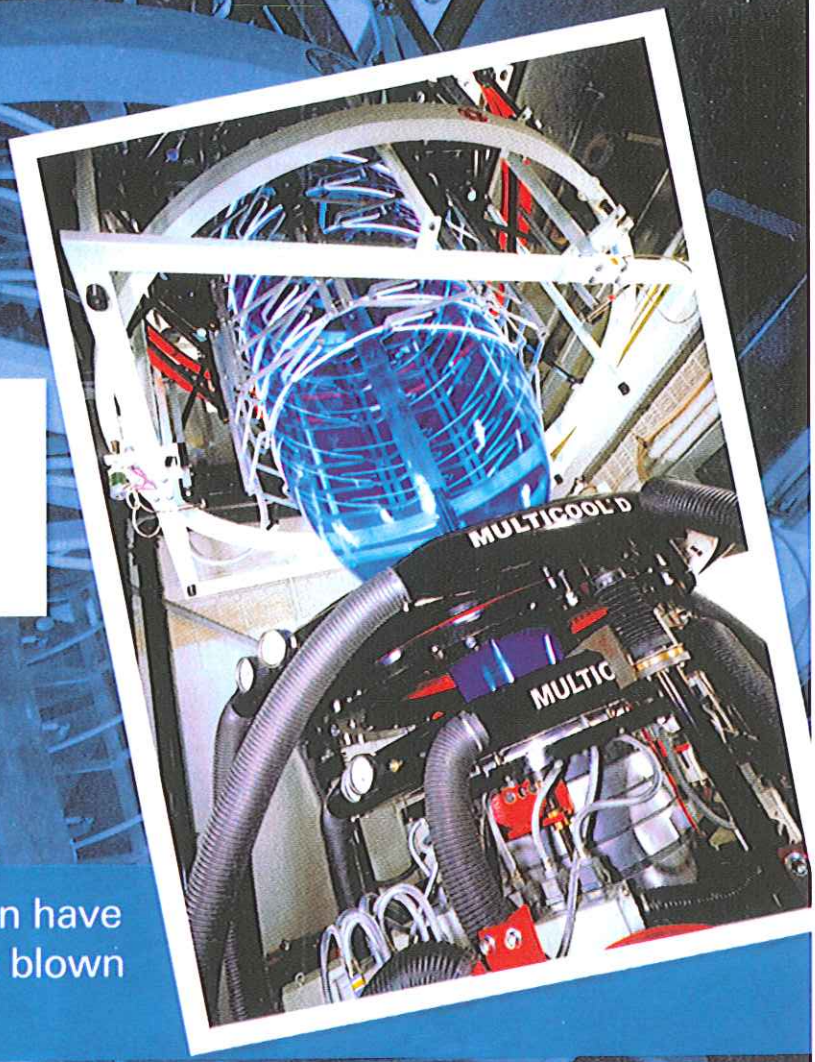
A Cool Film

Cooler sizing and maintenance can have a big impact on the efficiency of a blown film manufacturing process.



By Jessica Piwko, Mokon

Today's blown film industry demands a manufacturing process capable of high output rates and film quality, consistent results, reduced waste, and high productivity. Furthermore, as energy costs continue to rise, it is becoming increasingly critical to ensure that blown film equipment runs efficiently. Fortunately, operating costs often can be reduced by correctly sizing and maintaining the blown film cooler.

Blown film coolers are used to produce bags, liners and industrial, barrier, stretch, laminated, agricultural and construction type films. Integral pieces of the blown film equipment, these coolers provide uniform cool air to the internal and external film bubble to change the plastic from a molten to a solid state. They are used in conjunction with a blower and a chilled water supply. The blower provides ambient air at a specific static pressure, moving it through the blown film cooler and into the air ring. The chilled water supply enters the system, absorbs heat from the ambient air and then is returned to the cold-water source. The proper sizing, control, startup procedures and maintenance are imperative to ensure that all of these components function correctly and efficiently.

Sizing

A typical blown film cooler system supplies 600 to 10,000 cfm of cool air. Because they are not designed as portable systems, blown film cooler systems are large and must be handled carefully during transportation and installation.

When sizing the unit, you need to know:

- The tonnage of cooling required.
- How the cooling water will be supplied (through a designated portable chiller, central chiller, etc.).
- The cooling supply water temperature.
- The volumetric flow rate required.

Blown film extrusion systems are used to produce bags and liners as well as industrial, barrier, stretch, laminated, agricultural film and construction films. Courtesy of Windmoeller & Hoelscher Corp., Lincoln, R.I., www.whcorp.com

- The static pressure, voltage and atmospheric conditions.

Blower sizing also is important because accurate, constant static pressure must be supplied to the air ring. The altitude of the operation impacts the size of the blower — at higher altitudes, the fan will require less horsepower to maintain volume. This effect occurs because the blower moves the same volume of air regardless of the air's weight. Because the density of air decreases at higher altitudes, it produces lower static and velocity pressures.

Full-sized lines should be used to transport the chilled water supply from the central or designated chiller to the cooling coil assembly. If the supply lines

Proper sizing and preventive maintenance can prolong the life of your equipment and help keep your unit operating efficiently.

are too small, the coil will not receive enough cooling water and the unit will not be able to achieve the desired air temperature. The chilled water piping for your equipment should be insulated to reduce condensation and heat absorption from ambient air.

Condensate from the coil should collect in a condensate trap, which also must be sized properly. An undersized trap will not allow enough condensate to leave the unit, and the coil area will become flooded. Conversely, an oversized trap might lose its prime, which can cause the trap to fail in the open position and lead to a blow-through condition. The condensate trap should be piped with short, well-pitched discharge lines to an open drain.

Control Methods

The blown film cooler can be controlled with manual valves, modulating valves, or electronic two-and three-way valves.

Modulating or electronic valves are more efficient than manual valves because they accurately control the flow of cooling water through the coil so that the process uses only as much cooling water as needed. A modulating valve uses a sensing bulb to control the exiting air temperature of the cooler. An electronic valve uses a thermocouple to sense the exiting temperature and sends a signal to a controller. The valve or controller compares the air temperature to the desired setpoint and subsequently opens or closes the valve to achieve that temperature. If the air temperature is too warm, the valve opens to allow more cooling water to pass through the coil. If the air temperature is too cool, the valve will close to restrict the flow of cooling water through the coil. A 10°F (5.5°C) approach (cooling water vs. air outlet temperature) is standard.

Startup Procedure

Before installing the unit, read the manufacturer's instruction manual carefully and make sure you understand it. The first step in installing the unit is to secure it in place. Next, the air duct piping can be attached and insulated. After that, the water supply, return and drain lines can be connected and the electrical connections can be wired.

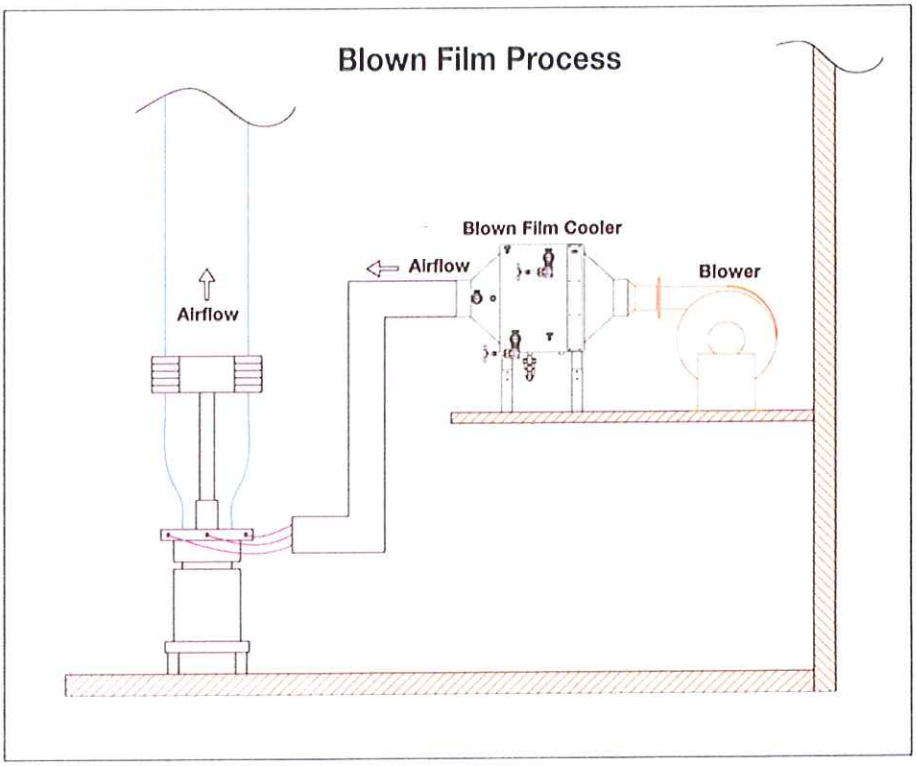
If electrical features are included in a system design, make sure these features meet all NFPA 79 electrical safety standards and that the equipment includes a UL labeled electrical subpanel.

General Maintenance

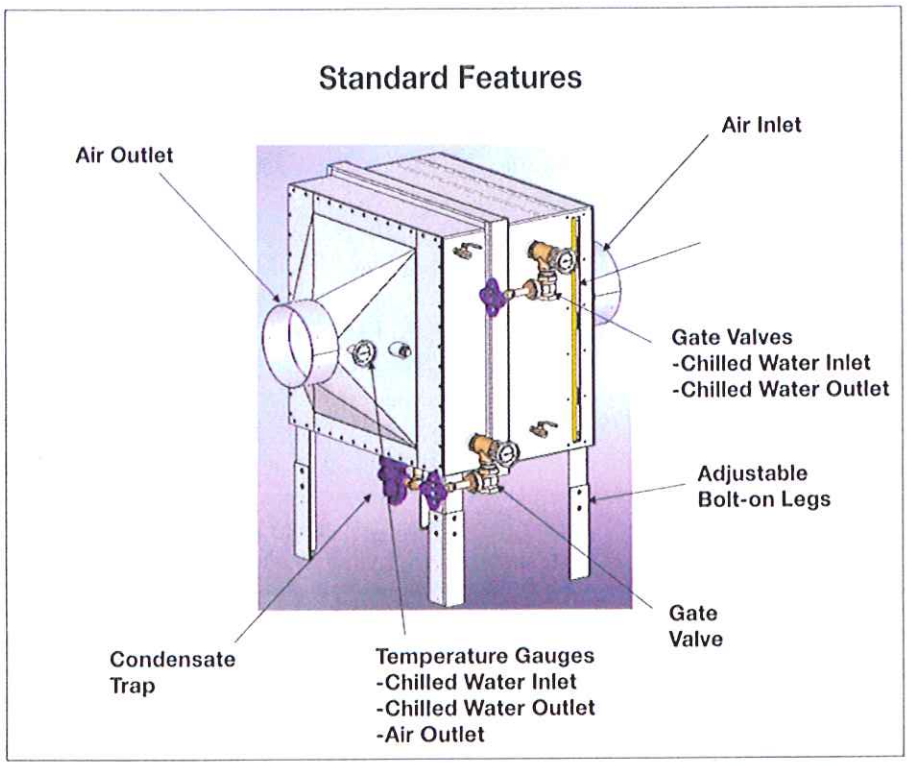
To ensure trouble-free operation of the unit, closely follow the preventive maintenance schedule outlined in the instruction manual. Common problem areas include the coil, filters and condensate trap.

The coil should be checked periodically for debris and cleaned regularly to maintain optimal heat transfer. The debris can be removed with a vacuum, compressed air or a mild chemical treatment. When dust and dirt accumulate on the coil, they significantly reduce the transfer of heat. The coil also should be vented occasionally to bleed off any air that might be trapped in the fluid loop. A descaling unit can be used to remove rust, scale or lime deposits from the coil's piping. A filter on the coil's air inlet can help to reduce the amount of debris that enters the coil. To extend the coil life, strainers should be used on the supply water side to help filter out any particulate before it enters the coil.

Filters should be cleaned or replaced often to remove any dirt or debris that accumulates. Dirty filters decrease the efficiency of the unit by restricting air-



Blown film coolers are used in conjunction with a blower and a chilled water supply.



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flow through the coil. If your unit has washable filters, they should be cleaned with a mild detergent and then air dried.

Additionally, the condensate trap should b drained periodically to remove small particles of particulate that may settle on the bottom.

Properly sizing and maintaining a blown film cooler requires careful planning and a certain amount of labor. However, the costs involved are much less than would be required to repair the unit after a major failure, not to mention the associated downtime. Performing the suggested preventive procedures can prolong the life of your equipment and help keep your unit operating efficiently. **PC**

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