SUBJECT: HEAT LOAD CALCULATION FOR MOLD TEMPERATURE CONTROLLERS **#1-A-142** **6/26/1995**

Sentra Series water temperature control Unit.

Mold temperature controller units, such as the Advantage **SENTRA** and **REGAL** must achieve three objectives:

1. Initially elevate mold up to operating temperature
2. Maintain the temperature during operation
3. Compensate for heat losses due to absorption and radiation.

To achieve these objectives, the internal heater of the temperature control unit must be sized correctly.

The formula for calculating the process heat load requirements for mold temperature controllers is discussed in this document.

HEATERS ARE SELECTED BY KILOWATT RATING. A kilowatt is the amount of heat energy introduced into the system, expressed in thousands of watts per hour. Common ratings are 4.5kw, 9kw, and 12kw. **ADVANTAGE** offers heaters from 4.5kw to 36kw in standard units. Large heaters are available on a custom basis.

TO DETERMINE THE PROCESSOR'S HEATING REQUIREMENTS, the following formula is presented:

1. Determine the mold's weight. Do this by multiplying the outside dimensions to compute total cubic inches. Multiply this by the particular weight of the mold material. See FYI #7-A-108 for more information on material weights.

2. Determine the mold's temperature rise. This is the difference between the non-operating (ambient) temperature and the setpoint temperature. It can be assumed the average ambient temperature is 70°F.

3. Determine the mold's specific heat value. Standard value for steel is .12 and for aluminum is .24. Other values are listed on FYI #7-A-108.

$$\text{KW PER HOUR} = \frac{\text{MOLD WEIGHT} \times \text{TEMPERATURE RISE} \times \text{SPECIFIC HEAT}}{3412}$$

KW PER HOUR is the kilowatts required to bring the mold up to temperature within one hour. Select the nearest "standard" KW rating for the heat load. Example: a 7.5kw load would require a 9kw standard heater. If a faster heat-up time is required, then the heater must be sized accordingly. For example, a 6kw load for one hour becomes a 12kw load for a half hour. Furthermore, a 4kw load for one hour becomes a 16kw load for 15 minutes.

45 minute heat up - divide KW per hour by .75
30 minute heat up - divide KW per hour by .50
15 minute heat up - divide KW per hour by .25

The KW required to maintain the setpoint, once achieved, is only a fraction of what is needed initially. Therefore, a heater sized for the initial heat-up is typically sufficient for maintaining the setpoint and compensating for any minute radiation or absorption loss. (See FYI #1-C-9 for more information.)

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