

Less wear thanks to continuous differential pressure measurement

Monitoring of membranes in water treatment

The optimised monitoring of membranes offers a clear competitive advantage: LABOM Mess- und Regeltechnik GmbH in Hude custom-developed for plant builder C-deg environmental engineering GmbH in Kiel an especially compact differential pressure transmitter that monitors membrane fouling in water treatment plants.

C-deg tested the measuring devices by LABOM with this experimental plant in Kiel. One characteristic of the Pascal CV differential pressure transmitter is its compact design.



C-deg environmental engineering GmbH, based in Kiel, has traditionally offered solutions for the environmentally sound incineration of climate-damaging gases since 2008. In 2014 the company expanded into the business of waste water treatment as well. Water that leaches from landfill sites is treated by a reverse osmosis system until it is clean enough for discharge into a natural body of water, known as the receiving water. From the very start in this new business field the company quickly saw it was confronted by new challenges: "There is intense competition in this industry," explained Jörg Delfs, who is in charge of the water treatment business at C-deg. "That is why we had to find a unique selling proposition to differentiate ourselves from our competitors." The solution was to optimize membrane cleaning by installing a differential pressure transmitter at the front of each pressure pipe. The system detects in good time when a membrane is becoming fouled and must be cleaned, and this prevents excessive wear. Furthermore, it makes it possible to pinpoint precisely in which pressure pipe there is a problem. This means that when there is a warning it saves flushing out the entire plant.

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As membrane monitoring is not an absolute necessity, merely an optimisation, low cost is a highly significant factor. During development C-deg received decisive support from LABOM, manufacturer of measuring devices based in Hude, with who they had already enjoyed a successful ongoing collaboration for over 8 years. Specifically to satisfy the needs of C-deg, LABOM developed the PASCAL CV 3300 differential pressure transmitter, a device that by virtue of its compactness is perfect for membrane monitoring and combines low unit cost with optimum performance.

Well combined

It was derived from two existing systems, but both on their own would not have fulfilled all the demands: The extremely high performance differential pressure cell of the complex differential pressure transmitter PASCAL Ci4 was combined with a stripped down readout unit. This still offers many setting possibilities, but is considerably more compact than other models. Ulf Denker, at LABOM's northern engineering office, explained how the new development came about: "A routine visit to their industrial gas plants provided the initial ideas for this project. There we first learned that they planned to enter the water treatment field. After we had thought through the specific challenges of this new business field, it soon became clear to us that a completely new solution would have to be created. The model we developed specifically for C-deg quickly proved itself in practice and we now also offer it to other customers in slightly modified versions." One outstanding feature of differential pressure transmitter PASCAL CV 3300 is its versatility with a choice of modules – with options of installing a complex display, a HART module or a switching module. If required, ex-protection is also possible. Moreover, with a turndown of 5:1 the PASCAL CV 3300 ensures a particularly high accuracy of ≤ 0.15 percent; the nominal range is between 0.4 and 40 bar.

The advantages of continuous differential pressure measurement compared to random spot checks:

- Plants suffer from fouling less often
- Membranes and pumps last significantly longer and require exchanging less often
- Fouling can be pinpointed thanks to having five individually tested pipes
- The result is savings of material and thereby costs

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Nonetheless, cost effectiveness is not nearly the only demand that the device must fulfill for its use in water treatment plants. The water to be treated is fluoride-containing landfill leachate, which typically seeps out of garbage dumps. This dark brown to black colored water is contaminated by metal and organic salts with degrees of a salinity that can be three times as high as seawater. For this reason the measuring device must also withstand the extremely corrosive and abrasive properties of the contaminated water and the electronic parts must also exhibit excellent material resistance. All parts that come into contact with the media itself, including the casing, are therefore made of robust stainless steel and provide a degree of protection of IP 66. Besides this, not only the dynamic differential pressure has an effect on the system, but also the static pressure, under which the reverse osmosis takes place – due to this pressure particles in the water are forced to move against the natural direction of osmosis and the pollutant is thus separated from clean water. On the input side this static pressure can reach 85 bar – the device must also durably withstand this load.

The reverse osmosis plant to purify water leached from landfill sites: Having five individually measured pipes enables pinpointing of any fouling, making flushing the entire plant unnecessary when there is a problem.



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Clean or replace?

To ensure the entire plant runs smoothly, it is important that all the pumps and membranes continuously function perfectly. Measuring the differential pressure at the front of each pressure pipe not only shows when the membrane is completely fouled, rather it indicates the current extent of fouling. This way it can be decided in each case whether the membrane should be cleaned or must be immediately replaced completely. When a pump is failing, it can also be easily detected by an extremely rapid fall in pressure. The remote readout of measurements and initiation of corrective steps is regulated by C-deg at their headquarters in Kiel – even when the plant itself is located elsewhere. In comparison with the formerly carried out random sampling, the system of continuous differential pressure measurement offers enormous advantages: The plants are less frequently fouled; membranes and pumps last significantly longer and need exchanging less often. When a fault occurs, where the fault has originated can be localized thanks to the five individual measurement locations. The material and cost savings so achieved by the measuring devices from LABOM provide plant builder C-deg with a unique competitive advantage.

Trouble-free operation

“After the initial successful test run in our trial plant, we installed PASCAL CV 3300 series differential pressure transmitters into our plants in April 2016 – since then we have not encountered any problems,” reported Jörg Delfs. “We also had the possibility to emblazon our company logo on the devices, which contributes a high recognition value to our plants.” LABOM is also more than satisfied with the project: “We have long regarded C-deg as a close and trusting collaborator,” explained Ulf Denker. “To develop such an individual solution is always a challenge, one that we eagerly accept.”

Author: Ralf Noormann, Area Sales Manager

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