

# New Chiller Technology Solves Problem for Plastics Firm

*"We had a problem. If the chillers go down, the whole plant goes down. And we didn't trust the chillers."* Walter Pipan, engineering manager for a California plastics manufacturing firm thus explains a decision by the firm to install a new type of chiller for cooling process water. His firm, UPM Inc., specializes in the production of custom injection molded plastics. A key element to the production is the availability of chilled water to keep the intricate injection molding machines cool.

## Chilled Water Flow Essential

UPM is located in Baldwin Park, a Los Angeles area suburb. This manufacturing facility, one of the largest plastics firms on the West Coast, produces a wide array of plastic parts for many applications. These include crates, containers, trays, and many complex specialty parts. Injection molding machines absolutely rely on a flow of chilled water to remove process waste heat. Pipan says, *"It's this simple: No chilled water, no production."*



Until recently chilled water was supplied to the facility by an older 150 ton water-cooled chiller with six reciprocating compressors and a 106 ton water cooled chiller with two screw compressors. Additionally there was an air-cooled reciprocating compressor chiller that was in reserve, though its condition was questionable. The chillers and related equipment are located at grade level in a mechanical yard adjacent to the manufacturing building.

## Recip Chiller Reliability Declines

Pipan and the production staff were concerned because the reciprocating compressor chiller appeared to be getting increasingly unreliable, and required frequent inspection and repair outages. Because the manufacturing plant operates around the clock, there was no good time to do service work, and there was an increasing specter of chiller failure that could threaten production.

UPM went to Thermal Care, Inc., a process cooling product manufacturer headquartered in Niles, Illinois, that specializes in chilled water equipment for industrial applications. Pipan worked with Michael Clavelli, Thermal Care's West Coast regional manager. Pipan and other staff members explained to Clavelli their concerns about the reliability of the chillers, and the need to reduce the risk of loss of chilled water service.

## Interest in Energy Savings

Further, Pipan indicated that they were interested in reducing the energy usage of the chilled water operation. He added that any replacement equipment would have to fit in the existing mechanical area.

After a detailed evaluation of the facility, Thermal Care recommended removing the water-cooled and the standby air-cooled reciprocating compressor chillers in stages and replacing them with two chillers custom-designed for the installation. The new units would feature a new type of centrifugal compressor manufactured by Danfoss Turbocor Compressors Inc. Clavelli says, *"We wanted to design a system with very high reliability and efficiency. What we proposed was a system that we think is ideal for this type of process application."* After reviewing the proposal, UPM told Thermal Care to proceed with the new system installation. Thermal Care and Danfoss Turbocor had worked together for over a year in the development of this chiller product. Because the new system would operate at a dramatically higher efficiency than the existing chillers, UPM was eligible for a rebate from the electric utility, Southern California Edison, which would further shorten the project payback. In early 2003, the water-cooled recip

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chiller was removed and replaced with the first Thermal Care chiller. In June 2004, the air-cooled machine was removed and replaced with a second Thermal Care package. The existing screw chiller remains on the site and is generally held in standby status. Clavelli indicates, *"The efficiency of the new chillers is such that we recommend they be used to carry the load and the screw chiller held as a backup."*

## Oil-Free Compressor Design

At the heart of the two new chillers are the Danfoss Turbocor compressors, which have a number of advanced features which contribute to their high reliability and performance. The Turbocor machine is an oil-free design and the shaft and twin impeller assembly is its only moving part. The impeller shaft rotates on magnetic bearings, which eliminate friction and wear in the compressor, and reduce noise. They also require no oil, avoiding many associated maintenance costs and problems.

A remarkable aspect of the Danfoss Turbocor compressors is their exceptionally quiet operation. At the time of the system startup, Walter Pipan was surprised at the drastically lowered sound level in the outdoor mechanical yard. He notes, *"You can immediately hold a conversation here now, where you couldn't when the recip units were running."*

The Danfoss Turbocor design features a variable speed motor and can operate at high efficiency over a wide range of loads. The revolutionary oil-free Turbocor design is ideal for mid-range size refrigeration applications such as the chillers designed by Thermal Care.



Interactive control panel allows easy access of diagnostic and operational information.

## Staying in the Sweet Spot

According to Dan Mason, Director of North American Sales for Danfoss Turbocor, the application of Turbocor compressors in the chillers at UPM is a good one for their machine. *"Long running hours at variable loads, and a need for high reliability are places where our product really shines."* He adds, *"Because of the oil-free design and the built-in variable speed feature, we can stay in an efficiency sweet spot all the time."*

The Thermal Care chillers designed for the UPM installation each have two 70-ton Danfoss Turbocor compressors. The chillers have individual unit controls and diagnostics, and along with the screw chiller are linked to a central chilled water control system. In this Thermal Care installation, chilled water at approximately 50°F goes to a 1,000 gallon supply tank, from which it is pumped to injection process machines as needed. It typically returns from the manufacturing

process to the chiller plant at approximately 60°F. The condensing water from the chillers is cooled by a custom fiberglass forced draft cooling tower, also produced by Thermal Care.

An important aspect of the installation is the remote monitoring capability. Thermal Care provided a CPU, interconnecting cables from the CPU to the chiller, software, and an internet card. This feature allows either UPM or service specialists at Thermal Care remote access to 79 points of diagnostic information per compressor, including the status of the compressors, electronic expansion valves, and condensing water regulating valves.

According to Thermal Care's V.P. of Sales & Marketing, Tom Benson, *"This capability is a tremendous value for the customer. We can quickly assist with any chiller performance questions by having one of our service specialists communicate directly with the chiller through the Internet. Both Thermal Care and the customer can view temperatures, pressures, volts, and amp draws, log and save data, adjust setpoints or control parameters, view alarm history and captured data at the time of the fault, view demand profile including kW usage, and make PLC program updates."*

## Coordination during Installation

The installation of the chillers at UPM was done by West Coast Industrial Services Inc. (WCIS) of Riverside, California. Bill Stanonis, president of WCIS indicates his team worked closely with Thermal Care's corporate staff and with Michael Clavelli from the firm to install and start the unit as efficiently as possible. Stanonis says, *"This was our first time with units with these Turbocor compressors and we wanted to do it right, and not create any problems at the plant."*

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According to Walter Pipan from UPM, with the installation of the first chiller in 2003, they immediately noticed a reduction in the plant electric demand charge from Southern California Edison, and the installation of the second unit increased that savings. In addition, the units use significantly less energy than their predecessors. Pipan says, *"They are using about 40% less energy than the reciprocating units that we were relying on earlier."* The payback on the Thermal Care chillers has been dramatic due to the Southern California Edison rebate and the reduction in energy usage by 40%.

Pipan also mentions that with a peak acoustic level of 71 dBA, the new chillers are much quieter than their predecessors. *"I came out into the yard during the installation and asked when they were starting the compressors. They told me they were already running. I was surprised."* While this low acoustic signature was not critical in this installation, Pipan says it was certainly a welcome change.

### **Reliable System**

With the installation of the second unit in 2004, the screw chiller was relegated to standby status. Pipan is impressed at the reliability to date of the Thermal Care system and the Turbocor compressors. *"They run great,"* he says, *"And we've been really pleased with the reliability of the chillers."* Bill Stanonis from WCIS indicates that his firm does the maintenance on the chilled water plant equipment at UPM, but there have been few service calls. *"These compressors just don't require much attention."*

Pipan points out that the new 140 ton chillers actually have a smaller footprint than the chillers they replaced, thus freeing up space in the mechanical yard. Pipan says that if he were asked by a colleague for his advice on installing this type of chiller with oil-free compressors, he would say, *"Go ahead. You will benefit from the energy savings, lower maintenance, no compressor oil, and only one moving part in the compressor. It's a good solution."*



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