Opto-sensors survive strength tests

Certified material stability

A glance at the food industry

Detergents and disinfectants do a thorough job – though not just on the equipment used in the food and beverages industries, but also on any installed components, such as sensors. Thus the maximum possible material stability is required. JohnsonDiversey and SICK have successfully put samples of a variety of sensor series to the test.

>> The W9-2 series of photoelectric switches was the test victor. But other opto-sensors, such as safety light curtains in IP 67 protective housings, also demonstrated a high level of material stability in constant contact with alkaline, chlorine-containing and oxidative products.

JohnsonDiversey: producer and service partner for industrial cleaning and hygiene solutions

JohnsonDiversey is Europe's market leader for industrial cleaning and hygiene solutions. The company offers a consultancy service for users and plant constructors based on its comprehensive practical expertise in the food and beverages sector. Typical plants that require cyclical cleaning and disinfection include filling plants in breweries, dairies and beverage producers; meat cutting and processing machines in the meat industry; or production and packaging plants for noodles, baked goods and other food. "External cleaning, i.e. the cleaning and disinfection of exterior plant parts with highly effective detergents and disinfectants, is particularly dominant in these segments of the food and beverages industry," says Dr. Andreas John from JohnsonDiversey in Mannheim. As Manager of the Brew, Beverages & Processed Food Plant Technology Department, he and his staff support and advise end-users in these sectors, in particular, who exploit the company's products. In collaboration with the user, existing processes are examined, analysed and conceptually optimised regarding cleaning and disinfection procedures. JohnsonDiversey has its own test laboratory for this purpose, in which the stability of materials in contact with aggressive media can be tested. "Machine and plant producers who supply such sectors are increasingly contacting us," says Dr. Andreas John. "Our expertise allows them to recognise critical aspects, e.g. during material selection or construction, in good time – because we almost always know the end-customers' processes that are of relevance to material stability." Adrian Schwarz, Product Manager in the Automation Technology Division of SICK AG in Waldkirch takes up this topic: "Because photoelectric switches, light curtains and inductive sensors are important automation components in the food and beverages industries, it makes sense to subject SICK sensors that are widely used in these sector to objective, documented and straightforward strength tests."

Simulating constant use over five years

The aim of the material stability tests was to examine the behaviour of the sensors in contact with typical industrial detergents and disinfectants. The JohnsonDiversey testing method – a documented testing process that forms the basis for the stability certificates subsequently awarded – involves a complete immersion of the sensors in the particular test medium for one month. JohnsonDiversey selected the highest

Dr. Andreas John, Manager of the Brew, Beverages & Processed Food Plant Technology Department at JohnsonDiversey in Mannheim (l.) and Adrian Schwarz, Product Manager in the Automation Technology Division of SICK AG in Waldkirch (r.) carried out the test project together

concentrations of the products typically used for external cleaning and hygiene to reflect, as accurately as possible, the stress that the sensors undergo in practical use.

These included the following detergents:
- a 5% concentration of the alkaline foam detergent Diverfoam SMS HD, which contains surface-active agents and does not attack non-ferrous metals,
- the alkali, metal-chloride-containing foam detergent Oxofoam (5%), whose oxidative components have a strong action on materials, and
- the acidic foam detergent Acifoam (5%), which is mainly used wherever inorganic residues require removal.

The disinfectants used were:
- the neutral Tego 2000 (1%), based on ampholytic surface-active agents,
- the hypochlorite-containing disinfectant Divosan Hypochlorite (1%), and
- Divosan forte (1%), based on organic per-acids, which is mainly used in filling plants because of the presence of resistant micro-organisms and spore-formers.

External cleaning, i.e. the cleaning and disinfection of exterior plant parts with highly effective detergents and disinfectants, is particularly dominant in these segments of the food and beverages industry. (Photo: JohnsonDiversey)

The test period is defined as one month. "This corresponds to a service life of five years, during which cleaning and disinfection is carried out daily on 300 workdays per year, and the maximum sensor contact time with the medium is 0.5 hours per day," explains Dr. Andreas John. "In the case of the thermally unstable chlorinated and per-acid products, the immersion bath in which the sensors were placed was refreshed after two weeks. In addition, the temperature of all the immersion baths alternated between room temperature and 40 °C twice a week."

When selecting the sensors, SICK considered the devices that are particularly frequently used in the food and beverages industries, and those that are especially suitable for them as a result of their sensoric properties. "A total of about a dozen photoelectric switches and photoelectric proximity switches with differently designed connections and operating elements, one safety light curtain in an IP 67 protective housing, and cylinder sensors and inductive switches in stainless steel housings," summarised Adrian Schwarz.

Results: of assistance to machine constructors and users

When evaluating the laboratory experiments, JohnsonDiversey assessed the sensors on the basis of a variety of optical criteria, e.g. discoloration, swelling, brittleness, removal of printing, dissolution of glues, blinding of optical surfaces, and corrosion or porosity of sealing compounds. Dr. Andreas John comes to a positive conclusion after the material stability tests, writing in the final report that: "the materials used ... [are] for the most part suitable, i.e. resistant to the typical detergents and disinfectants used in external cleaning." The absolute test victor was the W9-2 series in a plastic housing, which was subject to none of the above-mentioned problems and still looked as good as new after the tests. "Most of the sensors in plastic housings, and the inductive INOX sensors, also remained largely unaffected by almost all the detergents and most of the disinfectants," summarises Adrian Schwarz. "This was also the case regarding the function tests that we subsequently carried out with the sensors. And, according to the stability tests, all the devices are capable of operating without problems after five years." The prerequisite for this, however, as also explicitly stated in the test certificates from JohnsonDiversey, is the proper use of the cleaning agent in accordance with the cleaning plan designed for the food processing equipment.

Long service life: material stability important, but not the only aspect

The background is – and this is confirmed by both Dr. Andreas John and Adrian Schwarz – the fact that a high availability and long service life is often assumed on the basis of the chemical immunity of materials, without taking practical conditions into account. "Material stability is a very important aspect, but it is not the only one," says Dr. Andreas John. "A housing seal, for example, that is immune to a per-acid disinfectant need not necessarily be capable of withstanding a pressure of 80 or 100 bar from a high-pressure cleaner." Whether the construction will withstand the use of high-pressure cleaners is tested for an enclosure rating of IP 69K in accordance with DIN 40050. This defines certain test parameters such as pressure, length of time, temperature, or the distance of a high-pressure jet to the test-piece." That almost no-one takes any notice of properly cleaning IP 69K sensors in practical use is also confirmed by Dr. Andreas John: "Rapid refitting, short cleaning cycles, going-home time is approaching – then some people may tend to get too close to the machine or increase the pressure or temperature a bit in order to achieve the desired cleaning result quicker. This may be understandable in human terms, but may also sometimes be problematic for the machine's individual components."

To sum up the material stability tests at JohnsonDiversey: SICK has numerous sensor series that have been evaluated as suitable for use in the food and beverages sector and are certified according to the test process. The selection available to machine constructors and end-customers permits the application-oriented solution of the most varied of detection tasks – and appropriate for the conditions. Whereby materials' immunity to chemicals is to be considered separately from the tightness certified by IP 69K status.

The true masters, such as the W9-2 family of photoelectric switches and other SICK series, only become apparent during the interaction of both factors.

insight*LINK*

More about the customer at:
www.johnsondiversey.com