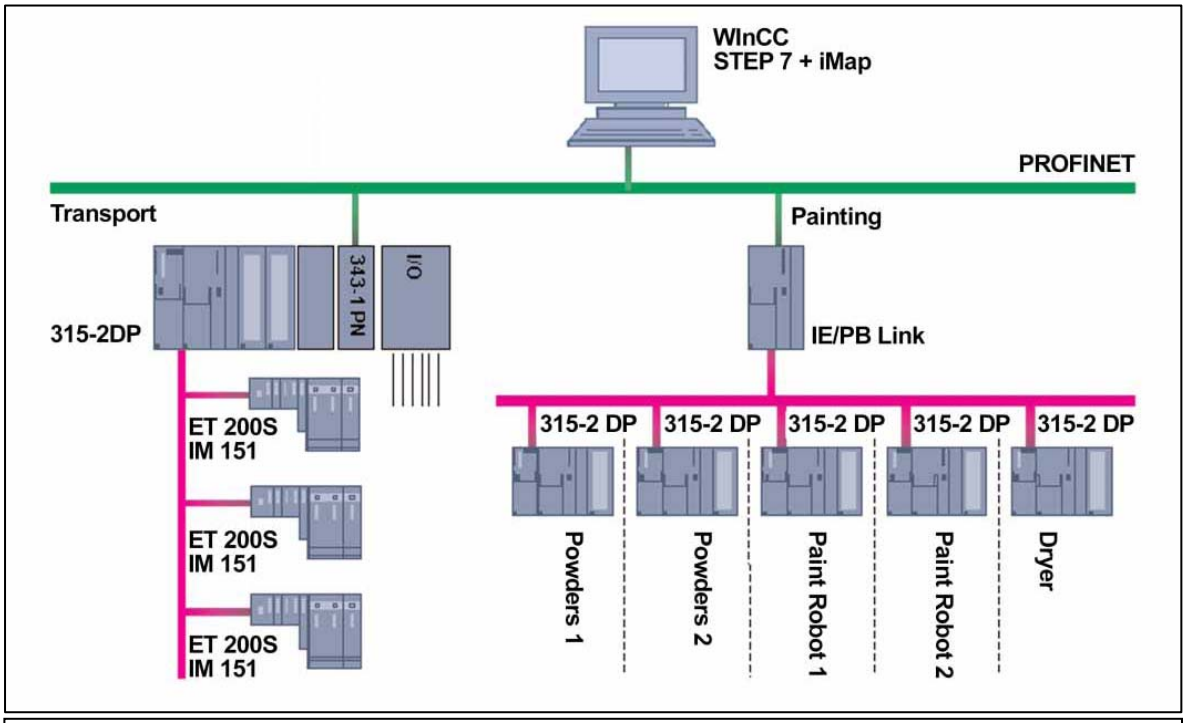

Figure 2: Configuration of the paint shop

network over PROFINET, the signals for the transport system as well as the signals between the programmable controllers. The PROFIBUS devices are integrated in the communication with PROFINET over the IE/PB link for transparency. This makes it possible for us to reprogram operation of the machine as needed from a central location, and gives us access in real time from any location in our factory network to all operational information from the individual plant sections."

Figure 3: Powder coating

Benefits of Component Based Automation

The entire paint shop consists of independent units, to each of which an intelligent component is allocated. The data which the intelligent components must exchange with one another (e.g. start belt, stop belt, start painting process and so on) are logically defined by constructing simple graphical circuit diagrams with the Simatic iMap configuration software. This allows flexible configuration of the communication links during commissioning or when the plant is expanded. Peresson confirms this: "Thanks to the Simatic iMap engineering tool which supports Component Based Automation, we were able to save a great deal of time. For example, it is no longer necessary to use a communication specialist just to write code that would allow the controllers to communicate with one another. All one has to do now is to follow the iMap circuit diagrams and that's it, regardless of the network type or the physical topology of the connections. Modularization also allows us to modify an intelligent module internally without having to intervene in the programming or in the operation of the other modules. This, in turn, allows us to maintain an enormous amount of flexibility in the development of the plant by permitting us to hang on to the investment we have already made."

Conclusion

Thanks to the efficiency of Component Based Automation and the total integration of the new paint shop in the factory information system, the plant in Porcia is already producing more than 10,000 colored washing machines per month, giving us the advantage of quickly increasing production while maintaining enormous flexibility for adapting the color mixture to suit the latest consumer trends.

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