PolyScience®

How to Choose a Chiller

Chillers provide heat removal for a wide variety of processes and equipment. When properly sized and selected, a chiller increases production speed and accuracy, protects valuable process equipment, and reduces water consumption and related costs. If it is undersized, the chiller will never cool properly; if it is oversized, it will be inefficient due to excessive cycling. In addition to having an adequate cooling capacity, the chiller must deliver the cooling fluid at the proper pressure and flow rate.

Here are four basic factors that affect chiller sizing and selection:

1. Desired Coolant Temperature

This is the coolant temperature at the inlet of your process or equipment. It is important to measure temperature at this point to allow for coolant heating as it travels from the chiller to the process. The longer the distance covered, the higher the potential heat gain. This heat gain can be minimized by insulating the cooling line and positioning the chiller as closely as possible to the equipment or process being cooled.

2. Heat Load

This is the amount of heat that needs to be removed. It is usually expressed in BTU/hour or watts. The heat load value is often provided by the equipment manufacturer. If not, it can be calculated using the following formula:

Heat Load =
Flow Rate x Fluid Density x Fluid Specific Heat x Constant x △T°

Heat Load Variables

		BTU/hour	Watts
Flow rate	=	Gallons/minute	Liters/minute
Fluid density	=	Pounds/gallon	Grams/liter
Fluid specific heat	=	BTU/pound°F	Joules/gram°C
Constant	=	60	0.016666667
△T° = the difference between the inlet and outlet temperatures of the equipment being cooled	=	°F	°C

Properties of Common Cooling Fluids

Fluid	Fluid Density		Specific Heat	
	Lbs/gal	Grams/liter	BTU/lb°F	Joules/gram°C
Water @ 77° (25°C)	8.333	1000	1	4.181
50% water, 50% propylene glycol @ 50°F (10°C)	8.744	1049.25	0.835	3.493
50% water, 50% ethylene glycol @ 50°F (10°C)	8.992	1078.72	0.776	3.245

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How to Choose a Chiller continued

It is generally recommended that 20 to 50% be added to the calculated heat load to provide a safety factor if the chiller will be operated at ambient temperatures above 68°F (20°C) or at high altitude, or if the heat output of the device is variable. This will also provide a margin of safety for future cooling needs. That said, resist the temptation to build more safety margin into your chiller than is necessary; an oversized chiller will not cool your equipment any more effectively, but will cost more to purchase and operate.

3. Coolant Flow and Pressure

These parameters are normally provided by the equipment manufacturer and are a function of the surface area and the heat transfer characteristics of the process/material being cooled. It is crucial that your chiller deliver coolant at the proper flow rate and pressure — if the flow rate or pressure is too high, the equipment being cooled may be damaged; if it is too low, the heat removal will be inadequate. Your chiller supplier can help you specify the type and size of coolant pump most suitable for your needs.

4. Condenser Heat Dissipation

The final factor influencing chiller/heat exchanger selection is how the heat removed will be dissipated. Devices with air-cooled condensers exhaust heat into the surrounding air and require only power and ventilation for operation. Devices with water-cooled condensers transfer heat to the facility's cooling water supply. Chillers with remote condensers (i.e., the condenser is located outside the facility) are also available. These are quieter, require less space, and do not add heat to the building interior, thus reducing summer cooling costs. However, they are more expensive to install and are not easily relocated.

Naturally, there are other factors — such as ambient temperature, heating capability, remote temperature tracking, DI water capability, etc. — that affect how a chiller is ultimately configured. PolyScience will take all these into consideration when helping you select the best chiller for your particular application.

If possible, please have the following information when you contact us:

- Desired coolant temperature at the inlet to your equipment or process
- Anticipated heat load, as calculated or specified by the equipment manufacturer
- Cooling fluid flow rate and pressure requirements
- Internal heat dissipation, space, and portability needs
- Environmental factors (such as ambient temperature, air cleanliness, etc.)
- Special requirements, such as remote temperature tracking or DI piping

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