

# RETHINKING

# CHILLERS

SPECIAL REPORT  
TEMPERATURE CONTROL  
EQUIPMENT

## Central cooling systems adopt advanced technologies

By Mikell Knights

**THE INCORPORATION** of advanced control technology to improve efficiency, as well as a rethinking of the definition of system modularity and flexibility, mark developments from three suppliers of central cooling systems that aim for increased capability.

### AQUATECH'S EASYCOOL+ IS SELF-ADJUSTING

At the K show, Aquatech Srl, Santa Maria di Sala, Italy, launched a new line of central chillers that automatically match the amount of cooling capacity to a plant's requirements.

The Easycool+ line was created specifically for the plastics industry, and features components and functions that provide self-diagnostics during startup, flexibility during operation and energy savings compared with conventional "fixed" central chiller systems, said Giorgio Santella, chief marketing officer for Piovan SpA. Piovan is Aquatech's parent company, also based in Santa Maria di Sala. Aquatech's products are offered in the U.S. through sister company Universal Dynamics Inc., Woodbridge, Va.

The Easycool+ line consists of 34 models with cooling capacities from 15 tons to 150 tons. The chillers are designed to deliver greater efficiency

and automatic control at a cost that is competitive with conventional central cooling systems.

The chillers have a favorable energy efficiency ratio (EER) due to their ability to adjust cooling capacity, pressure, temperature and more. EER indicates how many kilowatts (kW) of electricity are required to produce a kW of cooling capacity.

With Easycool+, at 100 percent heat load the unit will require 1 kW to produce 3.5 kW of cooling capacity (an EER of 3.5), which is about 0.5 to 1 ton of cooling capacity, Santella said. The EER improves when the chiller is used with partial heat loads, Santella said.

In comparison, a conventional fixed cooling system at 100 percent heat load has an EER between 2 and 2.5, Santella said. Conventional chilling systems can have a lower EER, due, in part, to components that add to the heat load, and also because their design does not allow for the management of partial loads.

Easycool+ chillers have several features that allow them to automatically adjust when cooling requirements change. This includes a unique con

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Aquatech's new Easycool+ self-adjusting central chiller

figuration of two Copeland multiscroll compressors of different sizes. Using different sizes of compressors allows the chiller to precisely tailor compressor operation to cooling demand.

The small compressor is turned on automatically when less than 35 percent of cooling capacity is required, the large compressor is used for 35 to 60 percent of capacity, and both compressors operate to achieve 61 to 100 percent of capacity, Santella said.

"Aquatech is the first company to introduce what's called 'uneven compressor assembly,' where a larger and smaller compressor work together. This is beneficial for energy utilization.

Conventional central chilling systems operate at their maximum cooling capacity all the time and are not designed to handle variable heat loads," Santella said.

Heat loads in a plastics plant vary when a machine is taken off-line, or when a new mold — with different heating and cooling characteristics — is installed.

The air-cooled Easycool+ incorporates fans from ebm-papst Inc., programmable controls and electronic expansion valves from Carel Industries and electromechanical devices from Siemens and ABB, Santella said. Aquatech offers Easycool+, which uses the refrigerant coolant R-410a, with a choice of two evaporator types: brazed plate or shell-and-tube.

Easycool+ also features Aquatech's new automated pressure control. It uses process-water pumps driven by electronic inverters to automat-

ically and precisely maintain the pressure in the water supply line at the highest pressure required. The control also ensures even distribution to all processing machines in the system.

"Users can set the system water pressure to the molding machine with the more demanding thermal condition. This is important in terms of energy consumption and life of the components of the chiller system," Santella said.

In a plant with 50 molding machines, where one mold requires a cooling water pressure of 50 pounds per square inch (psi) and the remaining 49 molds require 30 psi, a conventional system would be adjusted to deliver 60 psi of water pressure. "A conventional system will continue to operate at 60 psi even after the mold requiring 50 psi water pressure is taken off-line, while Easycool+ would immediately adjust water pressure to the lower pressure," Santella said.

Easycool+ is designed to maintain a selected temperature differential between the water delivery and return circuits. Each mold has a specific cooling flow velocity that is ideal for optimal heat exchange, Santella said. Typically, the temperature differential for a central cooling system is set based on the tool with the narrowest temperature differential.

"A conventional, fixed central cooling system serving an operating mold with a two-degree temperature differential would continue to operate the chiller to hit that narrow temperature delta even if that mold were removed and the remaining molds in operation had a 10-degree temperature differential," Santella said.

"Water flow is never stable and changes depending on the heat load. The higher the heat load, the higher the volume of water needed to circulate in the cooling pipes," Santella said.

Aquatech also developed plug-and-play technology as part of its advanced control software to automate a number of diagnostic checks. "When a molder changes a tool, some water from the chilling system may remain in the mold and becomes lost to the system, while the new mold being installed may be empty of water and has to be filled. Conditions in the molding shop like cooling level in the tool or the cooling system represent a critical aspect to the process," Santella said.

Air left in the cooling circuit of a newly installed mold can cause problems with water circulation and part quality.

At startup, molders using conventional systems must:

- ensure there is no air in the mold,
- confirm that all the cooling circuits are filled, and
- be sure that water circulation is adequate.

"Users simply replace the mold, connect it to the molding unit, and Easycool+ will automatically conduct a diagnostic and handle the various startup tasks. The plug-and-play technology of Easycool+ will determine if water is required

for the system and how much, and will refill the circuits. For a user with multiple machines conducting mold changeovers multiple times a day, this feature saves set-up time and ensures a good setup," Santella said.

The control software monitors operating parameters and can identify system abnormalities, even from a remote location.

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**GIORGIO SANTELLA** Piovan SpA