

Thanks to the separate signal processor, the status of the sensors is always very visible and the sensor unit is optimally protected

QUICK READ

The company Armaturenwerk Hötensleben GmbH (AWH) looked for a solution for measuring the speed on all sizes of its VPureMix magnetic stirrers. Turck developed a magnetic field sensor specially for this task, which could measure the precise speed of the mixing head in the vessel through its stainless steel wall. Thanks to the two Hall probes fitted, the sensor unit also detects the rotation direction of the mixing heads. With just one sensor type AWH is thus able to increase the process safety of all VPureMix stirrers.

Double Agent

A magnetic field sensor with a dual Hall probe detects the speed and rotation direction of the mixing head in the magnetic stirrers of stainless steel components manufacturer Armaturenwerk Hötensleben GmbH

Adam Opel is a company that started out as a manufacturer of sewing machines and bicycles. After its founding in 1889, Nintendo first started out manufacturing playing cards and is now building games consoles. It is not unusual for a company to increase the complexity of its products over the course of its existence.

The Armaturenwerk Hötensleben GmbH, which is headquartered in Hötensleben in the German state of Saxony-Anhalt, has a similar varied history. The milestones of the company, stretching from 1859 to today, reflect all the stages of recent German history. The company first started as a metal foundry and since 1992 it has been manufacturing stainless steel components such as valves, fittings and connections. Cleaning technology came first in 2003 and pigging technology was added later. AWH has also been recently offering its customers magnetic stirrers in the VPureMix series. The magnetic stirrers, which have been designed for optimum process safety and sterility, are particularly used in the pharmaceutical, biotechnology and food industry. This enables users to homogenize or suspend liquid media gently and efficiently, use them for exchanging heat or balancing concentrations.

Speed sensor for magnetic stirrers

"In order to determine mixing capacity, the information we need includes the speed of the mixing head," explains AWH product manager Anja Hauße. This is



Two Hall probes are integrated in the tiny sensor housing

implemented in the sector using a speed sensor. Especially when different speeds are required within a production batch, speed measurement is needed on the stirrer. This feature is therefore an absolute necessity for most customers.

The mixing head is driven without contact by magnets – through the vessel wall. Measuring the speed through the magnetic field was an obvious approach. "We needed a sensor that can implement this since the alternatives would have been very inconvenient. We wanted a sensor that we could integrate in the stirrer and use for as many variants of the stirrer series as possible," Hauße explains the requirement more precisely.

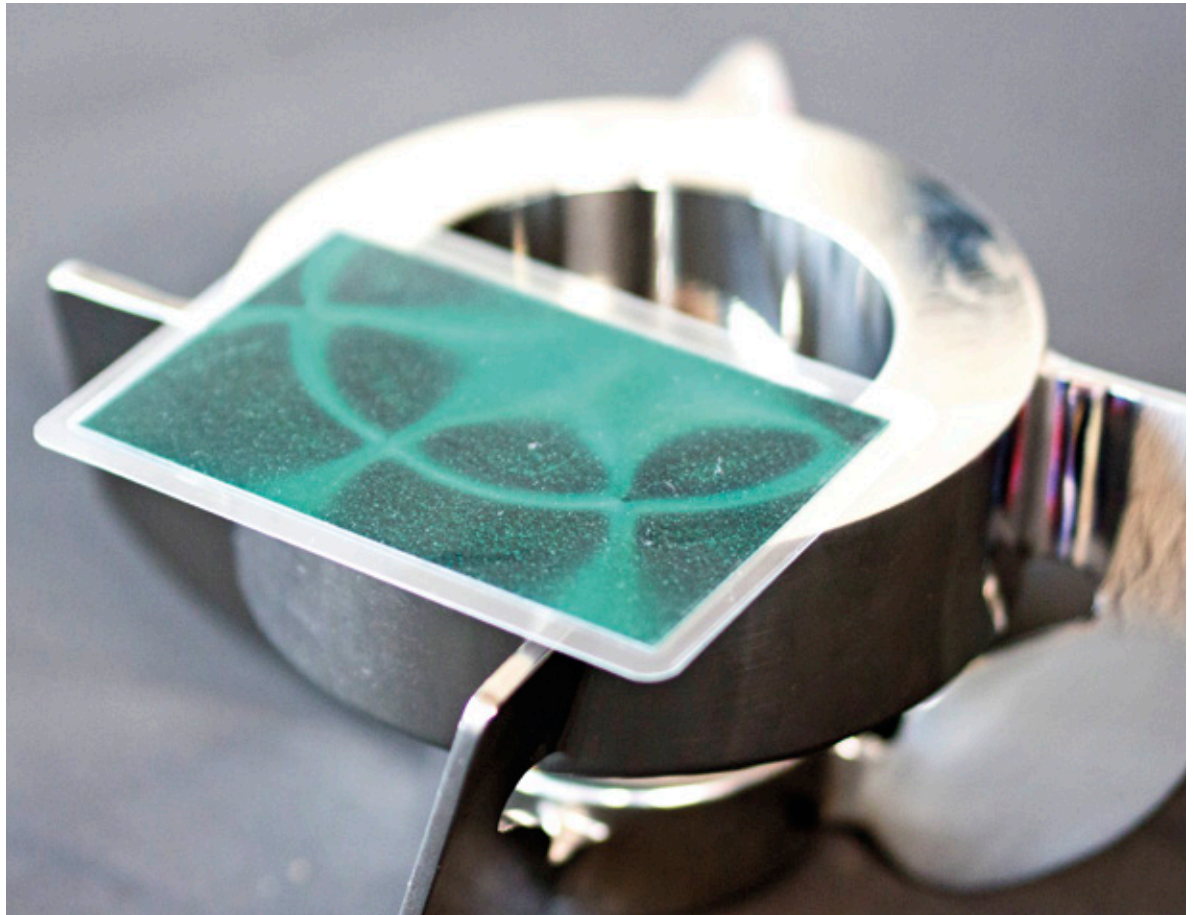
Magnetic coupling of the mixing head ensures the integrity of the vessel and the product

Permanent magnets in the drive unit build a magnetic coupling with magnets in the mixing head. This is so strong that the mixing head can be driven through the vessel wall at 490 revolutions per minute. The vessel plate must be welded into the bottom beforehand in



»The fact that we can cover all sizes with just one sensor is really useful. The software for setting the sensors is also really easy to use. A drop-down list enables me to select the relevant stirrer size. All other parameters are applied automatically via the stored data sets. Everything is done in just two to three clicks.«

Anja Hauße | Armaturenwerk Hötensleben GmbH



The magnetic field sensor foil makes the field lines of the magnets in the mixing head visible

order to mount the stirrer. Thanks to the magnetic coupling of the drive and the mixing head, the integrity of the vessel is ensured throughout in spite of the mixing process. This therefore excludes the possibility of any sterilization problems and contamination, which can occur with conventional stirrers with a shaft bushing. Only the mixing head and the ceramic bearings are in contact with the medium. They are designed and manufactured so that they can be cleaned easily without any residue.

In the search for sensors that could perform measurements through the vessel wall one off-the-peg solution soon stood out. "We asked several vendors but there was nothing on the market," Hauße continued. An individual solution therefore had to be developed. AWH therefore contacted Turck, the sensor and automation specialists, from whom they had received good support in the past.

Sensor detects speed and rotation direction

Turck developed a sensor with a separate signal processor. The actual sensor head can therefore be manufactured with a very compact design in order to integrate it at the upper edge of the mixing head support. The sensor head is provided with two active faces, so-called Hall probes, which measure the behavior of the magnetic field by an internal signal offset over time. This therefore makes it possible to not only measure the speed but also the rotation direction. The sensor is assigned parameters for a set rotation

direction. A malfunction is present if it later detects an inverted rotation direction. The LED on the processing unit is then red and the controller also indicates a warning, depending on the user setting.

Process safety through speed and rotation direction monitoring

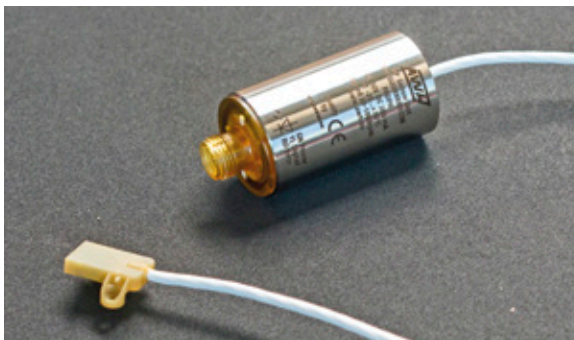
Not all customers require additional information such as the measurement of speed and rotation direction. The measurement of these two variables increases the safety of the production process in specialist sectors and hazardous plant areas. The pharmaceutical and biotech industry in particular is subject to stringent requirements with regard to the error-free recording, storing and documentation of data for every process step. An incorrect speed can quickly lead to a reduced product yield and significant financial losses. An undetected incorrect rotation direction of the mixing head endangers the magnetic stirrer itself and in explosion hazardous areas could even cause explosions due to electrostatic charge as a result of friction.

Incorrect mounting ruled out

The design of the sensor unit benefits from Turck's experience with robust IP67 products and its know-how in electronics potting. An injection molding was specially created in which the sensor head housing is manufactured from a special plastic. This plastic section is later fully potted with the electronics. The magnetic field sensors must be located permanently and precise-



The new analog modules are particularly flexible for the different types of input signal



Thanks to the shape and fully potted design, the electronics of the small sensor unit is always correctly seated

ly at a specific angle to the magnetic fields. This is firstly ensured by the potting, and secondly through the special design of the sensor unit, which can only be inserted correctly in the groove of the mixing head support. This design also prevents the sensor from moving. With other manufacturers, the position of the sensors is not fixed and can move through vibration, which then causes incorrect signals and malfunctions.

High visibility optical indicators simplify diagnostics

The separate processing unit is also made from robust stainless steel and is therefore also resistant to aggressive cleaning media. It is provided with diagnostics LEDs that ensure clearly visible indication of the sensor status. For example, if the rotation direction is incorrect, this is indicated to the operator by a red LED. Sensor head, connection lead and processing unit are suitable for continuous operation at ambient temperatures from -20 to +70 degrees Celsius. The sensor and cable can also withstand sterilization (150 degrees Celsius) for

up to an hour. Operation in the explosion hazardous area (ATEX Zone 2) is also possible.

One sensor for all magnetic stirrers

AWH manufactures VPureMix magnetic stirrers in nine sizes, which are fitted with a different number of magnets on the drive and mixing head. If the customer orders a mixer, AWH configures the sensor via IO-Link. The interface for IO-Link is nevertheless kept inaccessible for the end customer. "The fact that we can cover all sizes with just one sensor is really useful. The software for setting the sensors is also really easy to use. A drop-down list enables me to select the relevant stirrer size. All other parameters are applied automatically via the stored data sets. Everything is done in up to three clicks," Hauße explains. "Even the mounting of the sensor impressed me. The separate sensor unit cannot be damaged, and unlike those of other manufacturers, the processing unit is not made from plastic but stainless steel."

AWH customers impressed

"Customers who ordered a VPureMix magnetic stirrer for the first time were impressed by its quality and operation. Many of them are plant builders and since then prefer our magnetic stirrers. They even now recommend our magnetic stirrers to their customers in the pharmaceutical, biotechnology and food industry," says Anja Hauße.

Author | Wolfram Stahl is sales specialist at Turck

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