



Temperature measurement within the plastics industry

The process and production temperature is an important physical measurement parameter for many process techniques used in the plastics industry. Non-contact temperature measurement with an infrared sensor system is thereby a very effective method for process monitoring and control. It supports companies to achieve high quality levels within their production.

Within the plastic industry, the production and testing of products is subject to numerous thermal processes. Infrared thermometers or pyrometers are used for single point temperature measurement if the critical point is known within the process. Infrared cameras are securely established to reveal weak points, especially the compact and fast optris PI thermal imager. Infrared cameras help to visualise thermal procedures and therefore optimise and monitor processes.

Plastic processors are producing a great number of plastic products with different dimensions, thickness, texture, colours and embossing pattern in a roll or tabular. Depending on the framework conditions, infrared thermometers and infrared cameras can be used in different kinds to improve and secure the processes purposefully.

Process control during thermoforming

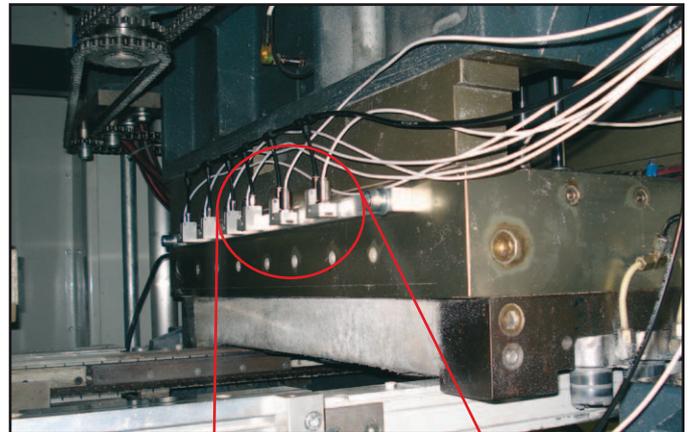
An important application for infrared temperature sensors is the fitting of pyrometers in thermoforming and packing machines.

During the thermoforming process, the original material is being heated up to 190°C with infrared emitters and thermally homogenised. A high homogeneity over the surface and a specific set up of the converting temperature leads

to higher quality results during reforming. A defined cool down in the cooling range closes the process.

To achieve a steady product quality of the material and avoid local combustion and crack formation, the optris PI infrared camera is used to regulate the temperature regime during the run into the machine. Pyrometers are then regulating the temperature via selected measurement points.

At a customer of Optris, the infrared thermometer optris CT LT have been setup in one line at the heating zone exit to monitor the temperature profile and visualize temperature gradients. This allows the machine operator to continuously monitor a complete temperature profile covering all used product lots.



Picture 1: Small optris CT LT sensing head; Heads installed in a machinery with laminar air purge collars for temperature monitoring during thermoforming

Surface finishing at embossing calender

During this application, plastic bulk is being extruded with wide slot extruders into a strap and then calandered to the wanted gauge by cooled and heated calender rolls. The surface (texture) is brought in via the embossing calender.

The original material is heated up to 190°C with a basic temperature within an infrared radiator and homogenised. The material is then transported to the heated embossing calender where it receives a product specific structure. A defined cool down in the cooling range closes the process.



Picture 2: Permanent temperature monitoring at an embossing calender, supported by the infrared thermometer optris CT LT

A constant and consistent temperature profile with variances below 5K over the range will be necessary during the embossing process, to obtain a constant thickness, homogenous graduation and the depth of the structure. To monitor the temperature profile during embossing



Picture 3: Infrared thermometer optris CT LT

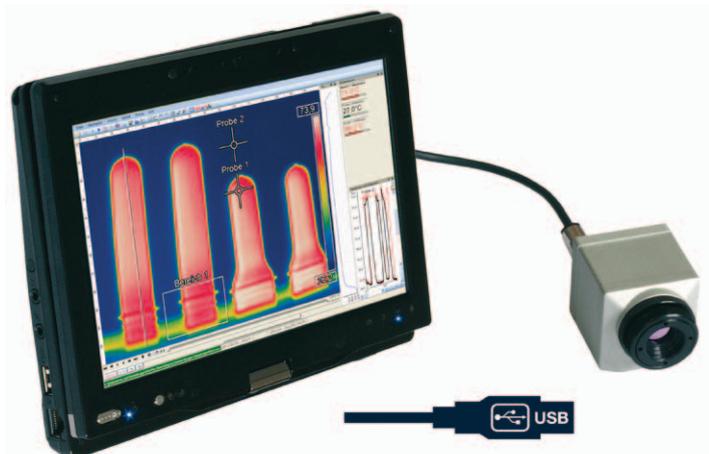
processes, some processors use up to 16 pyrometers optris CT LT measuring in single points which are installed across the moving direction. The temperature measurement merits are visualised at the Siemens PLC (S7). Therefore, it is possible to use the temperature merits for process monitoring and lodge the important process parameter according to the lots into the PLC.

Injection moulding – Reduction of distortion

During the production of injection moulding parts, dimensional stability is of importance. During the injection moulding process the plastic melting is injected with pressure into the tempered tool. The outer skin of the produced component is already set when it is separated. It stabilises the component, as the middle of the component is mostly still liquid and the saved heat slowly gets to the outside. If too much heat is saved in the component during separation, distortion can take place. The result: The dimensions do not fit any longer.

The optris PI thermal imager contributes to the optimisation of the tool temperature via the heating and cooling systems. A 120 Hz online monitoring can detect the maximum component temperature after separation. Reaction to temperature changes can therefore take place. The closing time needs to be raised if the temperature is above the specifications; if the temperature is below the specifications, the closing time needs to be shortened.

Until now, only samples of the temperature were taken and longer closing times set up precautionally - a huge waste of capacities. The optris PI infrared camera comes in handy for the production of injection moulding parts. The camera monitors the temperature of the production without disruption and without contacting the parts. The productivity increases as more components can be produced at the same time.



Picture 4: Small and fast infrared camera – mobile or stationary used - to detect weaknesses at injection moulds