Siemens Digitalized Production Cell Boosts Auto Parts Manufacturing by 20%

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Overview

Increases in order size and quantity led Wisconsin-based auto parts manufacturer Felss Rotaform to expand operations through a new dual robot machine-tending cell.

The continuous process improvement goals of the company meant that the new cell had to be safer, faster, and more flexible than their previous manufacturing cells. To address the complex nature of the automation, Siemens was contacted due to their track record in innovation and unique expertise in integrated robotics and control technologies.

They weren't disappointed. Six months after approaching Siemens and systems integrator IAS, Felss Rotaform found themselves operating a digitalized, integrated manufacturing cell that was quickly breaking productivity and profitability records. The results include:

- **Production increase** – Felss Rotaform's initial goal was a 48-second full cycle turnaround time for each individual part in the new cell (far faster than any of their older cells). The innovative design and implementation of the IAS and Siemens solution sped the complete part production process up to 38 seconds, an improvement in efficiency of 20 percent.
- **Profitability gain** – According to Chad Due, Electrical Controls Engineer at Felss Rotaform, "This new cell can produce in two shifts what would previously take three to accomplish. This allows us to produce 600 additional parts over a 24-hour period. In addition, profitability for the cell has increased by 13 percent."
- **Downtime reduction** – Once the new cell was implemented, downtime went from days to hours for complex changeovers and, for typical scheduled changeovers, what used to take eight hours to perform now takes just 15 minutes.

How they did it: Unique integration skills partnered with Innovative technologies

While reviewing requirements for their next generation robotics cell, Felss Rotaform had several goals. First, they wanted to boost productivity by deploying new high-speed PLCs to achieve shorter full-cycle turnaround times for each individual part.

Second, they wanted to explore a more advanced safety solution that assured better control of who was entering the cell. In the older cells, a machine could accidentally be turned on when a maintenance person was present in the cell, placing that individual at risk for injury. To avoid this, Felss

Rotaform wanted an automated process to guarantee the cell was vacant once the cell was restarted.

Third, they wanted more flexibility for cell changeovers, which would allow them to test and provide a more diverse product range for its customers. The older cells required the entire cell be reprogrammed each time a new process was performed, which could take days to execute.

These goals set the bar high for Siemens and IAS, but pushing the performance envelope is exactly what drives both companies.

According to Kyle Weise, IAS marketing manager, "IAS and Siemens are both always looking outward for the next level of digital manufacturing to help our customers improve productivity and shorten time to market, which enables them to be more competitive."

Richard Parkhurst, Siemens Account Manager, knew IAS would be strongly positioned to accomplish Felss Rotaform's goals. "Some integrators perform strictly software development and others are more skilled at building and assembling the hardware. IAS brought a combination of all of the necessary skills and expertise including robotics and safety engineering capabilities," he said.

IAS recognized Siemens products were critical in helping Felss Rotaform achieve their goals by providing the speed, reliability, flexibility, and safety required. For example, an Ethernet-based Siemens PROFIsafe digitalized communications backbone was designed into the cell to control machine and perimeter safety. Safe communication is provided between the various PLCs and robots. PROFIsafe relays status

information from the devices inside of the cell to the main PLC and provides a big advantage over older technology because both standard and safe communication take place via a single bus system. This avoids cumbersome, hard-wired I/O, as a single Ethernet cable is all that is required to transfer update data. Instead of having to run physical wires, the data update task can be accomplished through a configuration in the TIA Portal. Thus, the PROFIsafe system is easy to run and connect, which reduces commissioning overhead, and easy to modify if changes need to be made.

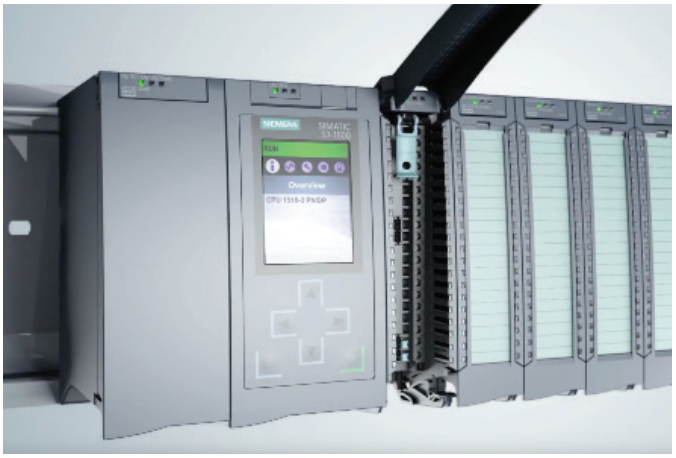
All sensors and actuators within the PROFIsafe solution can be freely programmed within the distributed safety concept, regardless of their I/O station. This flexibility allows operators to switch off actuators selectively. Other advantages include failsafe communications, advanced diagnostics and hot swapping capabilities which help to reduce downtime.

Siemens SIMATIC S7-1500 PLCs, with built-in PROFINET interface, also played a major role in increasing operational speeds. The high-speed backplane bus with its high baud rate and efficient transmission protocol yields a crucial performance advantage over non-Siemens equipment for fast signal processing.

According to Simon Vancina, the IAS Applications Engineer and main robotics and PLC programmer, “The S7-1513F PLC was a great choice for this project because of its speed, range of available I/O expansion cards, programmable safety controller functionality, relatively compact form factor, and low cost when compared to the competition. In the past we have used PLCs from other brands, and while they all offer similar features, they are often lacking in one area or another. They may have fewer I/O points per card, be physically larger, or cost much more. The S7-1500 series hardware really brings it all together into one great package with lots of options for expansion and configuring it all in TIA Portal is very intuitive. The ability to slide the wiring terminals on the I/O cards out into an easy-access wiring position is a nice touch as well.”

Siemens TIA Portal played a critical role in saving time and engineering resources when programming all of the PLCs and

HMIs. The use of the TIA Portal shortens time to market by means of simulation tools, programmer productivity tools, and additional diagnostics. According to Vancina, "The TIA Portal is a fantastic platform that provides an ease of use and freedom I haven't seen in any other industrial programming environment."



"Using other PLC development environments, I always feel like I have to change my program to work around the limitations of that environment. On the other hand, TIA Portal lets me write code the way I want to write it and switch from one programming language to another whenever I need to. For instance, with TIA Portal I could choose Ladder Logic to make simple logical sections easier to read, and then in the next line of code switch to something like Structured Text to implement the more complex process controls or calculations. Nearly all PLCs allow the use of the various IEC 61131-3 programming languages, but TIA Portal lets you combine them in a unique and effective way. This is a very convenient feature that allows us to reduce our code development time and enabled us to get this system online much faster," he said.

Vancina explained the creation and implementation of structured programming using functions and function blocks is much easier and more flexible when compared to other development environments. Tags can be organized into separate groups rather than having them all piled into a single, unwieldy list. Hardware and network configuration is performed graphically, making it easy to see how everything is connected.

Another unique feature is that the HMI development tool (WinCC) is built in, making it easy to cross-reference tags from the PLC to the HMI. Simple tasks like renaming a variable in the PLC won't break its connection to the HMI, which happens in other programming environments. "I really can't over-emphasize how huge an improvement TIA Portal is over every other PLC development environment I've used, and I've used all the big ones," he said.

Fast testing and traceability

Felss Rotaform immediately saw benefits beyond their core goals. Big automotive manufacturers are always looking to test new products. They count on their suppliers to assist them in the testing process. Those suppliers who are the most responsive in the testing phase are often rewarded with new business. The new IAS and Siemens manufacturing cell was designed with product testing in mind. It can run six different new parts numbers in a week, which takes an entire month on another cell.

For manufacturers like Felss Rotaform, traceability plays a key role in reducing operational costs. The new cell is also much more advanced in its ability to detect defective parts. The cell can help to prevent defective parts from being shipped by detecting the defects and placing those parts in a separate bin, even stopping the cell and alerting the operator if defects happen too frequently. If a defective part is shipped and found by the customer, it could mean a return of an entire shipment. Sending out defective parts can result in hundreds of thousands of dollars in lost revenues.

Next step: Grow the digitalized applications

The success of the IAS-integrated Siemens solution prompted Felss Rotaform to invite IAS and Siemens to participate in future automation and digitalization-related projects. Kyle Weise says the partnership with Siemens has been fruitful and unique. "When we partner with Siemens we don't just buy a component and then it's 'on us.' Our strong technological relationship includes comprehensive training, technical capabilities and ongoing support of Siemens, which makes a big difference and is critical for project success."

IAS and Siemens are currently testing two similar robot cells that will be implemented in 2018 and include better maintenance tracking for more advanced digital manufacturing. The new system tracks how long a machine has been running and indicates when key critical parts are nearing their projected cycle time thresholds. One of the Siemens solutions being explored is MindSphere, a cloud-based open Internet of Things (IoT) operating system that serves as a connected platform with apps that provide a range of functions such as reducing security risks and improving the availability of

connected machines and plants.

In addition, the new system will incorporate predictive analytics to send an alert to the master control of a cell to indicate potential issues. "The new system tells you what needs to be replaced and what type of part the system needs. You scan the part before you install it and it tells you whether it is the right part for that machine," said Vancina.

Felss Rotaform looks to Siemens and IAS to advance their digital manufacturing with solutions like better maintenance tracking and predictive analytics, that enable them to be more competitive. To learn more about how Siemens manufacturing automation solutions, or IAS Worldwide, can help digitalize operations and boost operational efficiency visit https://www.siemens.com/global/en/home/products/automation.html or www.iasworldwide.com.

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