MOLD TEMPERATURE CONTROLLERS AND CHILLERS

Portable units add flexibility with the new, more compact designs

The thermodynamics of plastic processing makes temperature control essential to assure product repeatability, dimensional integrity, and a good surface. To accomplish this, circulating liquid temperature control systems and chillers are commonly used.

Circulating liquid temperature control systems, often referred to as mold temperature control systems, are used to heat, cool, and control process temperatures. These systems are designed to circulate either water (or a water-glycol mix) or heat transfer fluid (oil) as the circulating heat transfer medium.

Water-based systems usually operate up to 250°F., with some designs available to 300°F. Heat transfer fluid (oil-based) systems are able to operate up to 600°F. Both systems thermostatically control the temperature of the fluid and pump it through the process to control the process temperature. The systems consist of pumps, motor, heater, temperature controllers, and a means of cooling.

Liquids are used because they are easy to pump, can transfer a lot of heat, and can reach hard to access areas requiring temperature control. A turbulent flow of liquid through the passages and lines maximizes heat transfer and temperature control.

Recent design trends for circulating water temperature control systems include cast heating manifolds, reduced fittings, and smaller *footprints (*floor area*)*, while still providing improved performance and ease of serviceability. Cast iron and carbon steel are common materials of construction with nonferrous materials offered by some manufactureres. Some recent heater designs incorporate a forced flow path of the fluid over the heaters for increased efficiency. Cooling options range from direct cooling with solenoid, motorized or modulating valve control, to indirect closed circuitry cooling which isolates the process fluid from cooling fluid via a heat exchanger.

Portable chillers, with capacities from 1/2 to 20 tons, can provide a cool water source for a range of manufacturing processes. [Photo, Mokon]

Circulating heat transfer fluid systems are used to control process temperatures above 100°F. and up to 600°F. These systems are similar to water systems in principle, but vary in construction, cooling methods, and size due to the higher temperature of operation. Cooling capability is offered in some designs for optimal control and in case of shut down, maintenance, changeover, or for safety purposes. Cooling is achieved either with an in-line heat exchanger or the use of a cool oil reservoir. Both are effective but the reservoir design eliminates thermal shock and water hammer, which can be destructive to the heat exchanger and cooling lines.

Both customized and brand name control packages are available. Most indicate setpoint and process fluid temperatures as well as diagnostic and operation conditions. Microprocessors and PLCs offer improved accuracy and interfacing with host machines or monitoring systems.

Portable or central chillers are an option for applications that only require cooling, or as a cold water source for circulating liquid temperature control systems. Chiller systems consist of circulating water and refrigeration loops. The water loop removes heat from the process, transfers it to the refrigeration loop, which then dissipates the heat by means of air or water cooling.

Portable chillers range from fractional tons (12,000 BTU/hr. per ton) to 40 tons of cooling. Most are 20 to 25 tons, or less. These chillers are used for plants with small cooling requirements, for specific machines needing cooling, or as a supplement to central cooling systems. Portable designs usually place both loops (water and refrigeration) within a common cabinet for ease of use and portability.

Portable systems are featuring small footprints and improved accuracy, efficiency, and dependability in operation. Creative design layout and space-saving components, such as brazed plate evaporators in place of shell and tube heat exchangers, allow footprint reduction. Microprocessor-based controls, hot gas bypass control to eliminate compressor short cycling, scroll compressors, and energy saving compact condensers increase accuracy and efficiency.

When both heating and chilling are needed, a combination of circulating water temperature control systems and a portable chiller together within the same framework allows for single or multiple zone process temperature control. It is ideal for heating-chilling applications or multizone processes where the water supply isn't cold enough or where drainage of hot water is a problem.

Central chillers are larger in scale than portables and are suitable when the total cooling requirement of the facility exceeds 20 to 30 tons. Central chiller systems usually separate the water system from the refrigeration loop and require layout of plumbing lines and logistical placement and sizing of all components. ❑

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