Tiny ceramic cell defies toughest process conditions

Christian Langensiepen *

Experiences with a new measuring transmitter for level and pressure

In Bergisch-Gladbach in Germany, M-Real Zanders produces on several paper and coating machines fine, coated papers for high-quality printing. The raw material is pulp from different kinds of woods gathered from all over the world and combined according to the required paper variety. Transmitters for level and pressure cause problems at several critical places inside the line of production equipment. This article describes the testing of a transmitter with a small, newly developed ceramic measuring cell.

Experiences with previous measurement technology

Previously used transmitters for level and pressure measurement had isolated diaphragms and metallic process diaphragms. They do work of course, but they have grown old and are no longer a match for today's production requirements. A breakdown rate of up to 10% of all applied instruments per year indicates this. The consequences are high replacement and service costs, as well as expensive machine downtime. Damage to the thin (15 ... 50 µm), vulnerable process diaphragm from pressure shocks and foreign matter or from cleaning processes is usually the cause. Also, on the present transmitters, the sensor and the electronics are one inseparable unit – it is not possible to exchange only the electronics. And the situation is aggravated by outdated technology and inadequate service. It's really no wonder, since those devices date back to around 1990.

Expensive replacement

The most common cause of instrument failure is the unavoidable buildup on the diaphragm, e.g. in the reject vat or in the vacuum area. This results in falsification of the measurement data. Since cleaning is not possible (because the sensor gets damaged in the process), the affected instrument is exchanged the next time the process is shut down. On existing paper machines, approx. 100 measuring ranges are required. A simple on-site adjustment of the measurement loop is not possible. For that reason, a painstaking test bench calibration of each replacement sensor must be carried out by specialist personnel in the instrumentation workshop.

The search for an alternative sensor

In the search for a better solution it was discovered that reputable suppliers were already offering suitable instruments for existing welded sockets and service fittings. To be sure, these instruments have exchangeable electronics and better adjustment options, but they don't solve the core problem, viz. the destruction of the metallic diaphragm. A further disadvantage is their lack of sufficient overload resistance.

That's why the decision was made to implement the new VEGABAR 54 with its small, newly developed ceramic measuring cell. As a leading manufacturer of absolutely front-flush, ceramic-capacitive pressure transmitters for the paper industry, VEGA had already offered solutions to this problem, but not for this special 1" process connection. Thanks to the new VEGABAR 54, the new technology is now available for existing welded sockets and PASVE service fittings.

Requirements on the follow-up sensor

The following requirement profile was drawn up:

- Robust, i.e. diaphragm mechanically cleanable
- Resistant to cleaning processes using acids and lyes
- Adjustment and indication directly on the sensor
- Adjustment via laptop on-site and from the control room
- Diagnostic functions for process optimization
- Quick exchange without rewiring
- Signal output 4 ... 20 mA/HART

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- Minimal stock keeping due to short delivery time
- Cost reduction due to long service life

Fig.1: VEGABAR 54 with process connection for PASVE fitting

Tests at critical measurement sites
For the test, measurement sites that are important for production and especially susceptible to failure were chosen:

- on the pulper of PM 3
- on the reject vat of PM 2

In the approx. 5 m high pulpers, 4.8 tons of cellulose is dissolved in 50 m^3 of process water at 30-40 °C. The pressure transmitter is connected on the side of the process vessel via a socket. Especially problematical are the pressure shocks caused by cellulose bales falling in and damage from wire remnants leftover from bale dewiring.

Fig.2: Measurement site on the reject vat

On the approx. 1.8 m high reject vat, the pressure transmitter is mounted via a weld-on socket and flange. A big problem here is the chalk residue in the rejected material – it deposits as a hardened plaster layer on the diaphragm of the pressure transmitter.

Experiences
The testing operation was monitored and evaluated by the control system. It was demonstrated that, compared with the previous instrument, VEGABAR 54 functioned on the pulper with greater stability and reliability. The comparable previous instrument exhibited noticeable drift and had to be repeatedly dismounted and recalibrated in the instrumentation workshop.

On the reject vat the previous transmitter failed after two weeks because of a clogged diaphragm and could not be cleaned or repaired. VEGABAR 54, on the other hand, was put back in operation after being cleaned with a fine wire brush and an acidic cleaning agent. In the trial run, the ceramic proved to be extremely resistant to abrasion. The typical pressure shocks had no influence on the measuring results.

User advantages
The results showed that the test instruments completely fulfilled all requirements and expectations. The cost savings were clearly recognized. Not only the positive experiences from the field test speak for these transmitters, but indeed also the 20,000 instruments (with the CERTEC® ceramic measuring cell) already implemented worldwide in the paper industry. VEGABAR 54 also offers the extensive functionality and reliability of the plics® concept from VEGA. As a consequence, all future defective instruments will be replaced with VEGABAR 54.

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