Technical

Wattage Calculation Formulas

Formula B: Wattage losses at operating temperature (see graphs on pages 150 and 151)

Average paraffin surface loss

3sq.ft. x 70w/hr. =   210 watts

Total losses

13.5sq.ft. x 55w/hr. =   740 watts

Compensation factor

20% (155 + 845 + 239 + 1,245 + 210 + 740) =   685 watts

Total wattage required =   **4,120 watts**

In addition to calculating the watts required for initial heat-up and heat losses, operating heat requirements must be calculated. Steel pins, each weighing .175 pounds, are to be placed in a 70 pound steel rack and dip-coated in the melted paraffin. 1,750 pins can be processed per hour with 25 pounds of paraffin.

Formula A: Wattage required for heat-up

To heat pins and rack

$$\frac{(1750 \times .175 + 70)\text{lbs/hr} \times .12\text{BTU/lb/°F} \times (150 - 72)\text{ °F}}{3.412 \times 1 \text{ hour}} = \qquad 1{,}030 \text{ watts}$$

To heat additional solid paraffin

$$\frac{25\text{lbs/hr} \times .70\text{BTU/lb°F} \times (133 - 72)\text{ °F}}{3.412 \times 1 \text{ hour}} = \qquad 310 \text{ watts}$$

To heat additional melted paraffin (fusion occurs at melting point)

$$\frac{25\text{lbs/hr} \times .71\text{BTU/lb°F} \times (150-133)\text{°F}}{3.412 \times 1 \text{ hour}} = \qquad 90 \text{ watts}$$

Formula C: Wattage for melting or vaporizing
Heat of fusion, to melt additional paraffin

$$\frac{25\text{lbs/hr} \times 63\text{BTU/lb}}{3.412 \times 1 \text{ hour}} = \qquad 460 \text{ watts}$$

Formula B: Wattage losses at operating temperature (see graphs on pages 150 and 151).
Paraffin surface loss

3sq.ft. x 70w/sq.ft./hr. =   210 watts

Tank surface loss

13.5sq.ft./ x 55w/sq.ft./hr =   740 watts

Compensation factor

20% (1,058 + 310 + 90 + 460 + 210 + 740) =   575 watts

Total wattage required =   **3,415 watts**

In the above calculations, the heat-up requirement is the greatest, therefore a heater with a wattage rating of 4,120 watts should be used in this application. The recommended watt density on the heater for this application is 16 watts per square inch (see page 148, table 1).