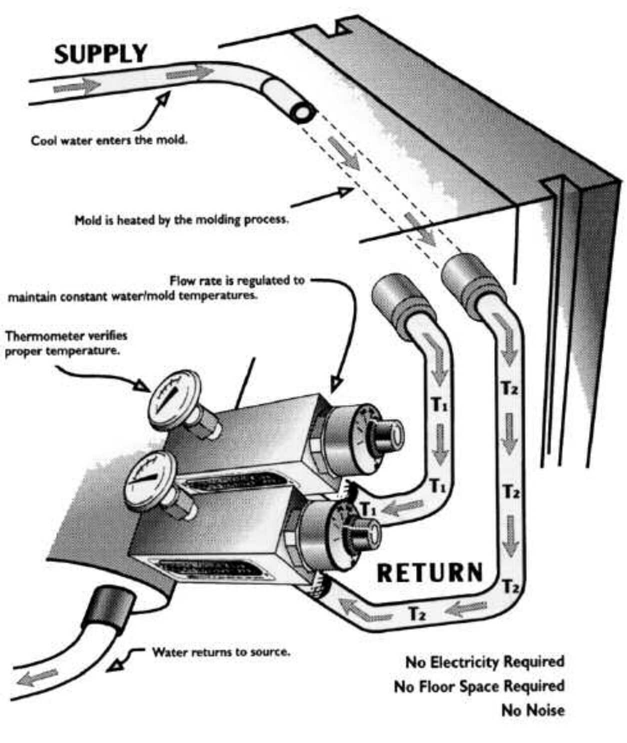
MOLD TEMPERATURE REGULATOR

Principle of Operation

The Smartflow Mold Temperature Regulator works on the principle of thermal expansion. It is connected to the return lines of the mold cooling water loop. A simple bellows and range spring capsule senses the temperature of the water leaving the mold and compares it to the Set Point temperature. The Set Point is easily adjusted by rotating the pointer knob to the desired water temperature value on the calibration scale. The dial thermometer provides visual verification of the setting. Note: *A discrete cooling water temperature always corresponds to a hotter mold (steel) temperature.*

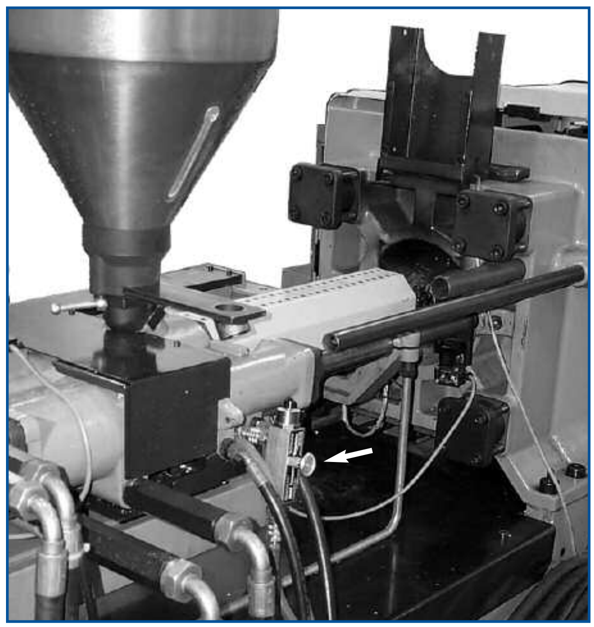
When the water temperature leaving the mold is hotter than the Set Point, the internal valve modulates toward open, cooling water flow rate increases, and cooling water temperature decreases to stabilize at the Set Point. When the water temperature leaving the mold is cooler than the Set point, the internal valve modulates toward close, cooling water flow rate decreases, residency time in the mold increases and cooling water temperature rises until stabilizing at the Set Point. The valve never completely closes.

Note: The Mold Temperature Regulator recovers waste heat energy from the resin shot and transfers it to heat the cooling water and the mold. The Mold Temperature Regulator does not generate heat, and it does not function as a chiller.



Applications

The Mold Temperature Regulator is generally suitable for mold applications where the supply water is cooler than the mold and where the resin shot size is sufficient to heat the mold in the first few shots.



Control Feed Throat Condensation by installing a Mold Temperature Regulator in the barrel cooling loop. Set the dial once on the MTR, and allow it to maintain temperature and eliminate condensation in the resin.

SMARTFLOW®

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Application Procedure

Use the following formula and method to calculate heat load for **one** cooling circuit. This will help determine suitability of the ***Smartflow*** Mold Temperature Regulator to your process.

1. Select material from the table at right and calculate BTU/hr using the formula below. Shot weight is the total drop including cold runner (if any).

$$\frac{\text{BTU/lb} \times \text{Shot Weight (oz.)} \times 225}{\text{Cycle Time (sec)}} = \text{BTU/hr}$$

2. Find BTU/hr along the X axis of the graph below. Locate the desired steel temperature along the Y axis of the graph. Find the spot where the X and Y values intersect.
3. The graphed line nearest this intersection point represents the difference in temperature between the incoming water and the Mold Temperature Regulator set point (ΔT).
4. The Smartflow Mold Temperature Regulator should work in your application if the sum of the incoming water temperature and the ΔT value is between 80° and 120°F.

   Every mold is different! The effectiveness of the Mold Temperature Regulator relies on the ability of the resin shot to heat the mold, and the efficiency of the cooling lines inside the mold.

NOTE: These graphs and information are intended as a general guide for sizing and initial setup of the mold temperature regulator. Due to the different mold designs, results may vary from the graphs.

Typical Heat Values of Plasticized Resin*

Material	BTU/lb
ABS	81
Acrylic	109
Nylon	183
Polycarbonate	112
Polyethylene - High Density	276
Polyethylene - Low Density	202
Polypropylene	291
Polystyrene	88
SAN	88

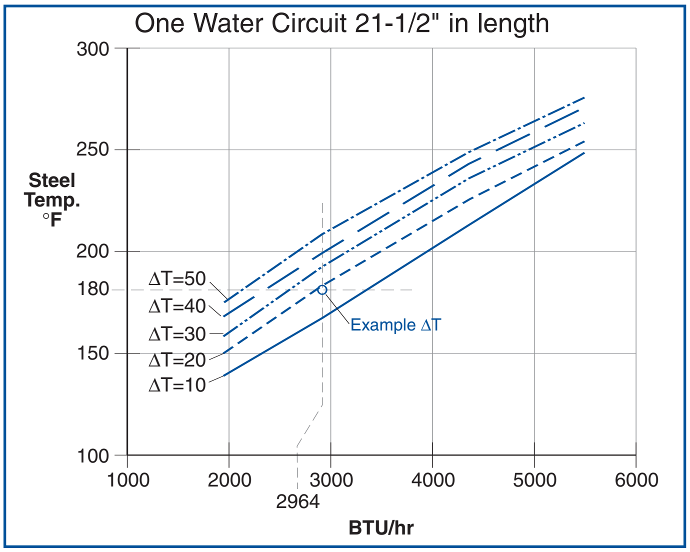
*Total Heat Content + Latent Heat of Fusion

Example:

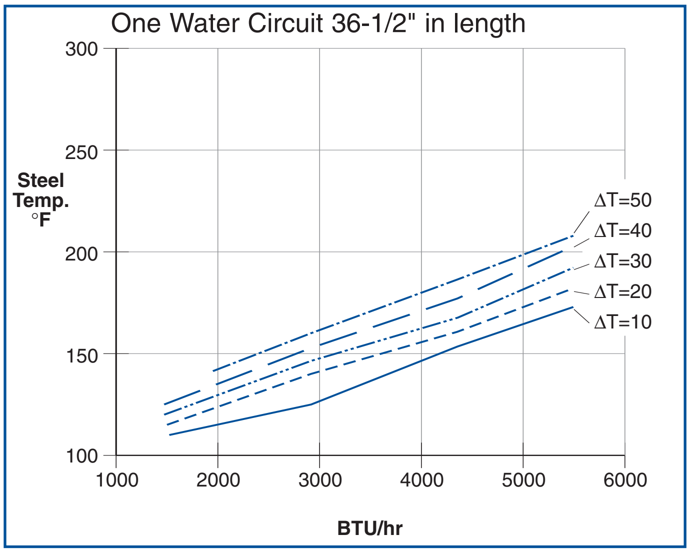
A molder is using nylon material in a four-cavity mold with a shot weight of .90 ounces (including the runner). The cycle time is 12.5 seconds with a mold steel temperature of 180°F. BTU/hr formula is as follows:

$$\frac{183 \text{ BTU/lb} \times .90 \text{ oz.} \times 225}{12.5 \text{ sec}} = 2964.6 \text{ BTU/hr}$$

See the One Water Circuit Graph below left for the differential temperature (ΔT) value. Add 70°F incoming water temp. to the ΔT value (20°F). This is the beginning set point for the mold temperature regulator, and may be adjusted as needed.



Mold Temperature vs. Heat Input for 21-1/2" Water Circuit and Five Different Values of ΔT



Mold Temperature vs. Heat Input for 36-1/2" Water Circuit and Five Different Values of ΔT

These graphs were generated by simulated molds, with BTU input varied by electric heaters. The water line path through each mold was 7/16" diameter.