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Basic Guide Lines for water cooling sizing

For Injection Molding:

First – Hydraulics:

To calculate the your hydraulic cooling needs, you need to:

1) Add up the hydraulic pump-motor-size for all your molding machines (eg.: 50 hp + 35 hp +...).
2) Multiply the results by 0.1 ton/hp factor. This will give you the load of your hydraulics in TONS.

Normally, you will use cooling tower water for the hydraulics, since the oil temperature is kept between 90°F and 130°F. There are many companies utilizing chill water for this task and that is fine as long as your molding machine has a water regulating valve attached to your heat exchanger which the machine can control for closing if the oil temperature is too cold and opening if the oil temperature is too hot. Old machines did not have this feature, but it is something you can retrofit easily. New molding machines already have this feature for controlling the oil temperature with chill water. For this cases (New machines using chill water only) you can use the following factor 0.075 ton/hp in lieu of 0.1 ton/hp .

Second – Molds:

To calculate the your mold cooling needs, you need know the following:

1) **Material type**
2) **Material consumption** (lbs/hr)**:** If you do not know this, follow this simple steps:
    a) Weight a complete shot (parts + runner if applicable) from your molding machine, (ounces).
    b) Read from the machine control the total cycle time in seconds.
    c) You have**:** material / time => ounces / seconds. Convert to lbs/hr by multiplying by 225.
3) **The following formula:** Now with the use of the table below and this formula you can compute your mold cooling needs:

Cooling Load = Material consumption (lbs/hr) / Chiller sizing factor (lbs/hr per ton) (from table)

Material	lb/hr per ton
HDPE	30
LDPE	35
PP	35
ACRYLIC	35
PC	40
NYLON	40
PPE	40
PS	50
ACETAL	50
ABS	50
PVC	75
PET	45

If your material type is not listed on the table above, you can use the factor number for the worst scenario which would be that of HDPE.

Chiller Capacity Loss: Chiller are design for 50°F operation. If your process runs below the design temperature your chiller will lose capacity at a rate of 20% per each 10°F below 50°F. The inverse also holds true, you will gain 20% capacity per each 10°F above 50°F.

Example: Your cooling needs as calculated above, is 50 tons. But your process is below design temperature parameters, lets say 45°F. A normal 50 ton chiller will only provide 45 tons at 45°F, therefore you would need a 56 ton chiller or larger in order to get 50 tons at 45°F.

Third – Feed Throat:

For screw diameters 3.5" or smaller: use 1 ton of cooling
For screw diameters greater than 3.5" Dia. up to 6" Dia.: use 2 tons of cooling

Fourth – Total Cooling needs:

Now you need to ADD up the numbers calculated in all three sections above.

Total Cooling Load = Hydraulic load + Mold load + Feed Throat load

Please note that to this point we have not taken in consideration the cooling load caused by the water pumps on your water pump tank system. This load can be calculated by multiplying the 0.1 ton/hp factor by every pump motor on your pump tank system and add them up to your total cooling load calculated above.

It will always be good to verify your numbers with a supplier, as conditions may vary and other equipment may be added to the list of variables discussed here. Also you would need to size up your pump tank system accordingly, but that is for another technical bulleting.