No defect goes unnoticed
Technologists at OCS have developed the ‘Close Loop’ process for more efficiency in the surveillance of film processing and extrusion lines.

In an extrusion or converting process, a web inspection system can help in identifying the ideal raw material or the best material combinations,” explains Oliver Hissmann, sales manager at OCS Service, which is based in Witten, Germany. “A sophisticated offline analysis software then adds up all finished rolls, which originate from a certain raw material batch, to a single roll and thus determines, for example, the degree of gel formation.

Gels or so-called fish eyes are small irregularities on a film, which are characterised by their size (surface in transmitted light) and their overlap above the film surface. Up to a certain degree gels are therefore an inherent film property. “There is no ISO or DIN standard for the definition of gels or fish eyes or for the purpose of their measurement," says Hissmann.

“Nonetheless, film producers try to measure the gel level by means of inspection systems. They want to minimise the number of gels and their corresponding size in such a way that the fish eyes do not pose any more problems for the respective film production process and the intended final application. Here, our ‘Close Loop’ concept offers an interesting approach.”

Online quality assurance
Take an offline laboratory and transplant it directly into the production process of the pellets. This is the best way to describe the idea behind the ‘Close Loop’ process. Until recently it took up to 10 hours until the producer received the results from the laboratory and was able to reliably estimate his current production quality.

In case of pollution, this temporal aspect has a crucial meaning. Furthermore, the fully-integrated automation in combination with encapsulation under cleanroom conditions eliminates any outside influence on the measurement. Thus, the contact with higher air humidity values outside the production process ceases no longer have any negative effects. “Within the ‘Close Loop’ concept, small samples are constantly removed from the pellet stream and guided on automatically to the immediate analysis at different measuring devices," continues the OCS expert.

“This online quality assurance is connected to a computer, which determines the process parameters and sends a direct feedback to the process control. With this method one can expect a return on investment within less than a year.”

In principle the online quality control can be divided into two aspects: measurements within the pellet stream and surveillance of the extruded films in a cast or blown film process. The online measurement of the pellets collects information about the LAB colour values and yellow...
values as well as dust and irregularities by means of pellet scan systems. Information about the form and curvature is also collected by means of pellet size measurements and form distribution systems.

The online measurement of the extruded films in a cast or blown film process, on the other hand, delivers data about gel contamination, specks or fish eyes (the so-called 'gel count'). Infrared spectroscopy is used to determine data about the additive content and physical properties (including gloss and haze values).

The advantages of the online measurement do not only have repercussions on the process itself but also on the raw material and the final product. The direct feedback into the process guarantees that pollution, which may appear within few minutes and then disappear just as quickly again after a silo change, may be discovered and removed.

The degree of gel pollution also provides information about the influence of different processes within a production environment. Furthermore, cleaning intervals can be better anticipated and standstill times are more predictable. The necessary setup times are also reported to have been optimised with the OCS solution, which is also expected to produce less waste materials.

"Online measurement with frequent sample extractions enables us to rate the raw material and eliminate low quality materials at an early stage," adds Hissmann. "Consequently, our customers can work with better materials, receive fewer complaints and produce higher quality products overall. At the extrusion or converting process we can further optimise the production, or reduce waste by installing inspection systems with alarm functions."

Intelligent system

"A system should be intelligent enough to 'learn' new defects which might appear in the future," emphasises Hissmann. "It is becoming increasingly important for the manufacturers to identify and classify the type of defect immediately. Even the origin of the defect needs to be identified so that wastes can be avoided and the process be improved."

About 20% of all defects arise inside the extrusion line; the raw material is responsible for about 25% of all errors. Of the remaining 55%, about 15% originate from the film converting process and 40% on the pellet transport. For example, screen or temperature changes may lead to the formation of gels or specks. Within the extrusion line errors within the screw geometry are a frequent source of problems that may cause fissures in the material.

"Online inspection systems are becoming increasingly important on the extrusion and converting markets," concludes Hissmann. "The requirements in regards to the necessary resolution, however, may differ significantly and will become even higher in the future." For this reason, raw material suppliers, converters and end customers have to work together even closer in order to be successful on the markets and generate true competitive advantages."
RAW MATERIAL INSPECTION

Complete Extrusion Lines
- Cast-and Blow Film
- Measuring Extruder - ME
- Chill Roll - CR9
- Winder Unit - WU9
- Pellet Transport System - PTS

Contamination, discoloration, size and shape distribution
- Pellet Analysis
  - PS25C
  - PS400C
  - PA66
  - PSSD
- Powder Analysis
  - PT2C
- Injected Plate Analysis
  - MPA
- Film Analysis
  - FSA100
  - FTA100
  - Tape Test & Calender equipment, Nip/Spike Test

WEB INSPECTION SYSTEM

Wide Web Inspection System
- FSP 600

100% surface control of films during production process for film speeds up to 1000m/min and a resolution from 25µm

Detectable defects
- Gels
- Fish eyes
- Wrinkles
- Coating voids
- Oil stains
- Contaminations
- Die lines
- Black specks
- Holes
- Scratches
- Water drops
- Insects
- Bubbles
- Craters

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