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Effects of Heat on Blow Molding

EFFECTS OF HEAT

Temperature problems can arise at any time and they affect the quality of the product, bottle weight, cycle times or a combination of the above. Most often the problem is excessive heat, though problems due to insufficient heat are not rare. Here are a few suggestions for fast, systematic identification of heating problems.

EXCESSIVE HEAT

- Set point is wrong: If this problem is detected quickly and corrected, much time can be saved.
- Insufficient thermocouple: When checking the controller, notice if the temperature indicator is at zero. If it is, the most likely problem is a shorted thermocouple. A shorted thermocouple delivers no voltage to the indicator and hence the controller continuously calls for heat. A broken thermocouple produces the same result. However, this is possible only in the older instruments that are not equipped with a thermocouple break protector.
- Poor contact between thermocouple and barrel: If the thermocouple is not making good contact with the metal of the barrel, it senses a temperature lower than actual and causes the zone point to overheat.

- Partial short in heater band: A partial short reduces the electrical resistance of the heater band and as a result increases the wattage output. This possibility takes a few minutes to inspect. First, note the voltage and wattage values stamped on the heater at the zone believed to be the trouble spot. Then, with the electrical supply turned off, disconnect one end of each of the heater bands in the zone and measure the resistance. With the voltage and wattage values stamped on each heater band, calculate what the resistance should be using the following formula:

$$\text{Resistance} = \text{voltage}^2 / \text{watts}.$$

For example, if the voltage reads 220 and the wattage is 2000, then $\text{Resistance} = 220 \times 220 / 2000 = 24.2$ ohms. If the resistance value measured is more than 10 percent lower than the calculated value, then that heater band should be replaced. The actual voltage should also be measured to be certain heat is correct. If not, the problem is probably in the power pack and not the heater.

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INSUFFICIENT HEAT

- Set point is set wrong: If this problem is detected quickly and corrected, much time can be saved.
- Broken thermocouple: When inspecting the set point on the controller, note if the indicator has been driven to the top of the scale. If so, the problem is likely a broken thermocouple and a replacement should solve the problem.
- Low voltage at heater band: If a voltage test at a heater band indicates low or no voltage reaching the heater, inspect the connections back to the controller. A break in the circuit cuts all voltage to the heater band. A poor connection, which causes high resistance in the circuit, results in low voltage delivered to the heater.
- Break or partial break in heater band: This increases the resistance of the band and reduces the wattage. Inspect the bands with a volt-ohm meter and make the calculation described previously for "partial short in heater band."
- Instrument recalibration: It's a good idea to inspect the instrumentation at least semi-annually. A controller actually holding a heater at 50° F higher or lower than indicated can produce some fairly puzzling situations. Use a pyrometer to test if actual and indicated temperatures agree. If they differ by more than a few degrees, recalibrate. This test, if not the recalibratio, can be done in moments and probably should be high in priority for checking before going on to tests that take more time and/or require the blow molding machine to be shut down.

For more information about blow molding, contact your LyondellBasell sales or technical service representative.