



# Pressure and Level in Water Treatment

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Having built more than 10,000 plants all over the world serving one billion people, Degrémont has proved itself without doubt to be an expert in the field of water treatment. The company develops and builds facilities such as drinking water production installations, desalination plants, waste water treatment and sewage sludge processing plants for local communities and industries. To ensure the efficient operation of its plants, Degrémont relies on the know-how and expertise of dedicated partners and suppliers. Digital devices such as TED50 and ED752 manufactured by Baumer (Switzerland) are used for pressure measurement and level detection.



## Degrémont - an expert in water treatment

Degrémont is a subsidiary of the French water and waste disposal group Suez Environnement. Since it was founded in Paris (France) back in 1939, the company has acquired extensive expertise in water processing and treatment technologies. It is recognised all over the world as a reference in relation to the design, construction and delivery of turnkey installations. "Our main fields of expertise are waste water treatment, seawater desalination (reverse osmosis) and drinking water treatment. And of course, we also have know-how in the area of sewage sludge processing," explains Patrick Descamps, engineer and instrumentation expert based at the company headquarters in Rueil-Malmaison (France). The Degrémont teams are capable of handling all the aspects of large-scale projects: operation, process optimisation, technical assistance and maintenance of the installations. Technical experts check, validate and approve the project and plant. "Therefore, our solutions must use reliable, state-of-the-art measuring instruments that are easy to parameterize and easy to adjust to the process requirements," adds Descamps.

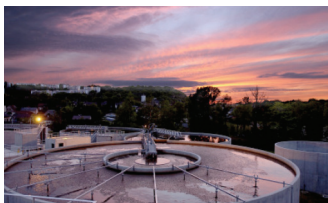


Figure 1-3: Degrémont facilities

## The advantages of digital instruments

When it comes to process instrumentation, analogue technology remains satisfactory for simple measuring or monitoring applications. For some years, Degrémont has been using Baumer's mechanical instruments for measuring pressure and temperature. However, as soon as there is a need to transmit measurement data or to ensure a high and repeatable level of accuracy, switching to digital technology is crucial. "As soon as we consider it necessary, we replace our mechanical pressure gauges, pressure and temperature switches with electronic devices, which is why we turned to Baumer. Since Baumer's mechanical instruments have been giving us full satisfaction for many years, it was natural for us to continue our cooperation with a reliable partner, capable of providing technical solutions in line with our requirements," explains Patrick Descamps. "For instance, one single electronic pressure switch is now enough to perform the operations previously carried out by three separate devices, because the pressure switch has a built-in digital pressure gauge and pressure transmitter."

## On-site programming of pressure switches with two isolated threshold outputs

The TED50 product from Baumer Process Instrumentation is a digital pressure switch with two galvanically isolated threshold outputs with a switching output of 400 mA under 60 Vdc. It measures vacuum and pressure, with pressure ranges from 0...1 to 0...400 bar for absolute pressure and from -1...0 to 0...400 bar for gauge pressure. The output signal is achieved through the 3-wire current loop. "Galvanic isolation avoids disturbances and protects the circuits, because the pressure switch power supply is electrically isolated from the signal outputs," states Gérard Demeulenaere, Product Marketing Manager at Baumer.



Figure 4: Baumer sensors

"Thanks to the integrated software, switchpoints can be adjusted in accordance with the needs of the application to open or close the two dry contacts at preset pressure values," continues Descamps. In addition, on-site programming of the instrument is child's play with the three keys on the front panel triggering value for both thresholds or for the hysteresis of each threshold, active status of the threshold, etc. Switchpoint adjustment levels range from 2 % to 98 % fullscale, and the typical response time of the outputs is 20 ms. "The high levels of performance of the TED50 with its accuracy of  $\pm 0.5$  % of fullscale with repeatability of  $\pm 0.2$  % fullscale and thermal drift of max.  $\pm 0.015$  % per  $^{\circ}\text{C}$  are particularly suited to water treatment installations," stresses Demeulenaere.

Degrémont also chose the TED50 for its high resistance to vibrations of 1.5 mm (10 Hz...55 Hz) and 20 g (55 Hz...2 kHz) according to EN 60068-2-6. "This insensitivity to vibrations, which is much higher than in the case of mechanical instruments, is an important criterion since our installations comprise pipeworks and other positive-displacement pumps," specifies Patrick Descamps. Finally, Baumer's digital pressure switch was selected because it is available with a number of pressure connections, and in particular a flush diaphragm connection, which is ideal for raw sewage applications.

The microprocessor-based TED50 comes in a robust stainless-steel housing. "In the range of TED pressure switches, we also offer models with PNP transistor outputs, Modbus 0-10V output signal, ATEX approval, or with an adjustable head over 300°," reveals Gérard Demeulenaere.

Pressure measurement devices can be found at every stage of processing in Degrémont's plants. The TED50 pressure switches are used in the sewage sludge processing facilities at the Limay and Le Havre sites, and in the drinking water treatment installations in Saint-Cloud and Apremont. "In reverse osmosis plants, which desalt sea water to turn it into drinking water, the pressure switches are mounted on diaphragm separators made of Monel or Hastelloy C materials capable of withstanding sea salt corrosion; this applies for instance to the Al Dur (Bahrain), Barka (Oman), and Barcelona (Spain) sites," adds Descamps. To date, close to 300 TED50 have been delivered and installed by Degrémont worldwide.



Figure 5: TED50

## Ultrafor process for waste water clarification

The TED50 is also used in the Ultrafor solution developed by Degrémont. In this biological process for the treatment of Urban Waste Water (UWW), the conventional clarification method is replaced with ultrafiltration. By combining biological treatment and diaphragm filtration technologies, Ultrafor makes it possible to discharge high-quality water back into sensitive natural environments or to reuse processed water. This solution is already in place in a number of cities in France and abroad; Qatar, and the Canary Islands for example.

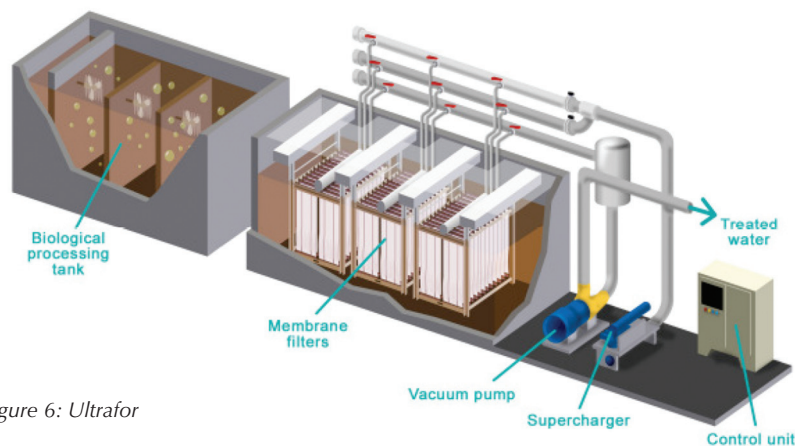


Figure 6: Ultrafor

## Hydrostatic level measurement using a pressure transmitter



Figure 7: ED752

The reliability of depth measurement devices is vital in water-related applications. Baumer's ED752 pressure transmitter is based on the principle of hydrostatic level measurement. Used as a submersible device, it allows high accuracy in depth measurement, including in raw sewage or waste water. Furthermore, the measurement is not affected by foaming, the presence of surface contaminants, or by condensation in the tank, all of which constitute a problem for ultrasonic sensors. Descamps comments: "This pressure transmitter makes up for the shortcomings of ultrasonic sensors; for instance, when a fluid drops by four metres into a pit seven metres deep, the foam forming in the process can

rise to a height of one metre." In addition, ultrasonic sensors are also more difficult to install because they must be placed away from walls. This creates a dead zone under the sensor, which may lead to erroneous readings.

The ED752 pressure transmitter contains a piezo-resistive silicon sensor which is isolated from the process by a stainless steel diaphragm and a filling liquid. The sensor is bonded on a very stable glass base, which is attached to a stainless-steel construction. This assembly guarantees excellent thermal isolation. The electronic components are located within the hermetically sealed transmitter housing, which provides the ED752 with an excellent resistance to shock and vibration. Built entirely out of stainless steel, the transmitter is also available in Hastelloy C, which allows it to resist the most aggressive fluids, such as sea water. The protection class is IP 68.

## Measurement of differential pressure variations



Figure 8: ED752 + DX display

Baumer has developed a reliable solution in order to assess the level of clogging in the filters of water basins. Based on two submersible ED752 pressure transmitters and a DX display, this system measures differential pressure variations caused by the obstruction of the filters. The two ED752 transmitters measure pressure values upstream and downstream of the filter. A DX display receives the signals from the transmitters and calculates the differential pressure which it then converts into an analogue 4...20 mA output signal. "We are interested in this solution for the maintenance of our reverse osmosis installations where the water is pumped out of the sea and contains various residues," explains Descamps.

## Looking for the most suitable technology



Figure 9: TED50 and ETTN

Other products from Baumer's portfolio may well be integrated into the water treatment processes in the near future, including the ETTN digital thermometer (a "temperature" version of the TED50), the LSK conductive level sensor, and the level switch LBFS. The latter is insensitive to deposits, which makes it highly suitable for detecting the high level in water processing plants. "To ensure the seamless operation of the facilities and their easy maintenance, we select the most effective measurement and detection instruments in terms of technology and reliability. Baumer is a supplier we can rely on," concludes Patrick Descamps.

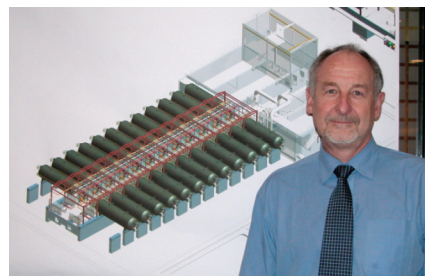


Figure 10: Patrick Descamps, engineer and instrumentation expert at Degremont

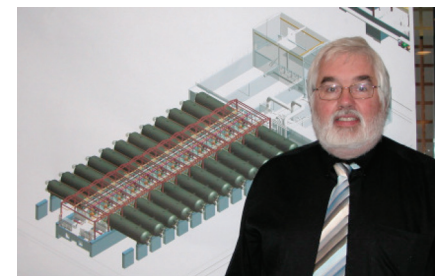


Figure 11: Gérard Demeulenaere, Product Marketing Manager at Baumer in France