Thermoforming

Thermoforming machines mold plastic sheets by using infrared heating elements and then forming the heated sheets with vacuum pressure.

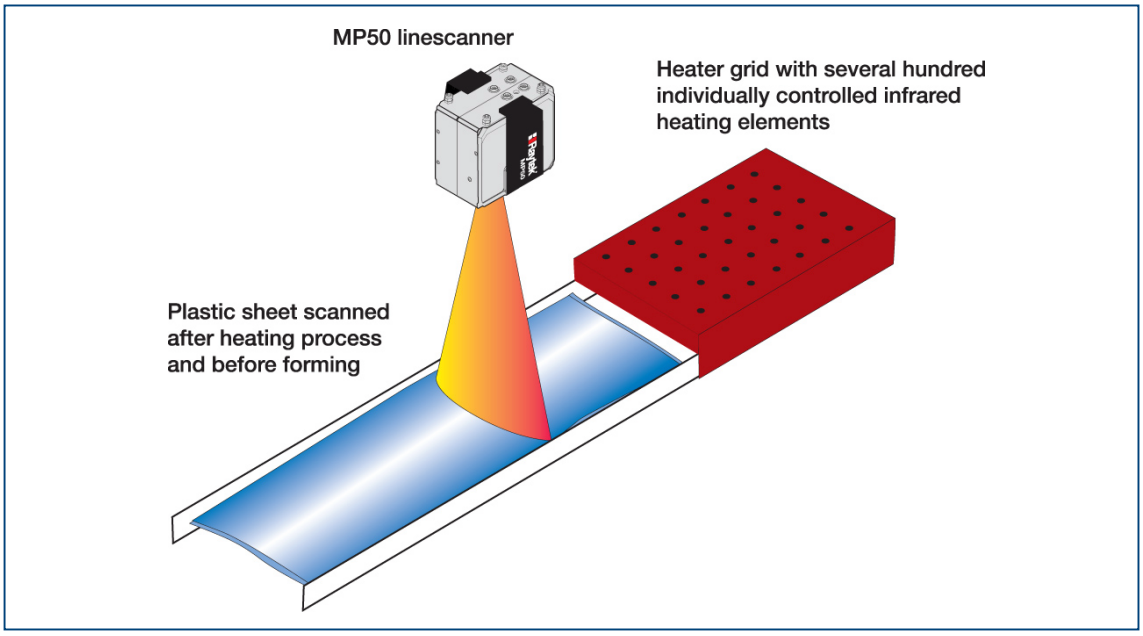
Q
Question

How to consistently and accurately monitor each heating element in the thermoforming process?

A
Answer

Situation Analysis

To produce molded plastic products with complex shapes (e.g., multiple bends, sharp corners, draft angles, etc.) proper temperature distribution on the incoming plastic sheet is critical. To achieve an even temperature distribution each infrared element on the heater grid must be individually adjusted. Insuring the correct setting manually is a difficult and time-consuming process and is usually performed by manufacturing “bad” parts and adjusting the process until the quality of the parts reaches acceptable levels. Making adjustments ‘on-the-fly’ during production is impractical and the time required for product change-over is considerable.



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A

Answer

Solution and Improvements

The Raytek TF100 system is specifically designed to monitor and control temperatures in the thermoforming process. Directly after the heating process, the MP50 infrared line-scanner collects thermal data and creates a two-dimensional infrared thermal image display as the heated sheet moves across the scanner view. This thermal image allows the operator to monitor the temperature distribution across the plastic sheet. Not only can the TF100 monitor the process, it can be configured to automatically control each heater element via closed-loop control. The dedicated software and unique user interface of the TF100 system are designed specifically for the thermoformer and make it easy and fast to set-up and adjust parameters as different products are formed. User-defined zones correspond to each heater element and alarms are automatically generated for any process temperature problems found in a heater zone.

The TF100 system snapshot mode can be used to record and display a series of temperature measurement data. Temperature data recording is synchronized by temperature triggering as the sheet enter the scanner field of view, or by an external trigger signal. All TF100 system processing data is available to share with the customer's control system and can be linked to a variety of process control programs via OPC (Object Linking and Embedding for Personal Computers).

Raytek Product

TF100 system
MP50 process imager
DataTemp TF100 software
Industrial power supply
RS232/485 converter

Accessories

MP50 carrying case
RS485 cable extension
Power cable extension
Line laser sighting
Terminal box
(for electronically triggering snapshots)

Benefits

- Real-time temperature measurement and alarming for heating process control
- Significant set-up time reduction for recipe changeovers and new product qualification
- Consistency in thermoforming complex shapes
- ISO9000 reporting for each manufactured part

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