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The Encoder Experts

Quality control

Speed measurement during optoelectronic quality control

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High protection class IP67
Long service life, even at high loads
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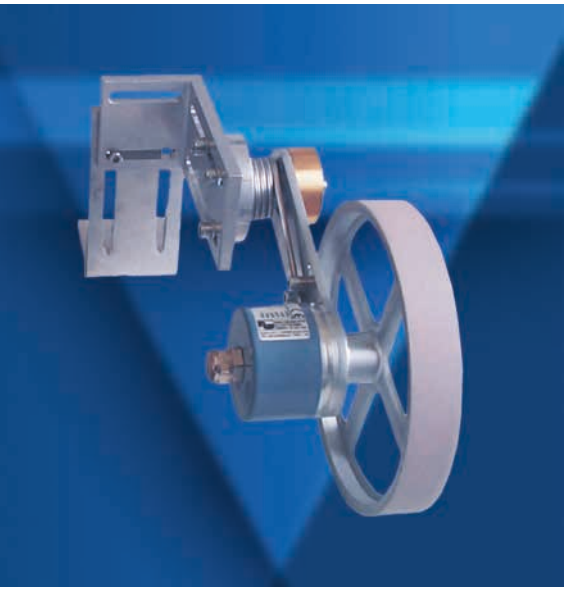

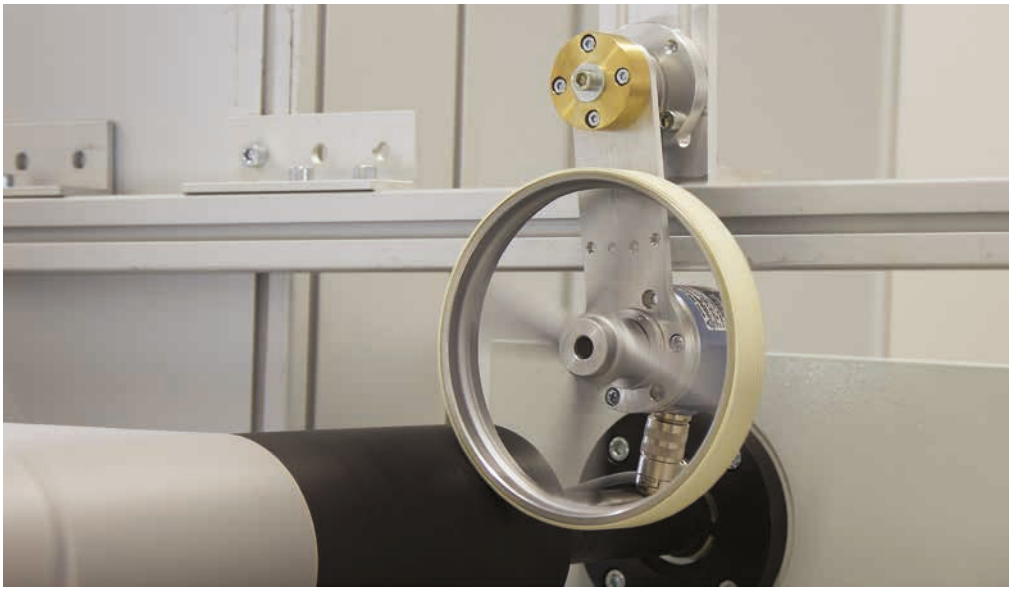

Speed measurement during optoelectronic quality control

Products made from plastic constitute an essential part of everyday life in a modern industrial nation. It would be hard to imagine many areas of life without them, and in many other cases polymers offer a tough, low-priced alternative to impractical materials.
Particularly high quality standards are often demanded of plexiglass, food packaging, blood plasma bags, and especially of plastic films and other web materials - where the usability can often be controlled only with a lot of time and effort. But many factors can interfere with the quality of a product. Material that has not completely fused, foreign bodies such as insects, wear & tear in the machine, or just everyday defects such as thin spots or black specks can lower the value of the manufactured web material or cause the production of scrap. This means that quality control actually undertaken during manufacturing is an important step in the production of plastics. Only in this way can appropriate action be taken at the appropriate place and the quality of the finished product kept uniformly high.

Application diversity in optoelectronic quality control
OCS – Optical Control Systems – a company based in Witten an der Ruhr, Germany, specialises in the production and sale of optical control systems for web materials. They supply plastics manufacturers worldwide. OCS are particularly proud of their own solutions concerning wide web inspection for a broad range of materials. Here a number of linescan cameras, working in parallel, are used to guarantee seamless optoelectronic monitoring of the total width of the web.
OCS caters as far as possible for individual customer requirements and thus is able to supply solutions perfectly tailored to the application in question, ready for installation onto the production lanes.
Important features of the control software developed in-house by OCS include fault analysis in real-time, so that production can be impacted as quickly as possible, the classification of individual faults into various categories, (e.g. insects, holes, fisheyes, black specs) but also the creation of error logs that permit later analysis, for example in the form of weekly statistics. These give rise to further possibilities; the systems from OCS permit the monitoring of the defect density, offer a trend display, automatic defect indication, a statement concerning the distribution of the defects across the web and a graphic defect viewer.

Detection of the web speed is extremely important
Exact information regarding the speed of the web material that is to be controlled, directly at the point of measurement, is of particular importance when it comes to the error-free functioning of all these features and the correct evaluation of the data collected by the line-scan camera. This is especially so, as the speed is not always the same. The plastic film lanes can run at up to 400 metres per minute beneath the control systems. When the machine is being started up or stopped the feed rate changes, different materials are processed at different speeds and external interventions can also affect the speed of the web.
Originally OCS had designed its first control systems for use in controlled laboratory environments. Here a simple sensor with just two pulses per revolution was perfectly adequate to collect the correct values for the speed of the web. However when used in harsh industrial environments then other factors play a role including for example: motors in the vicinity, power lines in a workshop and not least the large production machines themselves – it is impossible to count all the sources of error that can interfere with the data acquisition of a simple sensor.
However as soon as the web speed can no longer be accurately measured, then the ingenious OCS software is of no avail, as defects in the material are no longer correctly detected, but are registered as too large or too small depending on the deviation error in the speed measurement.

High degree of protection required

The solution to this problem is quite simple: an encoder is mounted to a guide roller, directly in front of the point of measurement; this immediately provides more accurate data than a sensor and is in addition shielded against noise interference present in an industrial environment. The encoder in question is manufactured by the Wachendorff company, based in Geisenheim in the Rheingau. The high IP67 protection rating ensures that the encoder used, type WDG58B, will continue to function even under adverse conditions. The protection rating at the shaft is only IP65 - however this can be compensated for by using a shaft seal. The permitted working temperature covers a range from –20 °C to 80 °C.
OCS uses incremental encoders with 60 pulses per revolution. However the WDG58B encoders can be supplied with an accuracy of up to 25,000 pulses per revolution.

Long service life, even at high loads

The permissible shaft loads on the encoder are a maximum of 220 N radial and 120 N axial. The encoder comes with two double precision backlash-free bearings. The service life is 109 revolutions at 100 % of full rated shaft load and is extended to 1010 revolutions at only 20 % bearing load. The maximum operating speed is 8,000 revolutions per minute.
The infrared LED has a life of around 100,000 hours. For instances where this period of time might be exceeded, the WDG 58 encoder is equipped with an early-warning output. This triggers a warning signal, if the intensity of the diode falls below 10% of the original value, i.e. before it fails completely. However the encoder will continue to function correctly for at least another 5,000 hours, so can be replaced without problem during normal scheduled maintenance.

Simple installation – a well coordinated system

As a rule the encoder is connected via a radial connector. If for reasons of space this is not possible, then the encoder can be supplied with a cable outlet. Wachendorff encoders can be supplied with a cable length of up to 100 metres, which is easily sufficient even for the largest production facilities, as the speed is always determined in the immediate vicinity to the measuring point. The WDG58B encoder has a diameter of 58 mm and a length of 42 mm. The shaft has a diameter of 10 mm and a length of 20 mm.
Wachendorff supplies its encoders complete with measuring wheels and spring levers, enabling fast installation at the site location. The prestressing force of the spring arms can be set to a choice of 20, 25 or 30 N; it does not matter which way the line is running or in which direction the system is installed – in all positions the measuring wheel on the encoder presses down on the material with the desired force.

The encoders are installed by OCS as required. If the end-user can supply accurate data concerning the speed of the web material, then this item can be omitted. However, Mendo Gusevski from OCS has learned only too well from years of experience: „We often get feedback from customers, who are not happy with the accuracy of the speed indication. In these cases we install Wachendorff encoders - this means we have precise data about the web speed and our system can then supply completely correct results.“

Image 1
A complete test arrangement at OCS

Image 2
For transparent materials they use transmitted light

Image 3
Housing with camera and electronic.

Image 4
The encoder can easily be mounted with the spring lever

Image 5
The encoder in use

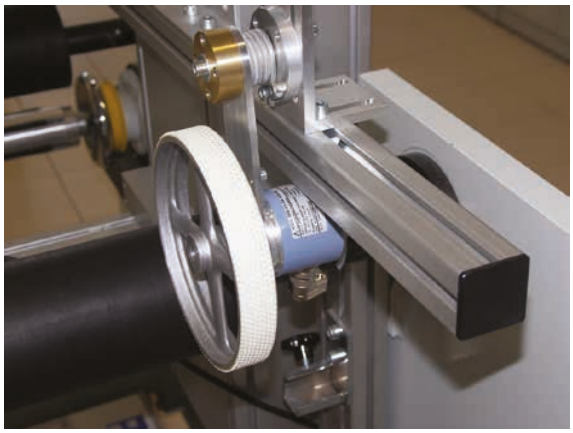

Image 6 - The encoder will be delievered completly with measuring wheel and spring lever 1

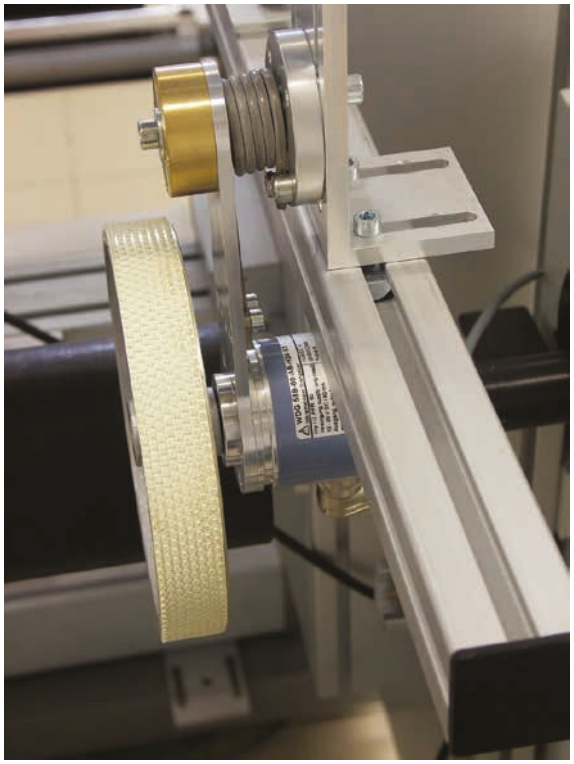

Image 7 - The encoder will be delievered completly with measuring wheel and spring lever 2

Image 8
The slots are good to see for the cameras

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