



Shortage production considerably reduced with thermal imager optris PI

Jacob Composites optimises its pilot production of automotive exterior parts by using the optris PI thermal imager. Constant temperature profiles throughout the thermoforming process are securing a high quality and also strengthen the bonds with the customer.

The Jacob Plastics Group combines different areas and companies. Each of them looking back on many years of experiences. The corporate division Jacob Composite deals with the processing of fibre-reinforced, thermoplastic composite materials such as for the automobile industry. Jacob offers everything from one single source – starting with the construction right up to patented solutions including the production.

A well-known automobile manufacturer has commissioned Jacob Composite in 2010 with the production of lightweight construction trim parts (automotive exterior). The pilot production is currently ongoing.

The sheets, which are required for the thermoforming process, consist of a thickness between 3.3 and 3.7 mm and are reinforced with fibreglass. Before being modelled into perfect trim parts, the plastic sheets need to be heated. This process takes place through upper and under heating's in a radiator field of the thermoforming machine.

After the heating process, the fibre-reinforced sheets are pressed into the form of the trim parts and are being cooled down. The handling time between heating and reshaping is thereby minimised.



Picture 1: Heating field consisting of emitters, arranged in columns and rows. One heating field has been removed for the field of view of the camera

Functional groups (such as air inlet nozzles) are formed onto the body during the reshaping process. In the next step, the trim part is cut by a laser and brought into shape before being dispatched to the customer for the final fitting.

Process optimization is the main aim of the pilot production at Jacob Composite. This also includes the securing of a stable series production, an optimised cycle time as well as a minimal shortage production.

During the pilot production, occasional burning of the trim parts took place due to too high temperatures, but also wrinkling due to a too low temperature profile. The greatest challenge during the whole process was a constant temperature monitoring for adjustment and readjustment of the heater.

Michael Northington, Process Developer R&D at Jacob Plastics GmbH reports:

“The initial use of pyrometers at each side proved to be inefficient due to varying temperatures across the whole material tailoring. I also considered lining up all the pyrometers. But it has been very difficult to reach an average temperature.”

The optris PI thermal imager proved to be the perfect solution. Due to an extensive temperature measurement across the majority of the fibre-



Picture 3 : Thermal imager optris PI operated via USB from a tablet-PC

Technical data of optris PI

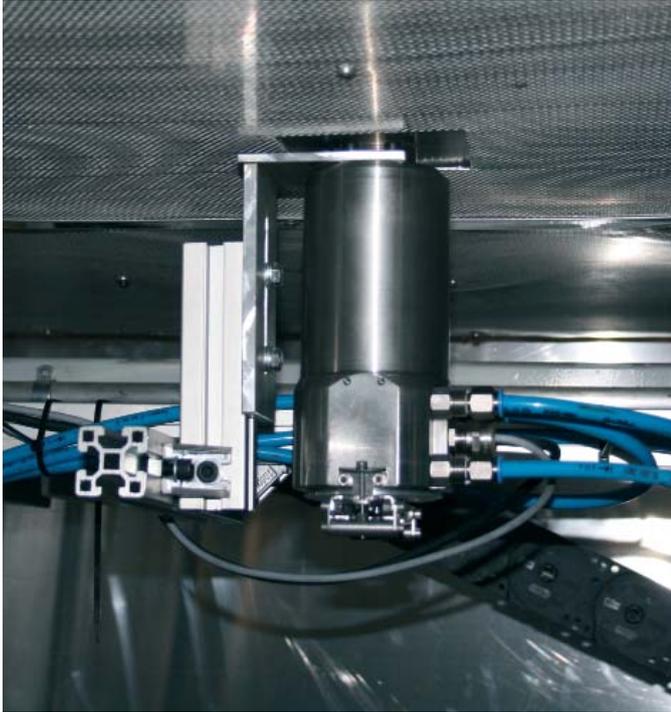
- Temperature range between -20°C...900°C
- 160 x 120 pixel and exchangeable lenses (23°, 6°, 48° HFOV)
- Thermal images in real time with 120 Hz (images per second)
- IP67 / NEMA-4 and industrial accessory
- Process interface (PIF), e.g. as trigger gateway
- Cost-free, extensive software for video and snapshot functions incl. COM-Port, DLL and Labview interface



Picture 2 : A deep-drawing machine of Kiefel is used at Jacob Composite for the production of the trimparts

reinforced sheet, single values such as cold spots and hot spots or average values and temperature profiles can be indicated for the whole surface.

An optris PI thermal imager with a 64° wideangle lens is installed at the upper and under heating's of the radiator field. To cover an area of 400 x 300 mm of the fibre-reinforced sheet, the camera is installed within a distance of 300 or 350 mm. The front of the camera was exposed to surrounding temperatures of up to 350°C due to the closeness to the heating



Picture 4: Thermal imager optris PI, water cooled within an industrial protective housing, to be used for temperatures up to 315°C

system – too hot for the optris PI without additional protection. To solve this problem, the thermal imager was placed into a cooling jacket with water cooling as well as fitted with decoupled brass in front of the housing (reflection of heat radiation). A constant surrounding temperature of the camera of 35 – 40 °C could be ensured. The software optris PI Connect is used to monitor the inside temperature of the camera and ensures that the maximum temperature of the optris PI of 50°C is not overrun.

Data evaluation and guidance by self programmed software

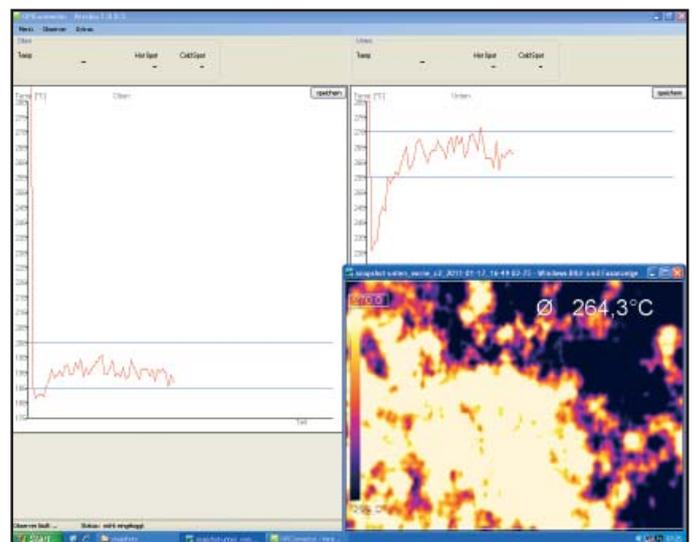
The evaluation of the temperature data takes place via the optris PI Connect software. The optris PI Connect is an extensive infrared camera software for the user, analysing and documenting temperatures and controlling the processes automatically. The software guarantees video and snapshot functions with up to 120 Hz and consists of a high degree of individualisation covering customer specific adjustments.

At Jacob Composite that data transfer is realised via a COM-Port interface into a self developed

user interface. The software has been developed by the company novo.design (Neustadt/Aisch) for Jacob Composite. The software is searching for new snapshots of both cameras within defined time frames. At the same time, both temperature values are selected and saved. The most important information are displayed into a temperature diagram. An in time alarming takes place if the temperature window is undershot or overrun. To ensure this, a temperature maximum and minimum limit has been defined upfront.

“To ease the work at the machine, the alarm appears in a pop-up-window with an appropriate instruction for the responsible machine operator. Thereby we can secure a perfect response at the machine.” informs Michael Northington.

The cameras are connected with the PC through an USB interface. An additional interface at the camera is the Process Interface (PIF) through which external trigger signals can be sent to the camera. Snapshots can be released by the trigger interface through a voltage signal. The signal needed is coming from the machine control. The latest snapshots of the single plastic sheets are shown in a display history and are saved for the documentation of the process.



Picture 5: User interface of Jacob Composite. The data transfer of the cameras software takes place via a COM-Port interface



Picture 6: Mr. Northington (Jacob Plastics GmbH) and Mr. Theilacker (Optris GmbH) during the set up of the camera and software

Ideal cycle time, reduced defective goods

The optimisation of the pilot production through a reliable temperature monitoring for the adjustment and readjustment of the heating emitter is a clear advantage of the optris PI thermal imager for Jacob Composite. Due to the use of the optris PI during the upcoming serial production of the trim parts, ideal cycle times of currently 65 seconds will emerge, based on a maximum possible heat output. Thereby the output quantity and productivity will increase.

“The shortage production has been reduced through the constant temperature profile hitherto.” explains Michael Northington, pleased about the improvement.

Advantages at a glance!

- Display of temperature profile across plastic sheet
- Simple readjustment of radiant heater temperatures
- Reduction of cycle time
- Realisation of highest possible workload of machine and output
- Reduction of shortage production
- Guarantee of high quality for customer satisfaction and retention

The greatest advantage for Jacob Composite is the securing of a high quality. The high quality demands of the customers can be fulfilled with the ideal heating temperature setting and hence customer retention takes place as well as an increase of the quantity of orders.

Reliability of Optris products convinced

“The decision at Jacob Composite for the optris PI was apparent. As pyrometers has already been successfully used for bending processes in bending machines, the fallback to the reliable devices of Optris GmbH for the new serial productions seemed sensible.”, informs Andreas Theilacker, Regional Sales Manager of Optris GmbH. “Beneficial has also been the wide product range of infrared measurement devices, accessory and software offers.”

Optris not only offers industrial thermal imager solutions (IP 67 also at industrial plugs), but also important components such as cooling jackets or simple integrations to the machines via an USB interface. The royalty-free, extensive camera software and the free usage of the different software interfaces (COM-Port, DLL, LabView) to pass on relevant datas to the user software have mainly influenced the decision to use the optris PI thermal imager.

Jacob Composite also wants to rely on Optris products in the future. The purchase of an additional optris PI for the mobile use within the company is already planned for this year.

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