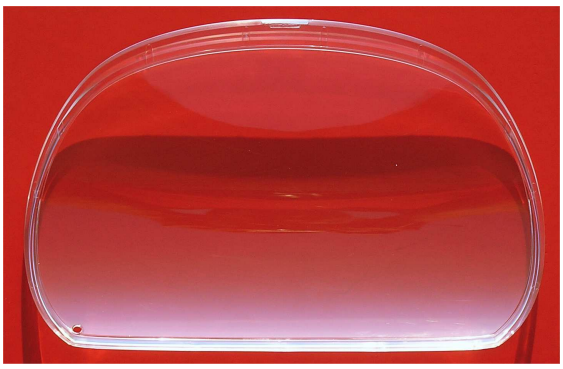
Inspection system OPAL for large transparent parts

Field of application

Large transparent plastic parts such as speedometer or headlight covers in the automotive sector demand especially high requisites on production quality. Due to the close viewing distance, also, smallest production faults are quickly detected by end customers. This effect is even intensified by variable background lighting.

Because of the large part dimensions, even smallest fluctuations in production quality (e.g. due to material impurities) lead to drastically increasing rejection rates, necessitating quick counteraction.

Consequently, production faults must be reliably recognized and consistently sorted out. Permanent faults should be detected as quickly as possible to minimize reject rates.



Speedometer covers are 100-percent inspected.

The OPAL inspection system inspects large transparent parts fully automatically for typical injection mold cleaning and surface faults. The system is part of a production chain, is fully automatically fed with parts and is applied, for instance, immediately after the parts unloading unit at the injection molding machine or after coating processes.

If contaminating production processes are involved (e.g. cutting off sprues or longer-lasting buffering sequences of parts under production conditions), cleaning of parts is recommended, which may be integrated in the inspection system or performed in a separate cleaning station. Inspecting parts cleaned in this way avoids the detection of pseudo-faults caused by adherent dirt.

On basis of the test signal, reject parts are directly sorted out and good parts are re-fed into the process or packed. The inspection is made as a 100-percent final inspection. Various statistical evaluations on faults types, export of inspection results to an existing data recording system provided by the customer, attribution to individual parts numbers, and inspection data archiving are feasible.

Automatic inspection of transparent parts with OPAL.

Preconditions for deployment

The inspection system is suitable for production lines with fully automatic handling in application fields like telecommunications, automotive, and medicine. The inspection system runs especially economically where products are produced in continuous operations.

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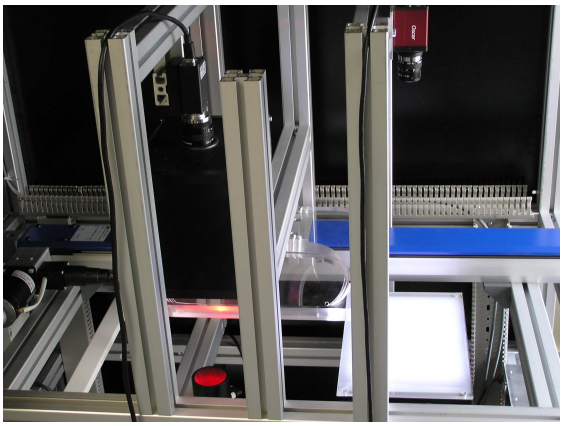
Components of the inspection system

The inspection system consists of image acquisition and evaluation components. The image acquisition unit contains optical sensor heads and the respective lighting and traversing units. An integrated linear axis drive moves the jig from the loading station to the inspecting positions.



An inspection cycle with variable lighting situations enables positive recognizing of all types of faults.

An integrated evaluating computer with user and machine interfaces controls the entire inspection system. System parameters can be modified, test results can be monitored per cavity, and external control signals can be exchanged.

The equipment works under normal ambient conditions. Changes in ambient lighting are eliminated by enclosing the sensor heads at the image acquisition unit.

Inspection procedure

Parts are picked up from the input station and successively brought into test positions by an integrated linear axis drive. There, the transparent parts are scanned under appropriate lighting conditions. All necessary controls are integrated.

After completing the inspection process, inspection results are displayed at the user monitor and transmitted via a control interface to the handling system in order to initiate eliminating of defective parts.

The inspection cycle time for speedometer covers in standard version amounts to approx. 15 seconds per part.

Typical faults for optical inspection

The following types of faults can reliably be automatically recognized and are relevant for the testing of transparent parts:

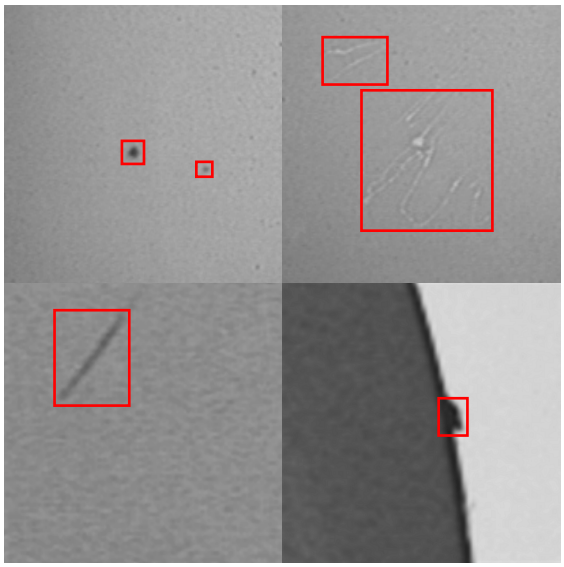
Transparent areas:

- Black spots and inclusions
- Dust marks and streaks
- Scratches and marks
- Dimensional errors
- Coating defects

Decor areas:

- Misprints (e. g. in tampon printing)
- Foil defects (e.g. in IMD)
- Cleaning faults, flakes (e.g. in IMD)

If any defect is recognized, a control signal is generated to sort out the part. In case of a repetitive fault, an operator call can be released. In addition, cavity-related statistical acquisition of faults provides indications for possible optimization in the production.



Types of faults in transparent parts inspection.

Avoiding faults instead of just detecting them

Close-to-process automatic fault detection not only saves inspecting costs, but also reduces fault rates, since causes for rejects in the process are signaled immediately and therefore, can be eliminated promptly.