

Cold Shot Chillers

"ECONOMICALLY PRICED DEPENDABILITY"



Chiller Sales & Manufacturing - Standard & Custom Designs New & Pre-Owned Chillers and Refrigeration Equipment

PLASTICS PROCESSING CHILLER SIZING

No matter what your application, there is a single formula for determining the size of chiller you need. Before you begin, you must know three factors:

- The incoming water temperature
- The chill water temperature you require
- The flow rate

General sizing formula:

1. **Calculate Temperature Differential "ΔT" in °F.**
 $\Delta T = \text{Incoming Water Temperature} - \text{Required Chill Water Temperature}$
2. **Calculate BTU/hr.**
 $\text{BTU/hr.} = \text{Gallons per hr} \times 8.33 \times \Delta T$
3. **Calculate tons of cooling capacity**
 $\text{Tons} = \text{BTU/hr.} \div 12,000$
4. **Oversize the chiller by 20% Ideal Size in Tons = Tons x 1.2**
5. **You have the ideal size for your needs**

EXAMPLE:

For example, what size chiller is required to cool 40GPM from 70°F to 58°F?

1. $\Delta T^{\circ}\text{F} = 70^{\circ}\text{F} - 58^{\circ}\text{F} = 12^{\circ}\text{F}$
2. $\text{BTU/hr.} = 40\text{gpm} \times 60 \times 8.33 \times 12^{\circ}\text{F} = 239,904 \text{ BTU/hr.}$
3. $\text{Ton Capacity} = 239,904 \text{ BTU/hr.} \div 12,000 = 19.992 \text{ Tons}$
4. $\text{Oversize the chiller} = 19.992 \times 1.2 = 23.9904$
5. A 23.9904 or 25-Ton chiller is required.

There also industry specific rules of thumb for chiller sizing depending on your application. For your plastic process cooling application, follow this formula:

1. Calculate the pounds of material per hour being processed.
2. Determine how many pounds per hour are required for each ton of cooling capacity on Chart 1.
3. Determine if the extruder or any auxiliary equipment will require chill water. If not, go to step #6.
4. Size the equipment cooling capacity based on Chart 2 and Chart 3.
5. Combine the process and equipment cooling requirements.
6. Size your chiller by rounding up to the closest standard unit.

EXAMPLE:

For example, what size chiller is needed for a polypropylene molding operation that incorporates a 6oz. "Shot Size" and a 18 second cycle time with a 3 H.P. hydraulic motor?

1. $6\text{oz.} / 18\text{sec.} = 19.99 \text{ oz/min} (20.00 \text{ oz./min}) 20 \text{ oz.} / \text{min} \times 60 \text{ min.} = 1200 \text{ oz/hr} 1200/16 = 75 \text{ lbs.} / \text{hr}$
2. Polypropylene requires 1 ton of cooling capacity for every 35 lbs./hr processed $75 \text{ lbs.} \div 35 \text{ lbs.} = 2.14 \text{ tons of cooling}$
3. A hydraulic motor requires 1 ton/HP of cooling capacity
4. $3 \text{ HP} \times .1 \text{ ton/HP} = .3 \text{ ton of capacity}$
5. Combine process & auxiliary cooling requirements $2.14 \text{ tons} + .3 \text{ ton} = 2.4 \text{ tons}$
6. This application will require a 3-ton unit.

Marrone & Co., Inc.

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PROCESS COOLING

CHART 1

INJECTION MOLDING	30#/HR H.D. POLYETHYLENE	= 1 TON
	35#/HR L.D. POLYETHYLENE/POLYPROPYLENE	= 1 TON
	40#/HR NYLON	= 1 TON
	50#/HR POLYSTYRENE OR ABS.....	= 1 TON
	65#/HR PVC OR POLYCARBONATE	= 1 TON
	70#/HR P.E.T	= 1 TON
EXTRUSION	50#/HR POLYETHYLENE OR POLYPROPYLENE	= 1 TON
	75#/HR POLYSTYRENE	= 1 TON
	80#/HR PVC.....	= 1 TON
BLOW MOLDING	35#/HR POLYOLEFINS	= 1 TON

AUXILIARY EQUIPMENT COOLING

CHART 2

AIR COMPRESSOR (NO AFTER COOLER).....	= 0.16 TON/HP
AIR COMPRESSOR (WITH AFTER COOLER).....	= 0.2 TON/HP
VACUUM PUMP	= 0.1 TON/HP
HYDRAULIC COOLING	= 0.1 TON/HP
HOT RUNNER MOLD.....	= 0.1 TON/10.5 KW
WATER PUMP IN CIRCUIT.....	= 0.2 TON/HP
FEED THROAT BELOW 400 TON.....	= 0.5 TON
400 TON MACHINE AND ABOVE.....	= 1.0 TON

EXTRUDER COOLING

CHART 3

GEAR BOX COOLING.....	= 1 TON/100HP
FEED THROAT: 3" SCREW OR LESS.....	= 1 TON
ABOVE 3" SCREW.....	= 2 TONS
BARREL OR SCREW COOLING (PER INCH OF SCREW DIAMETER).....	= 1 TON/INCH

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