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Cut lily grower Fred Green gained control of his heating bills by generating free heat with wood chips.

By David Kuack

Greenhouses cuts fuel costs with free heat

INNOVATOR

Stow Greenhouses was named a GMPRO Innovator based on the company's efforts to gain control of its heating costs by installing a wood chip-burning boiler.

FRED GREEN OF STOW Greenhouses in Stow, Mass., is a calculating businessman first and a quality cut lily grower second. He is always looking for ways to remove the variables that can affect his company's profitability. One variable used to be the price of heating oil.

"If someone would ask me about the future lily market, I'd tell them it all depends on what's going to happen to the price of oil," Green said. "My profitability was dependent on the price of oil. And the price of oil was dependent on factors out of my control."

Another of Green's concerns was that he grew cut lilies year-round, unlike neighboring growers who closed down unused greenhouses during colder periods.

"We're running full bore during the coldest part of the winter," he said. "We were burning about 30,000 gallons of oil during the winter. And we were seeing our heating bill go up substantially, from 70 cents per gallon to over $2, with no end in sight."

Cut lily grower Fred Green of Stow Greenhouses said his wood chip-burning boiler has enabled him to reduce his heating bills.

Free fuel source

The idea of switching to an alternative fuel came from Green's friend and fellow grower Paul Cavicchio, who operates a large wholesale operation in nearby Sudbury, Mass. Cavicchio, who sells to landscapers, would allow customers to dump at no charge the wood chips they collected from their jobs. Cavicchio, in turn, would sell the chips to electricity-generating power plants in Maine.

"Paul suggested that I should look at wood chips," Green said. "The fuel was free, but I thought that wood would be too much work. He told me that there were new systems available that are highly automated. We ended up making trips to several different commercial wood burning installations in the Eastern U.S. and Canada."

Green finally settled on a 1.5-million-Btu wood chip-burning unit from Advanced Recycling Equipment, which was installed in summer 2005.

Although Green is very happy with the system and with wood heat, he said growers considering using an alternative fuel source should be prepared for some obstacles.

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To keep wood chips dry, Green erected a single-layer polyethylene greenhouse.

Stow Greenhouses

Founded: By Fred Green in 1978.
Location: Stow, Mass.
Size: 32,000 square feet of glass-covered greenhouses; 6,000 square feet of polyethylene-covered greenhouses.
Crops: Year-round production of cut lilies; seasonal production of cut hydrangeas.
Customer base: Wholesalers in New England, New Jersey and New York.

"I thought I was buying a system where I was just going to plug it in and turn it on and it was going to work," he said. "We've had some problems and most of them we've had to resolve ourselves."

One of the biggest problems was the installation of an undersized hot-water heat exchanger that resulted in having to burn oil as well as the wood chips.

"Initially, we were running the system at full capacity and couldn't hold the temperature in the greenhouse," Green said. We ended up spending $5,000 on oil to heat during that first winter." A larger heat exchanger, installed in March 2006, corrected the problem.

Green also replaced the 45-foot belt conveyor that feeds chips into the boiler. The belt had to be repaired several times because it tore due to the friction between the belt and rollers caused by the weight of the chips. Green purchased a screw auger from a company that sells used saw mill equipment. Since installing the auger, Green said moving chips into the boiler is no longer a problem.

Minimal ash disposal

One feature Green really likes about the unit is its automatic de-ash system.

"When most people think about burning wood, they get this picture of smoke, smell and a lot of ash," he said. "This system automatically removes the ash, which is a very fine dust. It's total combustion. The ash goes into a container that we empty every few days. The end product is potash, which could be used for fertilizer."

The boiler is also equipped with vertical tubes, which prevent the ash from collecting so the unit is easy to clean.

Green is so satisfied with the way the system is operating that he purchased a second wood combustion unit — a Conifer manufactured by Hern Iron Works. This has allowed him to eliminate his backup oil burner. The second unit operates independently from the first unit and generates 2 million Btu.

Never out of chips

Green has had no problem collecting enough wood chips from landscapers and arborists to burn in the boiler. He said any time there is a storm with high winds he can expect to receive a large supply of chips. The deliveries tend to drop off from December through February.

Although the unit can burn wet (green) chips with up to 45 percent moisture content, Green said that the chips generate more Btus per

Stow focuses on lilies

Stow Greenhouses has been producing Oriental, Asiatic and LA hybrid lilies since the early 1980s. Owner Fred Green produces about 60 percent Asiatics and LA hybrids and 40 percent Orientals. Green said the market for Orientals, which produce large showy, fragrant flowers, is growing quickly. He said the market for Asiatic and LA lilies, which produce smaller, multiple flowers, is increasing, but not as fast.

"It was during the early '80s that the technology was discovered that lily bulbs could be frozen for the whole year," Green said. "We receive a shipment of about 525,000 bulbs in January from Zabo Plant in Holland. We store them in the freezer at 28°F. Each week we take out bulbs, let them thaw and plant them."

Oriental bulbs can only be frozen for nine to 10 months before they start to deteriorate.

Green said lilies are very temperature sensitive and somewhat daylength sensitive. A crop of Asiatics or LA hybrids finishes in eight weeks during summer, 10-12 weeks in spring and fall and 12 weeks in winter. For Orientals, add six weeks regardless of the season.

In 2002, Green installed a FW-Systems rolling table system and dedicated the entire production area to lilies.

Before the bulbs are shipped to Green, they are dipped in imidacloprid. Because of this preplant dip, Green hasn't had to spray for insects in more than six years.

"With other cut flower crops, there are not only problems with aphids, but thrips, mites and numerous diseases. Lilies have very few potential problems," he said.

Green said starting with good quality bulbs and maintaining the coir growing medium so that there is good structure, good porosity and good air movement helps to minimize disease. No fungicides are used. The only major disease concern is *Botrytis elliptica*, which can infect the lily leaves. Green avoids this disease by monitoring the greenhouse humidity with a Q-COM environmental control computer.

Labor, costs must balance

Stow Greenhouses plants about 10,000 lily bulbs per week. For Valentine's, Mother's Day, Thanksgiving, Christmas and Easter, production is usually doubled or tripled.

"One of the advantages of growing lilies is the demand for labor is steady," Green said. We plant every day. We cut every day and we sell every day. We do the same thing every day. For some people that might be boring, but for staffing it's ideal. It's also good for cash flow because we are always selling a product."

Green said one of the challenges of growing lilies is the need to plan production far in advance.

"You have to pay for the bulbs when you receive them," he said. "The bulbs cost 25-30 cents apiece so that's a lot of money at risk. If the bulbs arrive in January 2007 some of them won't be flowering until Mother's Day 2008 and payment for those flowers from our customers won't come until June 2008. We are sitting on a lot of inventory for a long time.

"With a crop like cut snaps, the cost of plugs is maybe 5-6 cents apiece. ... If you make a mistake with a crop of 1,000 snapdragon plugs, it's not going to break you," Green said. "You mess up with a crop of 1,000 lily bulbs and you're talking about a considerable amount of money."

cubic foot when they are dry.

To ensure that he has enough dry chips, Green erected a 28-by-80-foot single-layer polyethylene greenhouse to cover the chips. The structure was free from a grower who was going out of business. The structure holds 1,200 cubic yards of chips, which is enough to get Green through the coldest months.

Although 95 percent of the chips that Green receives could be burned immediately, it's the other 5 percent that may be too large and can jam the unit.

Green installed a disc screen to keep out most of the unchipped debris. He previously ran the chips through a grinder to ensure they were small enough. Occasionally the grinder would jam on a large piece of wood.

FOR MORE: Stow Greenhouses, (978) 568-1189; fredgreen@sprintmail.com