Cleverly regulated

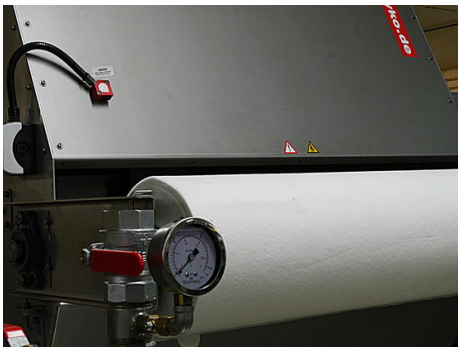
Level measurement and pump control with analog pressure sensors

Analog pressure sensors can do much more than it seems. A manufacturer of filter systems shows how such devices can be used to continuously monitor fill levels and, in this context, control speed-controlled pump drives. However, this requires sensor solutions for the smallest pressure ranges.

ISYKO Filtersysteme manufactures filter systems and components for the treatment of technical fluids. "In our case, the term 'technical liquids' is the best description, as we now have a large number of customers from a wide range of industries, such as the wood industry, metal processing, the chemical and plastics industries, the automotive industry, industrial laundries, etc.... And they all have very different media that need to be cleaned or treated," explains Volker Koczkowski, Managing Director of ISYKO Filtersysteme, which also specializes in the development of customer-specific special solutions in the field of filter technology.

Two processes for three system variants

The Wipperfürth-based company's filter systems are divided into fleece and continuous filters. While fleece is a classic consumable for the treatment of media, the fabrics of endless filters can be cleaned again and again. ISYKO Filtersysteme offers both processes as a central system, compact system or mobile system. Central systems treat technical fluids from several machines, for example, while compact systems are designed as stand-alone solutions for one machine. Mobile systems, on the other hand, can be used flexibly on different machines.



Inlet side of the filter fleece: An optical diffuse reflection sensor from ipf electronic monitors the presence of the filter fleece with a permanently present signal. If the filter fleece is used up, the signal is de-energized by the sensor and thus signals to the system's PLC (programmable logic controller) that new fleece needs to be inserted.

Continuous inquiry of the filling level

In general, all filter systems have two basins, a so-called transfer station, from which the soiling liquid is fed into the filter, and a clean tank for the cleaned medium, which is fed back into a production process from here. As there are pumps in both tanks for pumping the liquids, the fill level must be continuously inquired for their operation.

Contactless level control

There are now a plethora of solutions for level control, but they all usually come into contact with the medium to be monitored in some way. "Instead, we use both digital and analog pressure sensors as back pressure sensors to measure the fill level and control the pumps in the transfer stations and clean tanks. These devices have the advantage that they are contactless, i.e. they do not come into contact with the various soiling media we are dealing with and are therefore largely wear-free," emphasizes Koczkowski and explains the principle of level measurement in the filter systems in simple terms: "The system tanks are equipped with so-called dynamic pressure probes, comparable to a tube that is open towards the bottom of the tank and closed at the top, in which a pressure sensor is screwed in airtight. If the liquid rises in a tank and thus in the probe, a certain back pressure builds up in its upper area. This is detected by the pressure sensor and converted into a corresponding signal, which we can use to control the pump in the container, among other things."

No continuous control

With digital pressure sensors, however, it is only possible to set a switching point for a specific pressure and thus a previously defined liquid level in a container at which a pump switches on. If the liquid drops to a certain level, the pump switches off. "Continuous control of the pump and therefore permanent regulation of its delivery rate is therefore not possible. Depending on the liquid level, the pump switches off and then on again, etc.," says Koczkowski, describing a disadvantage of such devices.

Permanent pump control via analog signal

Different analog pressure sensors, more precisely the pressure sensors **DW35311A** and **DW35311M** from ipf electronic. The analog signals from these devices can be used in parallel with continuous dynamic pressure measurement and thus level determination in a tank to address the PLC (programmable logic controller) of a filter system in order to permanently control a pump drive via a frequency converter.

Volker Koczkowski comments: "With this permanent control, we achieve that the pump runs either faster or slower depending on the liquid level in a container and thus constantly adjusts its delivery rate. As a rule, the delivery rate of our pumps regulates itself to a certain level. Especially with high delivery volumes, analog pressure sensors can avoid the frequent on and off cycles that are typical of digital pressure sensors, which ultimately also mean higher wear on the pump."

The identical pressure sensors **DW35311A** (left) and **DW35331M** operate in the millibar range and therefore provide the high resolution and exact output signals required for transfer stations and clean tanks with comparatively low fill levels.

Precise measurement in the millibar range

The **DW35311A** and **DW35331M** are two compact analog pressure sensors in protection class IP65 with a sensor head made of stainless steel and a wide operating temperature range from -20° C to + 80° C. While the **DW35331A** was developed for pressures from 0 to 100 mbar, the **DW35331M** is suitable for a range from 0 to 200mbar. "We have been using these sensors from ipf electronic for our filter systems right from the start, whereby we either need the device with the smaller or larger pressure range depending on the application and container depth. As both sensor versions operate in the millibar range, they definitely provide us with the high resolution and exact output signals that we need for our transfer stations and clean tanks with comparatively low fill levels of one or two meters, for example. The measuring ranges of conventional analog pressure sensors, which range from 0 to 1 bar, for example, would be far too inaccurate for this," explains Volker Koczkowski, adding: "The choice of pump control is of course always a question of cost for the customer, as the control (unit) is more complex when using analog pressure sensors and a frequency converter is also required."

Close-up of the pressure sensor for level control above the filter fleece.

Filter system with a pressure sensor (center) for level control. Once the filter fleece has reached its absorption capacity, the liquid to be filtered builds up above the fleece. The pressure sensor reports this to the system control unit so that the soiling part of the filter is removed from the system.

The **DW35311A** (picture, below). The analog signals from this device can be used in parallel to the continuous dynamic pressure measurement and thus level determination in a tank to address the PLC (programmable logic controller) of the filter system in order to permanently control a pump drive (on the left in the picture) via a frequency converter.

Further advantages for the practice

Nevertheless, the Managing Director of ISYKO Filtersysteme also sees a number of other advantages for these sensors in practice: "With digital pressure sensors with a fixed switching point, the filters in a system are suddenly exposed to a contaminated medium, whereas with a speed-controlled pump drive via an analog pressure sensor, the pressure is applied more evenly." In the transfer stations of the filter systems, dirt deposits also form at the bottom of the tank, especially when pumps are operated cyclically and the medium to be cleaned comes to rest when the pump is switched off. "Although level control via a speed-controlled pump cannot prevent this completely, it can certainly keep the deposits within clear limits. In addition, the analog pressure sensors can not only be used for continuous pump control, but can also display and process all filling levels via the dynamic pressure and integrate them into the system control to define a wide range of operating points, such as for replenishing liquid, recording and evaluating different media levels or preventing the pump from running dry, to name just a few examples."

Volker Koczkowski, Managing Director of ISYKO Filtersysteme: "With the permanent control, we achieve that the pump constantly adjusts its delivery rate depending on the liquid level in a tank. Especially with a high delivery volume, the analog pressure sensors can avoid the frequent on and off cycles that are typical of digital pressure sensors, which ultimately also mean higher wear on the pump."