Saving with Single-Stage Pre-Treatment

A furniture manufacturer finds an environmentally friendly, cost-effective replacement for its outdated three-stage pre-treatment system.

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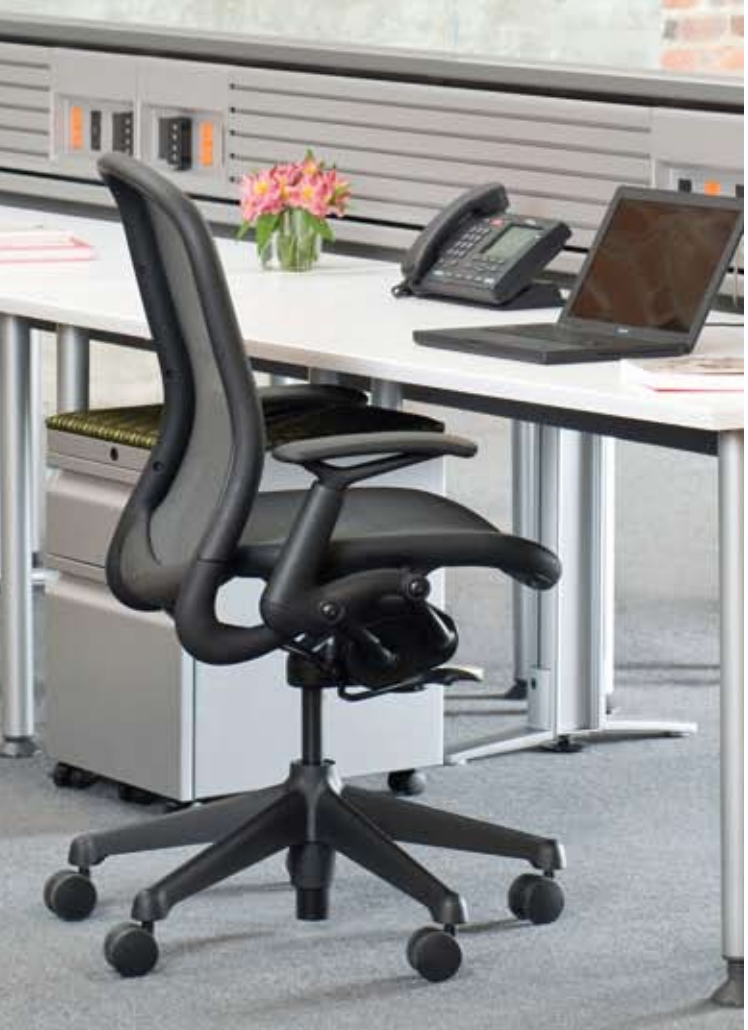

Almost all of the furniture components shown here ran through Knoll's single-stage pretreatment system.

It's a common thought among company officials these days: "We need to do our part in finding ways to reduce our carbon footprint." And what better time to make changes to effect a desired result than when it's time to replace outdated equipment? Near the end of 2006, Knoll Inc. (East Greenville, Penn.), manufacturer of contract office furniture, was in the market to replace its 25-year-old three-stage iron phosphate system used to process extruded aluminum, hot- and cold-rolled steel, die-cast aluminum, and pre-welded materials. Working under directives established by company managers to reduce carbon dioxide emissions, the company's engineers searched for a system that would consume less natural gas and electricity. After extensive testing, the company was pleased to adopt a pretreatment method that originally appeared too good to be true.

Environmental Commitment

Founded in 1938, Knoll manufactures innovative and modern office systems, seating, files and storage, tables and desks, wood casegoods, textiles and accessories. With its comprehensive environmental, health and safety plan, the company has an ongoing commitment to incorporating policies and practices designed to protect the biosphere, conserve natural resources and reduce waste. Aligned with a number of third-party certification organizations, including the Greenguard Environmental Institute, the U.S. Green Building Council, and the Forest Stewardship Council, the company continues to reach out to serve its clients through environmentally responsible practices. All four of its North American manufacturing facilities are ISO 14001-certified.

As part of its 2006 commitment to the Clinton Global Initiative, the company adopted an internal campaign in cooperation with the Chicago Climate Exchange, and this move played a significant role in the selection process for the company's most recent wash system.

At the time, a three-stage iron phosphate system was serving two separate powder coating lines used to finish a large percentage of the components produced at the plant. As this system quickly became obsolete, company management saw its replacement as an opportunity to further work towards annual targets for reducing CO_2 emissions. The key was finding an effective replacement that would also consume less natural gas and electricity.

The Search

Because Knoll was familiar with running an iron phosphate system, first consideration was given to a lower-temperature alternative of this technology. This idea was ruled out, though, because the initial savings of the process would be offset by expenses relating to the deionized water rinse that would be

Before the new system could be installed, the old iron phosphating system needed to be cut down to pieces small enough to fit through the dock door.

required to compensate for the decreased effectiveness of the alkaline cleaner. This lower temperature cleaning method was also not as suitable to the wide assortment of materials with which the company works.

After further research, company engineers were introduced to Plaforization, an organic phosphating technology that is effective at room temperature for degreasing and phosphating metal surfaces. This one-step process seemed too good to be true, so the people at Knoll took it upon themselves to test and re-test in a best-effort attempt to prove it would not work for them.

Linwood Rohrbach, quality assurance engineer, explains, "After five or six rounds of testing, sending parts out to different end users, having them run the parts and send them back, we would powder coat them and send them back out for further product testing such as salt spray, adhesion and impact." When those tests indicated that the process was effective, Mr. Rohrbach contacted another end user who allowed him to bring fixtures for the parts to that plant, run everything through, and see exactly how the system worked. "That company had been running the system for over a year without ever dumping a tank," he continues. "We were amazed that all parts still tested wonderfully."

It only took a week (including weekend work) to tear out the old system and install the new one. Through careful planning, the company was still able to provide 96-percent on-time product delivery during the installation process.

After nearly two years of testing, doing everything they could think of to force the system to fail, Mr. Rohrbach and Manufacturing Engineer Guy Godschall finally agreed that the new system might actually be their best solution. It was time to sell upper management on the idea.

The Savings

Because of the significant process changes the new system would require, Mr. Rohrbach and Mr. Godschall had to show upper management that not only would the system provide equal or better quality, but that it could also provide real savings, both in time and money. The iron phosphate system had to be dumped every 12 to 15 weeks, which included cleaning the nozzles and getting rid of all the solid waste. That process totaled about $45,000 a year in waste removal on top of the labor involved. According to Mr. Godschall, "With the new system, no water is needed for the rinse cycle, so we could completely eliminate the waste stream and the labor to do the tank dumps. We could also eliminate the gas fire for the heater on the first stage of processing ambient-temperature material.

Mr. Rohrbach added more supporting figures. "Natural gas consumption with the old system was $120,000 a year, but we could cut it to zero," he says. "Electricity was $20,000 a year, and we cut it to $10,000. Water was about $1,600 a year, and we cut it to zero." The list continued. Chemical disposal for the three-stage system was about $80,000 per year, but that could

Total labor savings, including reduction of line gaps and time devoted to maintenance, could be reduced by $130,000 a year.

After using the single-stage system for about a year and a half, engineers at contract office furniture manufacturer Knoll Inc. are quite pleased with the results. Not only has it fulfilled the company's requirements for substantially lower CO_2 emissions and saved considerable money, it has proven particularly effective on the company's entire assortment of materials. Besides that, it's easy to use and low maintenance, particularly compared to the company's old three-stage iron phosphate system.

"The reduction in man-hours required for the system is one of the most noticeable things for people on the plant floor," notes Linwood Rohrbach. "Previously we had someone checking the tank every day, doing pH titration, conductivity reports, and so on. We don't have to do that at all anymore." Now the operator only has to add chemicals once a week—a half-hour process. Maintenance operations also involve changing the filters in the pumping system. This involves taking the filter chamber apart, removing the filter bag, letting it drain and throwing it in the dumpster; it's not hazardous waste. Frequency depends on the volume of parts run through the system, but for Knoll, it's once a week for two separate tanks—total time of about 40 minutes.

By contrast, the old system required pumping 60,000 gallons of sludge and waste per year, then treating it before disposal. Mr. Rohrbach continues, "Mostly, our operator just hits three buttons at startup and walks away." Startup is quick, with no need to run through a purge timer and no heating of tanks. It's simple enough that they even turn the system off at break time.

The equipment is so manageable because the chemical process is simple. "You pour the chemical in, you put your sheet metal in, you swirl it around, and you dry the parts," says Guy Godschall. "That's basically the process. The chemical is the driving force of the system, but properly engineered and installed equipment is critical with considerations given to the control of air flow, proper application of the chemical, and optimal chemical return to the holding tank."

Jerry Taeger, president of T&S Enterprises, states that in 60 seconds the system can do what a five-stage washer does. According to Jeff Thomas, finishing specialist ,"There's no heat, no rinse, no water and no waste treatment. It's strictly chemical. You flood the part and let it drip off. For example, you might have a 10-foot-per-minute conveyor line. The parts get sprayed in a 10-foot spraying section—one minute—then drain for a distance based upon part geometry and liquid drainage, and they're done. The chemical drains down through a chemical return system and back into the holding tank."

Mr. Godschall recalls some design considerations that companies should keep in mind should they decide to go with such a system. "Putting the tank in-ground can be advantageous. You want to capture as much of the chemical as you can; it's expensive, so you don't want to waste it. In some cases we even put on air knives to help blow it off, but the elevation changes are where you get most of the savings off the parts." Also for conserving as much of the chemical as possible, he recommends making sure the washer is not too close to a pre-heat oven or other heat source that can cause evaporation. Knoll's oven is installed about 20 feet off the end of the washer, which seems to be sufficient to avoid baking off the valuable chemical.

From an installation standpoint, the entire canopy, tank and pumps all should be stainless steel. Piping should be polypropylene. These materials are sufficiently resistant to the chemicals. In a recent inspection of the system, Mr. Rohrbach took the nozzles apart to check the headers for wear. "After a year and four months, we figured we'd see settlement in the pipes," he explains. "We went in and tore the nozzles off and looked everything over, and it looked as good as the day we installed it."

The single-stage system installed by T&S Enterprises has helped Knoll reduce CO_2 emissions by 916 tons per year while providing substantial savings in both money and man-hours.

If the wash system is not manufactured with the proper materials, the chemicals can quickly eat it away. The canopy, tank and pumps all should be stainless steel, and piping should be polypropylene.

be fully eliminated. Equipment maintenance could be reduced from $4,000 a year to $1,500. Total labor savings, including reduction of line gaps and time devoted to maintenance, could be reduced by $130,000 a year, or 4,000 man-hours. The only significant increase in costs (no small number) was from $37,000 a year to $200,000 for chemicals. But the net savings were remarkable, and upper management supported the team and agreed to bring in the new system.

The Installation

Knoll brought in T&S Enterprises (Zephyrhills, Fla.) to design and install the two single-stage washing systems (Knoll uses two industrial washers, each independent of the other).

T&S is a full-service provider of turnkey finishing systems specializing in the design, manufacture and installation of pre-treatment systems, drying and cure ovens, wet and powder applications booths, air make-up equipment and product conveying systems. The company bases its installation strategy around its ability to install systems—even some of the biggest in the world—within a four-day (Friday through Monday) window, with minimal interruption to production.

T&S had been heavily involved in Knoll's review process, and the customer support the company provided played a big role in Knoll's decision. From his experience, Mr. Rohrbach recommends contacting an equipment supplier such as T&S Enterprises that has proven experience in the single-stage process.

The company was pleased to adopt a pretreatment method that originally appeared too good to be true.

Because of the aggressive production schedule at the plant, Knoll needed the installation to be as quick as possible. But first the old system needed to be removed. Two months of scripting among six different departments at Knoll prepared the company to continue fulfilling customer orders during the installation.

In only seven days, the old 86-foot washers were cut down to manageable pieces and removed and the new system, nearly the same size, was put into place. During that week, deliveries were still 96-percent on time.

Bottom Line

After installation, although thoroughly pleased with the system, Knoll continued to examine ways for even further improvement. Mr. Rohrbach and Mr. Godschall continued to test other chemicals by sending parts to companies that had switched from Plaforization to other chemical processes. About six months later, Knoll made the change to Enviro-Prep, offered by Calvary Industries Inc. Mr. Rohrbach says, "The change brought us even further reduced cost, less odor from the chemical, and improved drainage. We also like dealing with a domestic supplier that provides full lab support."

Cost savings have fallen in line with Mr. Rohrbach and Mr. Godschall's original estimates; total savings in the first year were approximately $174,000. When calculating only the equipment and chemical costs versus the savings, that amounts to a quick three-year return on investment. But the real driver for the move to the single-stage system was the need to reduce CO_2 tonnage. With the reduction of electricity usage and the elimination of natural gas and water consumption and chemical disposal, the company was able to reduce its CO_2 emissions by 916 tons a year. The new system has proven to be a significant boost in the company's environmental initiatives. **PC**

T&S ENTERPRISES can be reached by calling 813-779-8024 or visiting *tse.us.com*.
CALVARY INDUSTRIES INC. can be reached by calling 513-874-1113 or visiting *calvaryindustries.com*.

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