

Case Study

Factory takes giant step in its digitalization journey by installing an advanced Siemens SITOP power supply system



- **Company:** Carrier Corporation, with U.S. headquarters and operations across 180 countries
- **Challenge:** Outdated machinery and automation controls with poor operating visibility
- **Solution:** A complete Siemens automation upgrade, using SIMATIC components and the SITOP PSU8600 power supply system, all programmed with the TIA Portal
- **Results:** Greater flexibility, control, and visibility, plus saving time and cabinet space

When Willis Carrier invented the world's first electrical air-conditioning unit in 1902, he aimed to improve the process control at a printing plant in Brooklyn, New York. The plant wanted to better manage ambient temperatures and humidity inside its operations, in order to improve control of paper dimensions and ink alignment. By the 1950s, central "AC" found its way into residential markets. This drove the enormous growth of the U.S. cities and suburbs into the desert Southwest, such as Phoenix and Las Vegas, as well as making cities in tropical and subtropical climates around the world much more livable.

Today, as part of the United Technologies Corporation, the Carrier Corporation's U.S. operations include a plant with 830,000 square feet of manufacturing space in

Collierville, Tennessee, 30 miles west of Memphis. It's the world's largest maker of residential ducted split system air conditioners and heat pumps.

Inside the plant is a coilshop with large hairpin bender machines that bend and cut copper tubing for the coils that are functionally core to the plant's main output: highly efficient 1.5 to 5 ton AC units. With innovation as one of the company's key values, Coilshop Engineering Manager Dave Crawford saw an opportunity to upgrade the machinery in his area, to help keep up with growth and as part of a longer-term vision of further digitalizing the factory's operations.

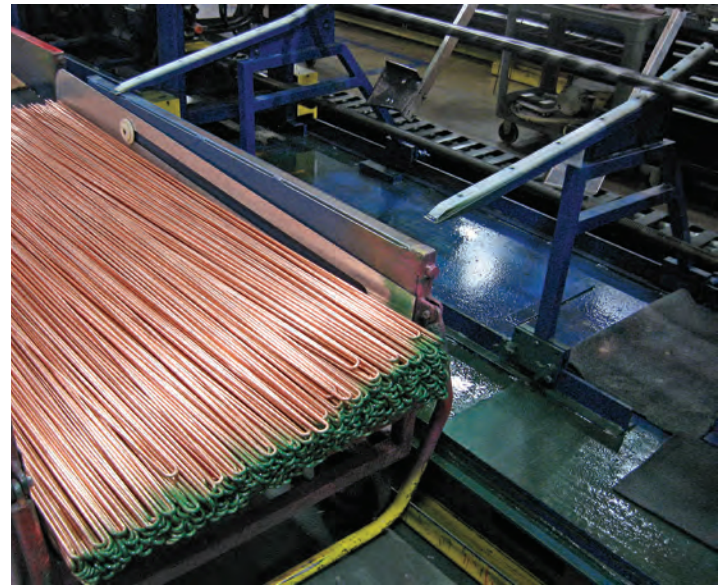


Figure 1. Left, view inside the Carrier factory coilshop, with newly installed Siemens SIMATIC Comfort Panel HMI in right foreground. Right, bent copper tubing destined for the insides of 1.5–5.0-ton residential air conditioners manufactured at the plant.

Challenge: Outdated machinery and automation controls with poor operating visibility

Crawford explains that the machinery's existing control system was designed in the 1990s with a proprietary, multi-axis controller and Opto22 I/O. "To accommodate the growth expected from a new product line, we put in a capital request to replace our old bender machines that were built in the 1990s and are much slower than what's available today," he says.

Crawford needed to cut costs and improve quality without losing his shop's productivity. "Since that was the case, we decided to challenge ourselves and rebuild some of the older benders to boost their performance speed and output quality to what we knew we needed," he says. "And to prove we could, we started with the oldest machine we had."

Solution: A complete Siemens automation upgrade, using SIMATIC components and the SITOP PSU8600 power supply system, all programmed with the TIA Portal

Crawford recalls taking part in some planning discussions where the upgrade feasibility was questioned. "When they said that, it became an immediate challenge for me to show them otherwise," he says. "We stripped the machine completely down, cleaned it up, added new hydraulics and a multi-axis controller arm. We then put all the I/O in one main cabinet, and installed brand new Siemens controls and HMIs. We also swapped out the old motors and starters for Siemens ones and its latest power supply unit."

Specifically, Crawford used Siemens SIMATIC S7-1500 safety-integrated PLCs, SIMATIC ET 200SP central and remote I/O, and SIMATIC Comfort Panel HMIs in the machine's overhaul, all programmed in the Siemens TIA Portal's common engineering framework. In addition, he installed the Siemens SITOP PSU8600

power supply system, which he notes delivered a big boost to the bender machine's modernization.

"The SITOP PSU8600 power supply system has given us a lot of advantages," Crawford says. "Long before this, we had installed expensive indicating fuse blocks in our power management scheme with all kinds of wiring that needed our electrician's attention."

"Then we upgraded to two SITOP 24V/20A modular converters and four PSE200U selectivity modules for circuit protection. While those worked great and were a big improvement over what we had before, the 8600 takes us even further on our digitalization journey."

SITOP power solutions: reliability, flexibility, and efficiency

SITOP power supply solutions are known worldwide for their reliability, flexibility, and efficiency – up to 95 percent. They're also used to manage critical, often variable, electrical network conditions, especially providing auxiliary power during utility interruptions to prevent machinery shutdowns altogether or enable safe shutdowns if the duration of power disruption is extended. For example, the SITOP PSU8600 power supply can deliver 50 percent extra power for short-term loads, and it can buffer brief power failures up to 20 seconds at a full 40 A load, should a situation require it.

The ultra-compact and modular SITOP PSU8600 power supply is the most recent addition to the SITOP portfolio. It's fully programmable in the TIA Portal, same as all of the SIMATIC devices, so Crawford could do his power engineering with the same tool he used for his automation and controls – and do it just as easily and quickly. The SITOP PSU8600 power supply family also includes optional, easy-to-install expansion, buffering, and battery modules to address a wide range of power management needs.



Figure 2. The Siemens SITOP PSU8600 power supply system requires half the cabinet space than the previous SITOP solution it replaced. At left is previous cabinet configuration using two SITOP 24 V / 20 A modules and four PSE200U for circuit protection, with significant wiring required. At right is the upgraded configuration: One Siemens SITOP PSU8600 5-28 V / 40 A basic module and three SITOP CNX8600 expansion modules for power, integrated circuit protection, and diagnostics via PROFINET.

In fact, Crawford upgraded to one SITOP PSU8600 5-28 V/40 A module and three SITOP CNX8600 expansion modules for power, integrated circuit protection, and diagnostics via PROFINET. Altogether, the modules took up half the cabinet space as the power modules they replaced, as shown in Figure 2.

Fast, easy installation

Installation was easy, Crawford reports, thanks to the SITOP System Clip Link connector system. It allows the basic SITOP PSU8600 devices to be expanded using expansion modules, buffer modules, and uninterruptible power supplies without requiring any wiring.

“We virtually eliminated our wiring with this connector system, and it makes expansion a total breeze, taking just minutes.”

With the SITOP PSU8600 power supply’s built-in Industrial Ethernet/PROFINET switch functionality, plus the two ports on its base units, Crawford was able to easily connect its modules to the factory’s existing automation network. Able to support both in-line and ring network topologies, the power supply also features the open OPC UA machine-to-machine communications protocol, so it can interconnect with other third-party equipment that also features OPC UA communications.

Results: Greater flexibility, control, and visibility, plus saving time and cabinet space

With the SITOP PSU8600 and the TIA Portal, Crawford can check in on the coilshop machinery’s operating power conditions and energy management functions, to view and evaluate diagnostics

data. He can either access this information locally from the machine’s HMI or remotely, from wherever he has an Internet connection, thanks to its built-in web server.

“Given the SITOP 8600’s connectivity and its operation via the SIMATIC PLCs and TIA Portal, I have total control and flexibility over assigning various devices and machinery different voltages and amperages, both input and output levels,” Crawford says. “Do I want 24 volts? 12 volts? 5 volts? It doesn’t matter. With just one 8600 power supply system, I can easily set and see them any way I want. This saves money and cabinet space on having to buy, install, and manage separate power supplies for different voltages.”

What’s more, Crawford can see the power levels and trends of everything he’s running at any given time from just about anywhere he has an Internet connection. “I can check and adjust machine and device voltages as necessary from my upstairs office desk or even from home or away, for that matter, without having to take time and go down to the shop floor,” he says.

“I can remotely look at what is going on and identify any potential issues like a device that’s drawing too much current. I also don’t need a factory electrician to do it for me or to assist me.”

Saving staff time, while finding and resolving power issues sooner

Being able to get power diagnostics via the SITOP PSU8600 through the HMI display or remotely via the web server also saves Crawford and his staff time when troubleshooting.

This also helps alert them to potential issues sooner and resolve them faster – usually before production disruptions can occur.

In the future, as the Carrier factory invests in greater digitalization, Crawford sees the Siemens SITOP PSU8600 power supply system playing a key role. He cites as one example the system's extended expansion with CNX8600 modules to as many as 36 outputs, each adjustable from 4–28 V.

As another example, he points to the system's OPC UA communications capabilities and the Siemens MindSphere open IoT (Internet of Things) cloud-based platform as ways to manage power across the entire plant and eventually all of its plants worldwide. "With digitalization, your imagination is the only limit to what can be done," he says.

For today, however, Crawford is more than gratified that the overhaul and upgrade of the coilshop's oldest machine has turned out so well, showing doubters what's possible with Siemens technology.

**“Now, with its upgrades in place,
the older machine we fixed up can
outperform the new machine with
better quality and speed,” he says.**

“That’s a big deal for us and for the company, especially given the substantial capital cost we avoided in buying new bender machines.”

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