HVAC Maker Carries On Its Upgrades

BY SHARON SPIELMAN

For 30 years, this now PCI-certified provider of heating, air-conditioning, and refrigeration solutions has continued to upgrade its finishing line, saving dollars and the environment.

Photo courtesy Carrier

When Carrier Corp., the world's largest provider of heating, air-conditioning, and refrigeration solutions was looking for a way to achieve a more durable finish for its outdoor products, the company opted to replace one if its liquid paint lines with a powder coating system.

The year was 1980, and the world's largest provider of heating, air-conditioning, and refrigeration solutions was looking for a way to achieve a more durable finish for its outdoor products. Carrier Corp., headquartered in Farmington, Conn., opted to replace one of its liquid paint lines with a powder coating system. That was 30 years ago. Today, Carrier's manufacturing plant in Collierville, Tenn., applies the finish to the company's products. It is there where you will find eight Nordson cartridge-style reclaim booths with automated spray guns, six of which utilize iControl technology.

When asked why the company chose the equipment they did, Mark Hildenbrand, senior manufacturing engineer at Carrier, explains, "Carrier has a long history (30 years) with Nordson and has upgraded equipment many times over the years, implementing many technology advances."

Two of Carrier's systems were installed in 1989, three more in the 1990s and three more in the 2000s. "I began working with Nordson in 1994, and have installed six systems and several upgrades since then," Hildenbrand says. "The most recent upgrades installing Nordson's iControl systems occurred in 2005, when a major plant expansion required additional equipment to meet capacity requirements."

The Line

If you were to walk through the Collierville plant, you would find two separate dual line spray systems, designed by George Koch Sons, each with a six-stage pretreatment system—two cleaner stages, followed by two recycled water rinse stages, then fluorozirconic treatment, then a fresh-water rinse stage. The pretreatment systems also include Suparator oil

Photo courtesy Carrier Corp.

The pretreatment systems at Carrier include Suparator oil separators on the first stage and end-of-line blower systems to reduce water carryout. The cleaner is Henkel Parco ZX-1, and fluorozirconic is Henkel Bonderite NT-1.

separators on the first stage and end-of-line blower systems to reduce water carryout, says Hildenbrand. The cleaner is Henkel Parco ZX-1, and fluorozirconic is Henkel Bonderite NT-1.

The two conveyor systems are standard 4" monorail with dual drives, operating at 18 fpm, designed and installed by North Mississippi Conveyor. AP Conveyor designed and installed the load bar system to maximize part-hanging density. The entire paint cycle is approximately 90 minutes from part hanging to part removal. The ovens, designed by George Koch Sons, are convection with approximately 16 minutes of cure time.

Although Carrier's products do not require any masking for the sheet metal parts, hanging these parts on clean hooks is very important to Carrier. To ensure a clean hook for every pass, Hildenbrand says that Carrier uses a Kolene molten salt bath installed inline on two of the paint lines. "The hooks are stripped clean in less than 30 seconds and return to load area clean, dry, and ready for parts," he says. "Utilizing this method of cleaning provides an uncoated hook with every pass and ensures no grounding issues. Hooks from the other paint system are transported daily to the conveyors with the Kolene system and are hung between hooks already on the line," he continues. "This allows us to clean hooks from all four paint lines with the one salt bath system."

Green Machines

Carrier is part of United Technologies Corp., a Hartford, Connecticut-based provider of products and services to the aerospace and building systems industries worldwide, with operations in more than 170 countries. Carrier principally manufactures HVAC equipment for all sectors. United Technologies Corporation (UTC) is a diversified company whose products include Carrier heating and air conditioning,

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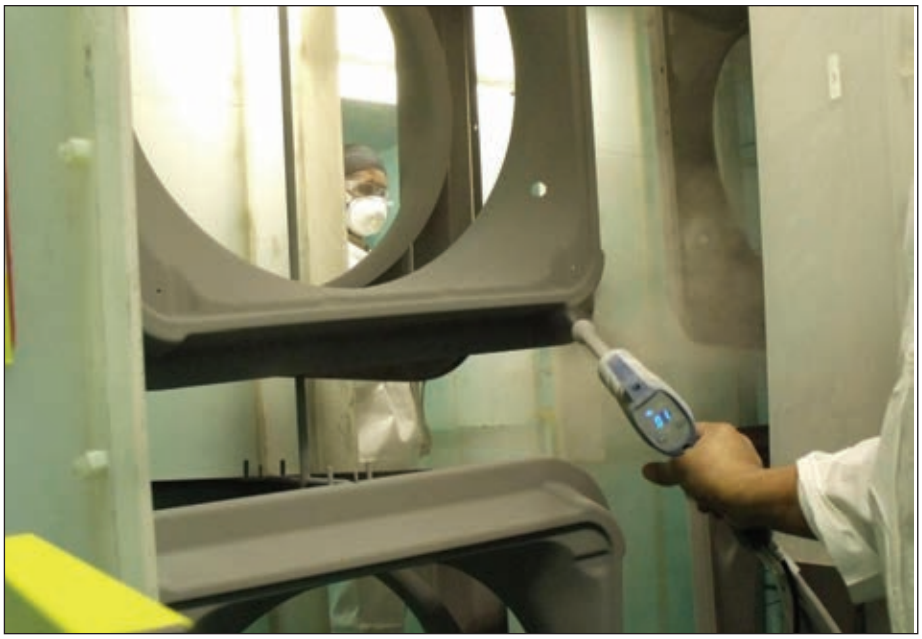
If you were to walk through Carrier's Collierville plant, you would find two separate dual line spray systems, each with a six-stage pretreatment system. There are eight cartridge-style reclaim booths with automated spray guns. The two conveyor systems are standard 4" monorail with dual drives, operating at 18 fpm.

Photo courtesy Carrier Corp.



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Hamilton Sundstrand aerospace systems and industrial products, Otis elevators and escalators, Pratt & Whitney aircraft engines, Sikorsky helicopters, UTC Fire & Security systems and UTC Power fuel cells.

When it comes to the Green initiative, Carrier is serious about reducing their water, air, and carbon emissions. "The most significant change occurred with the elimination of zinc phosphate on our pretreatment systems by implementing Henkel's NT-1 fluorozirconic nanoceramic metal treatment technology," Hildenbrand explains. Because the chemistry operates at ambient temperature, Carrier was able to reduce its natural gas usage on the water heating boilers by 50 percent, he reveals. "With the associated reductions in sludge, and maintenance and repairs, we were able to save more than $200 thousand the first year. Also, we have installed cascading water recycling piping to supply makeup water to each of the stages in the pretreatment systems."

To reduce compressed air consumption, Carrier installed low-flow continuous fluidizing systems to its powder booth feed hoppers, which Hildenbrand says allow the booths to be shut down when not in use but enables immediate startup by not having to wait for the powder to fluidize before spraying. "Before, we were leaving all booths running, wasting air through the cartridge pulse cycle. Approximately 300 cfm reduction was realized with this system," he says.

"Another green initiative at our facility involves reducing VOCs (volatile organic compounds) in the manufacturing of our condenser coils," Hildenbrand continues. It is a new system that utilizes a lubricant with lower VOCs as well as a wicking process where the precise amount of lubricant required in manufacturing coil fins is regulated and applied through pumps and metering devices. "This change resulted in a 60 ton reduction in VOCs in 2008 when the change was made, which translates to a 15 percent reduction for all of UTC and a 19 percent reduction for all of Carrier," Hildenbrand explains.

Since 2000, Hildenbrand reports that Carrier has reduced air emissions by 76 percent, water usage by 52 percent, and Greenhouse gas emissions by 33 percent. He also says that in 2009, the Collierville plant developed a new lubrication system that reduced VOC emissions by more than 80 percent below the 2006 baseline. "We introduced the first commercial and residential air conditioning system using a non-ozone depleting refrigerant in 1994 and have since led the industry away from ozone depleting substances," Hildenbrand says. "For this achievement, the U.S. EPA (Environmental Protection Agency) awarded Carrier its 'Best of the Best' Stratospheric Ozone Protection Award in 2007."

Commitment to Excellence

Carrier's quest for excellence does not stop with its green initiatives. Recently, Carrier has earned its PCI 4000 certification.

In 2009, PCI conceived and launched a certification program to identify powder coaters that could demonstrate the capability to achieve a specific standard of workmanship in the use of powder coatings. The PCI Certification program is a com-

prehensive audit process used to evaluate the business practices, process elements, equipment capabilities, employee competencies and quality control capabilities of a coater to produce a high quality powder coated product with a high degree of customer satisfaction.

The benefits for the certified coater include:

- Expert input from the PCI Certification process to evaluate and create a methodology to continually improve and enhance their powder coating process.
- Use of the PCI world-renowned logo and benefit from the high standards this image brings to elevate their business image.
- Establishes the business as a coater that has met an accepted industry standard for coating capability.
- Differentiates the coater from all other coaters and provides access to business opportunities requiring PCI certified applicators.
- Being highlighted as a certified coater on PCI's website and *Powder Coated Tough* publication.

PCI has developed the PCI 3000 Certification Program, which is available to all custom coaters applying powder coatings, to acknowledge coaters who can meet a standard of product quality that fits their market and meets or exceeds all of their market needs and advertised standards. In addition, PCI offers the PCI 4000 Certification Program, which is designed and offered to all original equipment manufacturers (OEMs) applying powder coatings. This is the certification that Carrier Corp. has earned.

The audit process exposes the powder coater to a thorough examination of their equipment and process used for application. It also examines their business operation from raw materials to finished products. This includes the safety culture within the company, inventory control, quality control, process control, and customer satisfaction. The entire operation is examined to make sure that the powder coater can deliver their expressed level of quality on a regular basis. In addition to the initial audit, the coater is required to perform routine internal audits and they are required to schedule an annual audit by PCI to reaffirm their continued compliance with the goals of the program.

During the auditing process PCI closely examines each of 12 operating elements. These elements include:

1. Pretreatment of the substrate
2. Ovens used for drying and curing
3. Application of the powder coating
4. Incoming material quality control
5. Training practices and competencies
6. Maintenance of the system
7. Customer satisfaction
8. Safety record and practices within the operation
9. Process control
10. Warranties, guarantees and performance expectations
11. Final quality control practices
12. Loading, unloading and packaging

Within each element, the powder coater must meet a minimum required score in order to receive the approval of PCI and become certified.

The company seeking certification selects specific standards that meet their particular markets. The stan-

Photo courtesy Carrier Corp.

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dards available include steel, aluminum, heat sensitive materials, functional products and others. Within the aluminum standard the company may want to include specific outdoor levels of performance. These performance levels include A1, A2 and A3 designations. The letter stands for aluminum and the number corresponds to the American Architectural Manufacturers Association (AAMA) standards 2603, 2604 and 2605. Each of these standards includes different levels of performance for increasingly demanding environments.

"This certification is recognition to the hard work and attention to safety, quality, and productivity that our facility demonstrates every day," Hildenbrand says. "It was a chance to have our entire process audited by an independent knowledgeable professional in order to discover improvements that can be made to our process as well as acknowledgement in areas that our facility does well."

The company also has a program for striving for excellence in manufacturing, called Achieving Competitive Excellence (ACE). Hildenbrand reports that ACE is UTC's operating system. It is powered by the disciplined application of tools for process improvement, waste elimination, problem solving and decision making with a disciplined focus on the customer. "The ACE operating system incorporates the major elements of lean manufacturing and statistical quality control," he explains. "ACE is a customer-focused, process-based methodology for achieving higher levels of customer satisfaction and business performance."

The ACE approach aligns decisions and resource allocation with those activities that will yield the most impact on customer-defined expectations. Included in the ACE definition of "customers" are all stakeholders in the business such as employees, the environment, internal customers, and the end customer, Hildenbrand says. "This drives a balanced scorecard approach to improvements.

ACE was first introduced to UTC in 1996 as the fusion of two philosophies and tool sets: "Quality First" from Yuzuru Ito, UTC's Quality Consultant during the 1990s and "Flow (Productivity) First" from Taiichi Ohno, the developer of the Toyota Production System, Hildebradt reveals. ACE also has other philosophical threads and tools, known collectively as process certification, that stem from the teachings of W. Edwards Deming and Genichi Taguchi, who in 1960 revolutionized the definition of quality to mean "on target with minimal variation."

At its core, ACE is comprised of three fully integrated elements: culture, tools, and competency levels. There are four levels of ACE achievement for cells and sites: Qualifying, Bronze, Silver and Gold. "All cells at the Carrier Collierville site are Gold," Hildenbrand says.

Community Involvement

This year the Collierville manufacturing facility donated over $15k to the American Cancer Society for Breast Cancer Awareness. In addition, we have pledged over $109k next year for United Way. In addition, we support the Ronald McDonald House, Page Robbins, Collierville Firefighters and Policeman Foundations, March of Dimes, St. Jude, Habitat for Humanity, Junior Achievement, and Southern Heritage Foundation.

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