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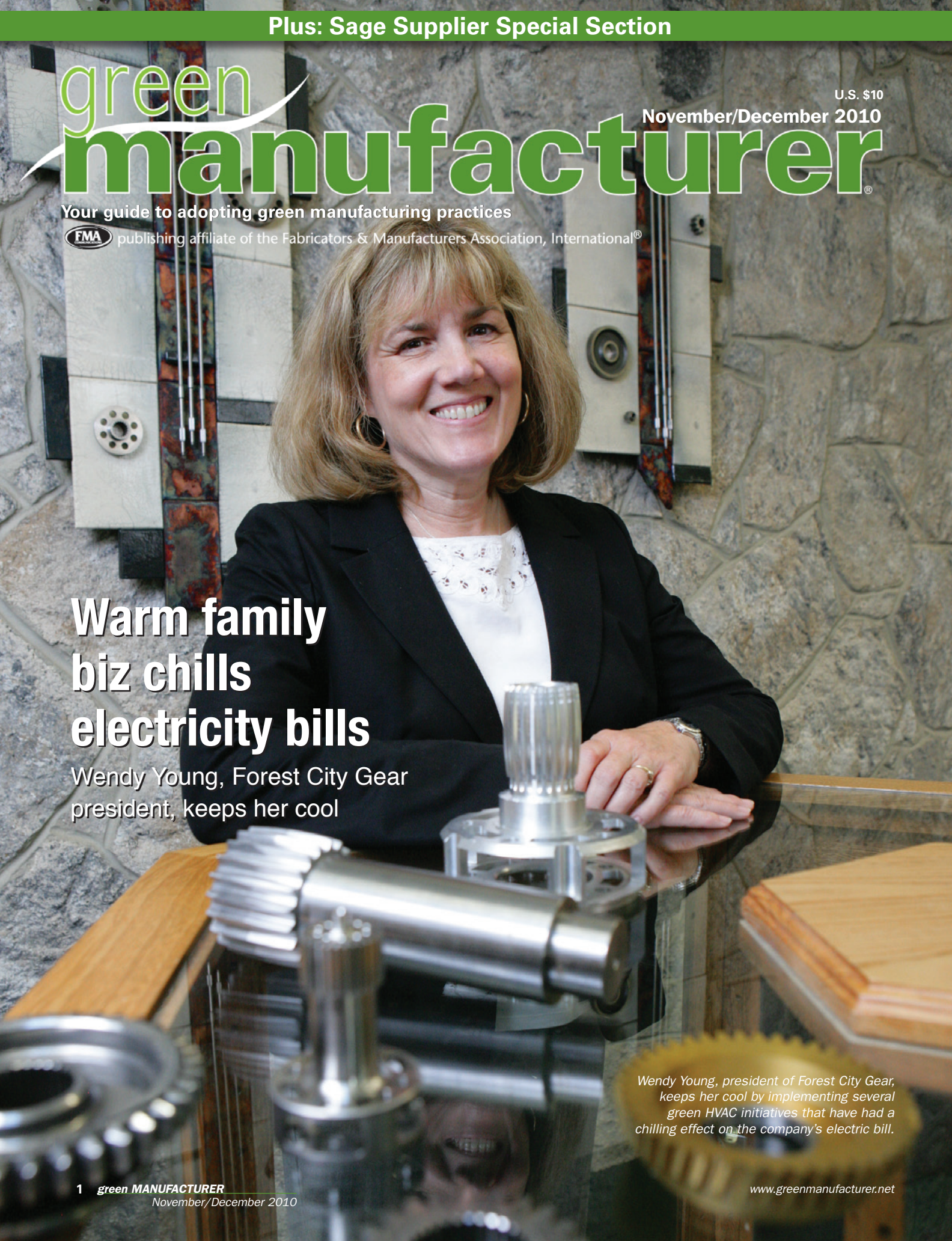


Warm family biz chills electricity bills

Wendy Young, Forest City Gear president, keeps her cool

Wendy Young, president of Forest City Gear, keeps her cool by implementing several green HVAC initiatives that have had a chilling effect on the company's electric bill.

Warm family biz puts the freeze on electricity bill

Green cooling, heating initiatives keep gears cool and precise

By Kate Bachman, Editor

During these cold winter months, it may be hard to recall how heat can be harmful, but for precision gearmaker Forest City Gear, Roscoe, Ill., excess heat is an enemy to a quality product. Achieving the tight tolerances inherent in precision gearmaking requires keeping the metal at a constant temperature. A heat increase of even 20 degrees will change the gears' dimensions dramatically. Boeing, Airbus, Siemens Medical, Bradshaw Medical, Baldor Electric, Thermadyne, and Harley-Davidson depend on the accuracy of the company's gears.

Too, the company's state-of-the-art machines are all computerized and very sensitive to high temperatures, so keeping the facility cool is critical.

Also adverse to efficient manufacturing are the high electricity bills that can result from cooling a 30,000-square-foot facility. Escalating electricity bills were wreaking havoc on the manufacturer's operating costs and taking a bite out of its $12 million annual sales profits.

When a monthly electricity bill climbed to $15,000, Forest City Gear President Wendy Young decided it was time to put a freeze on rising costs.

"When our electric bills started increasing about five years ago, we started looking hard at costs. Fifteen thousand was really an eye-opener for us," Young said. "The global manufacturing atmosphere is highly competitive. From an economic perspective, we had to look at ways to keep our costs from increasing for us to remain competitive."

The manufacturer hired an independent consulting firm to do a cost-benefit analysis and compile a list of options for lowering costs. The company initiated several of the suggestions over a five-year period, starting with those with the shortest ROI.

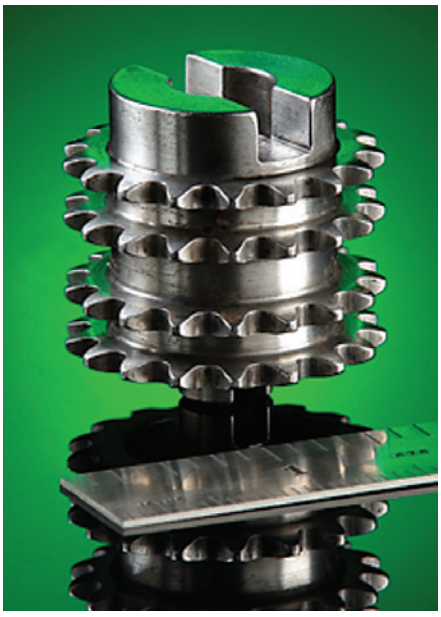
"We didn't implement everything right away, but we did look at the things that had the shortest payback period and that were affordable at the time," Young said.

Energy-efficient cooling and heating system initiatives included:

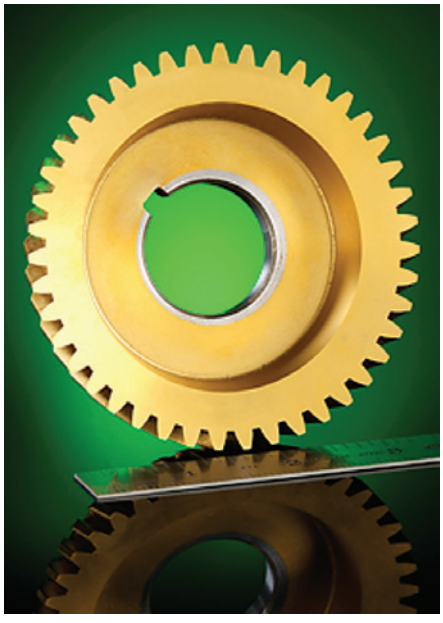
- Tinted windows with low-E film
- High-energy-efficient, Energy Star heating/AC units
- Large, high-efficiency ceiling fan
- Programmable thermostats throughout the building
- Oberlin Filter oil filtration/cooling unit for gear grinding
- New roof on front office for more insulation
- Minimal heat/air usage on weekends and major shutdowns
- Regularly checked and resealed air leaks in building (door/docks, cracks/openings)
- Reflective covers for skylights

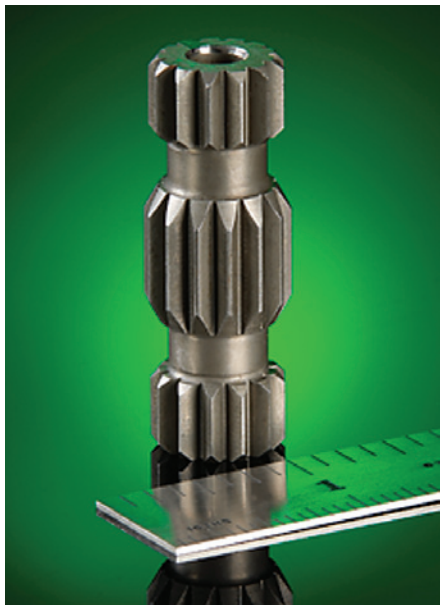
Window Coverings. Window treatments and covers were installed first and had a four-year payoff. "All of our windows have 3M window covering treatments on them to prevent heat from coming in during the summer and from going out in the winter. The window treatments were the first thing we did because they were economical and we earned our money back in four years," Young said.

Chiller/Filtration. "Our biggest energy-saver and our most costly investment was our Oberlin oil chiller and filtration system for the gear grinding," Young said (see **Figure 1**).



The tight tolerances inherent in precision gearmaking requires keeping the metal at a constant temperature. A heat increase of even 20 degrees will change the gear's dimensions dramatically. Boeing, Airbus, Siemens Medical, Bradshaw Medical, Baldor Electric, Thermadyne, and Harley-Davidson depend on the accuracy of the company's gears.





"We have six gear-grinding machines out here that all require their own filtration systems," she explained. The heavy machining, gear-grinding machines are huge power consumers. The equipment generates a lot of heat too. Because most of the production equipment is very high-end, state-of-the-art CNC equipment with delicate electronics, maintaining the temperature is critical.

"Also, their footprint is huge, and our space is limited, so installing the Oberlin fulfilled a couple of needs. Number one, we were able to remove these machines that were throwing off 114 degrees while they were running.

"Now they go through the Oberlin, which is out in the back warehouse, and then the other half of the system sits outside." As an added bonus, the chiller uses outside air for chilling the oil anytime ambient air temperature is 50 degrees F or below.

"Number two, it opened floor space so we could buy production equipment and put it on the floor," Young said. "Needless to say, it lowered our heat index in the building, and then the production space we gained was a huge byproduct," she said.

The lowered facility temperatures had a third, important effect, Young said.

"Not only do the machines need the cooler air, but when our employees have to work in 90-degree heat, they're uncomfortable, they're sluggish, it slows them down, and they think we don't care about them. That's probably the most important reason. If they're not there to run the equipment, we have nothing," Young added.

Energy-efficient Air-conditioning Units. The company replaced its old air-conditioning units with larger, more efficient units that cool more using the same amount of amperage, said Larry Cass, safety manager.

"The new AC units are larger—25s instead of 20s—but the energy usage is the same," Cass said. "We've gotten bigger, more efficient units and more cooling for the building as a result, for the same money.

"We're seeing improvements not only in the physical facility, but also in the production equipment, because despite the relatively small size of the building, we consume a lot of power with the heavy machining equipment that we use."

Heat Vented From Air Compressors. The air compressors have been set up to exhaust out of the building in summer and reverse the venting into the building in winter, Cass said. "So the warm exhaust helps heat up our dock area. Because we can vent the heat from the air compressors back into the warehouse, that is a big savings. It's a big space. Maybe 2,000 or 3,000 sq. ft. back there. It's free heat for us all winter long," Cass said.

High-efficiency Ceiling Fan. "That big fan out there really does move the air," Cass said. "Compared to the cost

of an air conditioner, it's a small percentage and it covers a big area."

Operational Energy Efficiencies

The manufacturer also implemented several operational energy reductions:

- V-Blox power protection/power factor correction system (Energy Star)
- New, energy-efficient gear-grinding equipment
- Lights off during lunch period
- On/off lights as required for bathrooms, lunchroom, conference room, and warehouse
- Larger, more efficient air compressors
- European Union (EU) REACH regulations regarding chemicals
- Regularly repaired air compression leaks
- Lean manufacturing

Air Compression Leaks Sealed. One low-cost energy conservation effort was simply tightening air compressors and hoses.

"We have air hoses all over the plant, and our compressors are in the back. We were leaking so much air constantly, you could walk into the shop and hear this hissing sound, but nobody paid attention because it was just always there," Young said. "So we went through and sealed 99 percent of those leaks just going through the lines and tightening and sealing them."

The company continues to check for leaks in the compressed-air system annually, Cass added.

Power Protection Installed. Recently the manufacturer installed V-Blox power protection/power factor correction units. The units go in front of the power panels on the machines that draw the most power (see **Figure 2**).

"All the energy coming into the building comes in at different rates, so we have power surges all day long, and it's very hard on our equipment," Young said. "Too, we're paying for all of that extra electricity."

> It would be a mistake to confuse a lack of cutthroat conduct with a lack of cutting-edge sophistication, however. Forest City Gear is renowned in the gear industry for its stellar craftsmanship, exacting precision, and commitment to excellence.

The system works twofold, Cass said. "It blocks any spikes that might happen because of lightning or from the utility company. It blocks those surges so they won't blow a microprocessor of some kind, which has happened to us before.

"The other thing the system does is … what you get off the line typically is higher than what the motor draws. That's just the way electricity works," Cass continued. "This puts a block on that so we don't use any more energy than what the motor needs. It helps the motor be more efficient, and it matches the consumption to the power usage.

"This is not only controlling the incoming power from the main to flatten that curve out a little bit, it's also

The manufacturer puts the "forest" in Forest City Gear with plantings that are not only beautiful, but strategically arranged to enhance cooling. "I'm a fisherman and hunter and have always spent a lot of time outdoors, so I like something that reminds me of nature and that's in tune with our name."— Forest City Gear CEO Fred Young

Fred and Wendy Young installed a green oasis in the middle of the plant floor, complete with a park bench and greenery to provide respite to employees. The concept was borrowed from a Ferrari factory.

Warm Family, Cool Facility

When Wendy Young greets you at the door with her charismatic smile and disarming charm, it's easy to feel quickly as though you've known her for years. Her voice is soft, her demeanor kind, and her gaze attentive. A new grandmother, she keeps nursery furnishings on hand near her office.

She and her husband Fred, company CEO, know all the employees by name. In fact, all 72 of their pictures and names are posted on a wall in the lunchroom.

The company celebrated its 55th anniversary with a corn boil this past summer. Invitations featured Wendy and Fred Young in a parody of Grant Wood's painting "American Gothic."

Fred Young, a world-class fly fisherman, is the second generation of Youngs to own Forest City Gear. His parents, Stetler and Evelyn, founded the business in 1955. Fred and Wendy's adult children are involved in on-the-job training to assume company leadership and continue the family legacy. Their photos and handiwork are visible throughout the facility.

The company's Main Street facility resides in a rural area surrounded by 6 acres of undeveloped land and landscaped with trees, shrubbery, and flowers. Missing from the building are electronic occupancy sensor devices to turn lights off. In their place are homey signs posted near the light switches saying, "Last person out turns out the lights."

It would be a mistake to confuse a lack of cutthroat conduct with a lack of cutting-edge sophistication, however. Forest City Gear is renowned in the gear industry for its stellar craftsmanship, exacting precision, and commitment to excellence.

The company's gears are in the Space Station and Mars Rover vehicles, telescopes, artificial elbows, aircraft, military lasers, fighter jets, medical examining tables, and dental drills, as well as tractors, printers, plotters, and power tools. Industry segments served include aerospace, military, medical, racing vehicles, recreational vehicles, and instrumentation.

The gears are ground under banners declaring the company's motto, Excellence Without Exception, which Fred Young has insisted be hung in the plant.

"We have gears in all the Boeing 7 series aircraft, including the 787. We have gears in three different Airbus planes, including the A380. Generally speaking, we do very sophisticated work that only a handful of people in this country are capable of doing," said Fred Young.

"I encounter people all the time that pay lip service to quality, to aesthetics, to value, to efficiency, but when you start digging down a little bit you find, well, it's only skin deep," Fred Young said. "There are hard numbers on the blueprint that state what quality has to be. Sadly, I hear people backtrack and say, 'Well, it's worked. It's functional. It may not be in tolerance, but it's worked for us and we don't want to pay the extra money.'

"I believe that's the death knell for this country. Unless we figure out how to produce absolutely the best products here in the U.S., we don't stand a chance of competing in the world," Fred Young said.

"We want to have quality everyplace that you look at Forest City Gear; absolutely in our DNA."

After all, the family DNA is already there.

allowing all of the drive motors and the electrical power equipment on each machine tool that we run here to run at a lower speed and greater efficiency," Cass said.

The proof is in the kilowatt-hour (kWh) reduction, Young said. "It lowered our electricity consumption on the machines by about 20 percent, and our machines run cooler and more efficiently. We spent about $80,000 on it, and we'll see the payoff in three to four years," Young said.

Buildings and Grounds

Young looked at other energy efficiencies that could be gained in the building and on the grounds:

- Switched out lighting system from T-12 to T-8
- Left approximately 6 acres of Forest City Gear land undeveloped
- Strategically planted shade and fruit trees, shrubs, and plants all around grounds
- Added trellis and vines on the south side of the building for shade in the summer to assist cooling
- Created green plant area in the shop

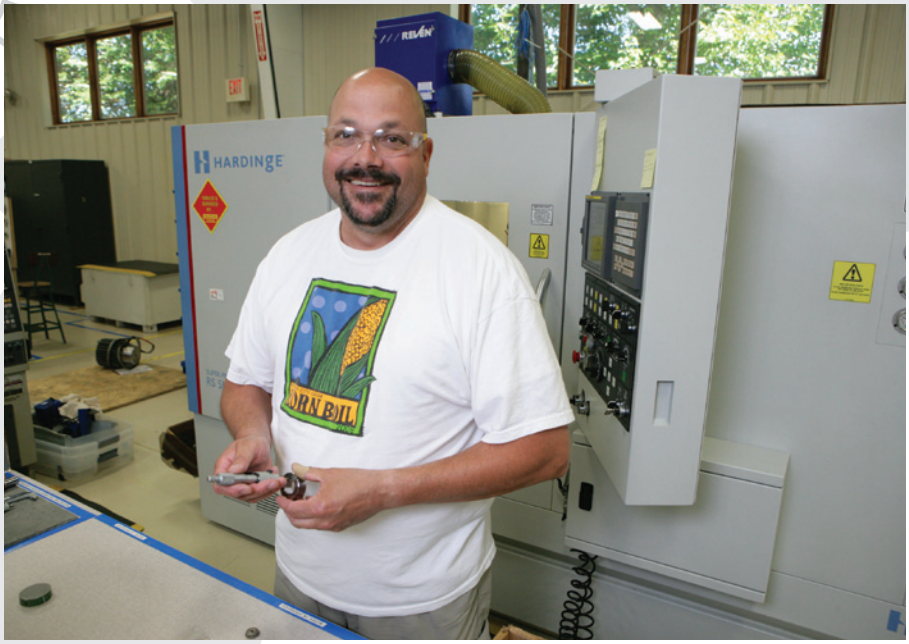
"We changed every overhead light out in the shop from T-12 to T-8 using 25-, 28-, and 32-watt lamps," Young said. "The lighting was expensive, but the payoff was pretty quick: about three years.

"The day after the lights were installed, people were coming in and saying 'It's too bright in here!' and we said, 'You'll get used to it.' And they did in about a day. It was so much nicer," Young said.

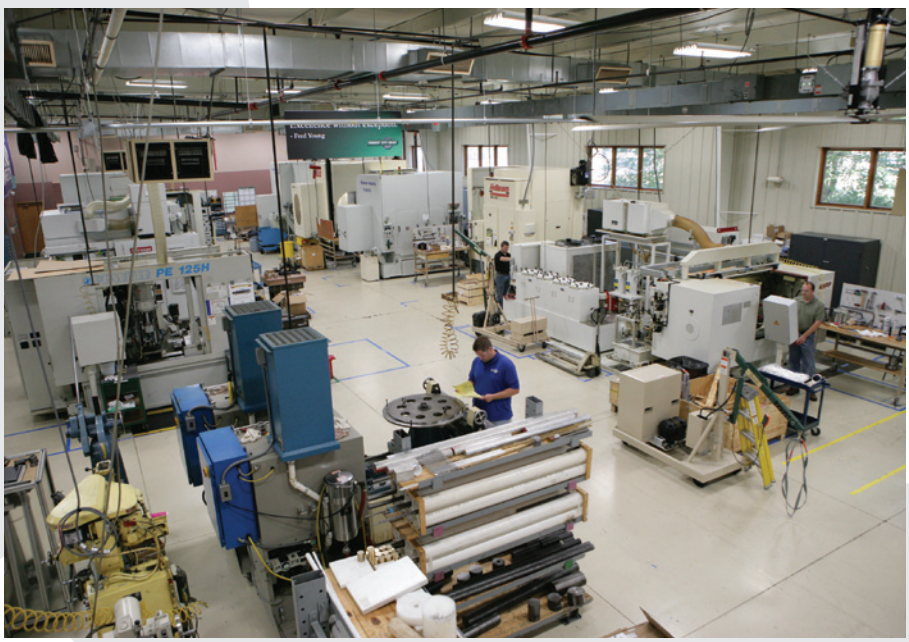
Recycling and Reuse

In addition, Forest City Gear implemented a robust recycling program:

- Oil (spun out of chips)
- Scrap metal (segregated for resale value)
- Cardboard and mixed paper



Tommy Kalt, who runs the blanking department, said he really appreciates being able to take time off for family priorities such as teacher-parent conferences or Donuts With Dad Day. "I think you want to instill a sense of pride in all of the workers. I believe that if they have a good environment—preferably a clean, comfortable environment—that's going to help modify their behavior so that they'll say, 'This is too pristine. I don't want to mess it up. I want to make things look as classy and as good as possible.' If you're sloppy and you don't care, that has a way of permeating throughout your manufacturing floor. Setting a good example enhances that cooperative spirit for all to try to be efficient, neat, clean, and doing absolutely the best we can."—Forest City Gear CEO Fred Young



The machinery and facility must be maintained at a cool temperature for the best product results and employee comfort and productivity.

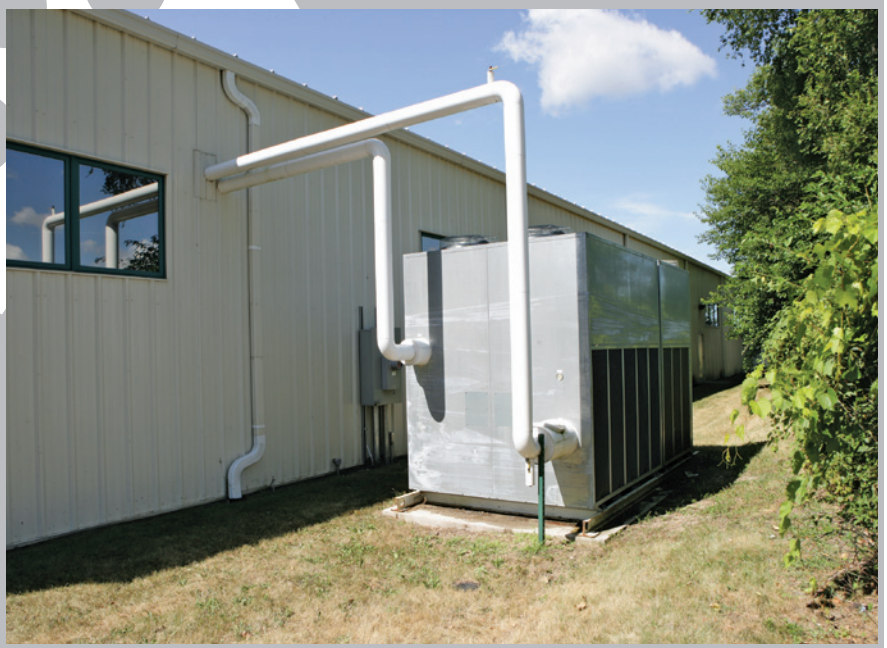
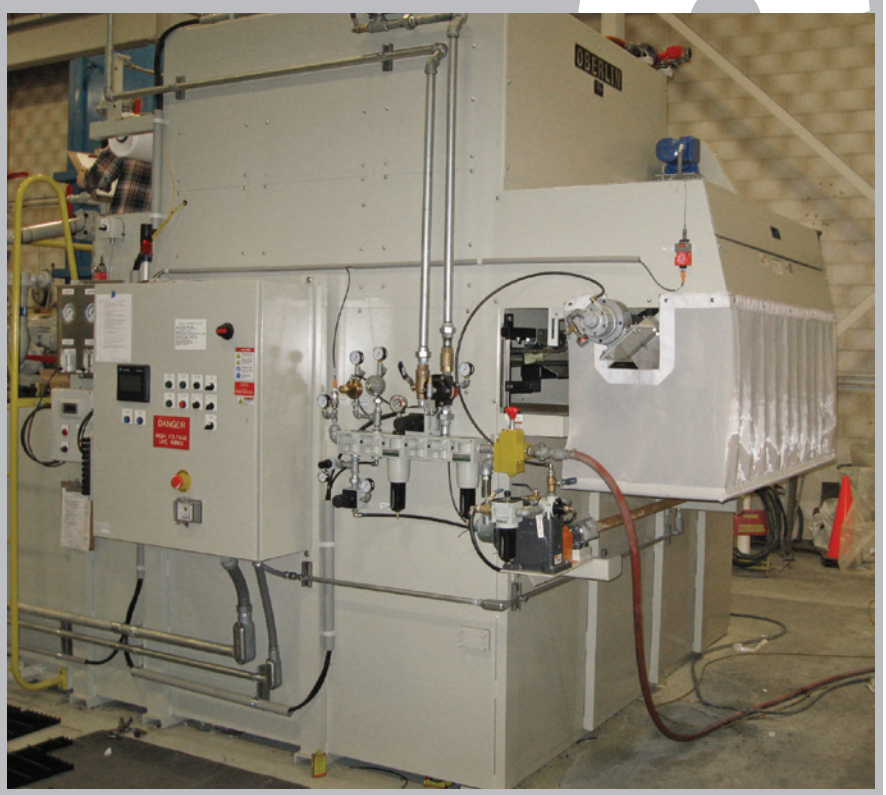


Figure 1

Forest City Gear's six gear-grinding machines require their own filtration systems. The heavy machining, gear-grinding machines consume substantial amounts of power and generate a lot of heat. Now the filtering and chilling are done through an Oberlin oil filter and chiller system. Half of the chiller/filtration system for the gear grinders sits outside, while the main unit is positioned in the dock area, saving valuable floor space.



> "Not only do the machines need the cooler air, but when our employees have to work in 90-degree heat, they're uncomfortable, they're sluggish, and they think we don't care about them. That's probably the most important reason."

- Aluminum cans
- Plastic bottles and shrinkwrap
- Oil and mop water (oil skimmers)
- Packaging dunnage, except for Styrofoam® peanuts, which are recycled locally
- Printer cartridges
- Documents
- Light bulbs

Future Energy Efficiency Endeavors

White Reflective Roofing. "We're looking at putting a single, uninterrupted white reflective roof sheeting on the building's roof to reflect the heat. There are no seams, so there wouldn't be any leaks. That's the newest thing we're doing," Young said.

The company is also investigating installing a solar energy system on its roof.

The Triple Bottom Line

Forest City Gear was recognized in 2008 as a green business leader by the Winnebago County Green Business Coalition. In 2009 it received the Outstanding Corporate Friend of the Environment Award from Keep Northern Illinois Beautiful (KNIB).

But the accolades were not the reason for the sustainability efforts, Cass said. "You do it because you care about the environment, but also it makes economic sense. It's more efficient to manufacture that way. It is cheaper to manufacture using green initiatives."

Forest City Gear's sustainability efforts and energy efficiency approaches have not reduced its electricity bill so much as allowed the gearmaker to add equipment and increase productivity without increasing electricity consumption.

"It's hard for us to measure how much our electric bill has been reduced because rates keep going up and we're buying more machines," Cass said. "Productivity per square foot is substantially higher."

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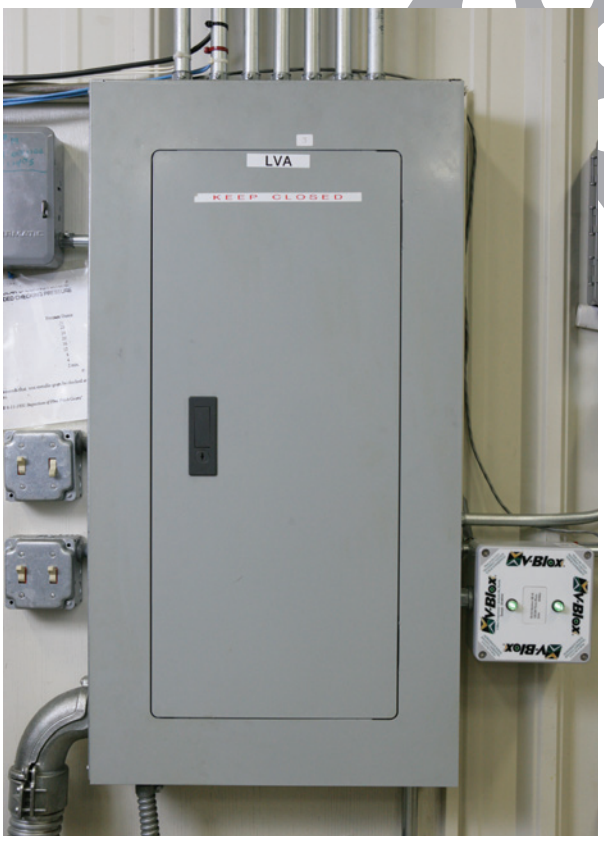

Figure 2

Power protection/power factor correction units, installed in front of the power panels on the machines that draw the most power, not only protect the equipment from power surges, they help match power consumption to usage as well as help keep equipment cooler.