



Project:

Wastewater treatment plant Bergstraße, Weinheim



ifm electronic gmbh
Sensors
in wastewater treatment technology

Why wastewater treatment?



A view which we will hopefully have for many more years.

Water evaporates from the oceans to form clouds which bring rain. The rain water which drains into the ground is pumped into towns as drinking water as well as process water.

People need water, not only for drinking but also for many other purposes. During use in the household, bathroom and WC, by trade and industry, the clean drinking water is soiled.

In order to keep streams and rivers clean, to create and maintain optimum conditions for animals and plants in and around the lakes, rivers and canals, the water we pollute has to be purified. Wastewater treatment plants carry out this purification. Wastewater treatment plants are environmental protection facilities which ensure economical purification of wastewater so that it can be released into rivers and streams, thus closing the water cycle again in the direction of the sea.

Tasks of a wastewater treatment plant

Water purification is not the only task of a modern wastewater treatment plant.

During wastewater treatment sludge is produced. Sludge consists of substances which people discharge into the wastewater treatment plant via the sewerage. Thus sludge is produced which nowadays is very difficult and expensive to dispose of in an environmentally-friendly way.



Sewage and sludge treatment are the tasks of a modern wastewater treatment plant. This can only be managed with a lot of help replacing our senses. The varied processes in such a plant are no longer possible without innovative sensors. Here the technology provided by ifm electronic gmbh creates new standards.

Raw sludge pumping station (see diagram point **1**)

In raw sludge pumping stations the pumps must be protected. Defective pumps are a high cost factor which can be minimized at any time by means of inexpensive monitoring sensors.



Flush mounted pressure sensors from ifm electronic gmbh monitor the suction side of the pumps. The sensors set to 30mbar switch at approx. 10% of the pump supply pressure. This ensures reliable switching-off if no medium is conveyed any more.

The pressure sensor type PN used for seal water monitoring protects the mechanical seals of the pumps in case of too low pressure.

The pressure side of the pumps is monitored for overpressure to protect the plant. The ifm pressure sensors switch the pumps off reliably if the pressure is exceeded.

Pumping station for digested sludge (se diagram point **2**)

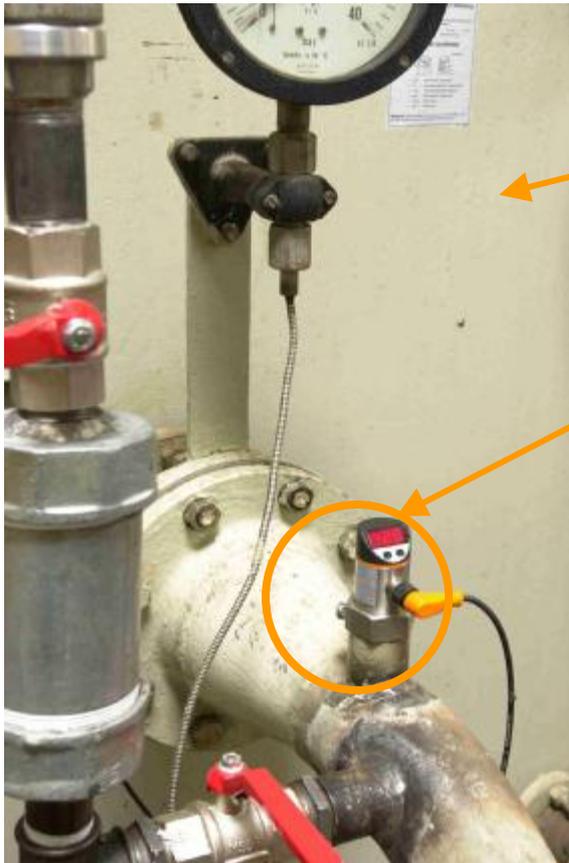
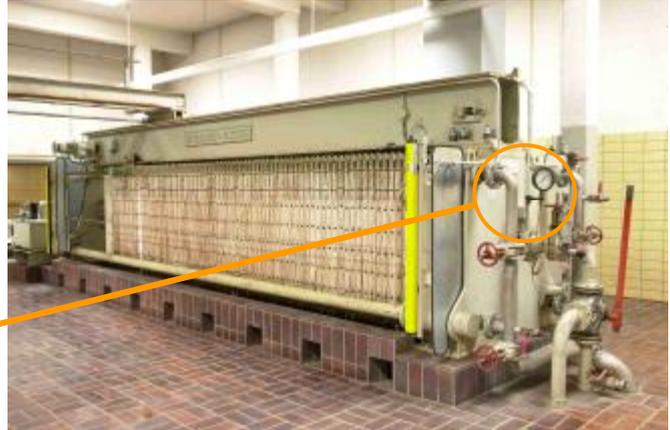


The very complex mechanical pressure switches which were connected to the contact manometers by means of oil-filled tubes, were very susceptible to damage. Here the use of modern sensors does not only have optical advantages. As the display is already integrated in the unit a manometer is no longer required. The additional analogue output allows remote recording and visualisation.

Flush mounted pressure sensors prevent deposits building up at the sensor. The integrated display is an easy aid to set-up and allows direct checking of the plant parameters. Damping, switch points, reset points, hysteresis, etc. can be adjusted by means of two push-buttons. They can be locked electronically to prevent tampering.

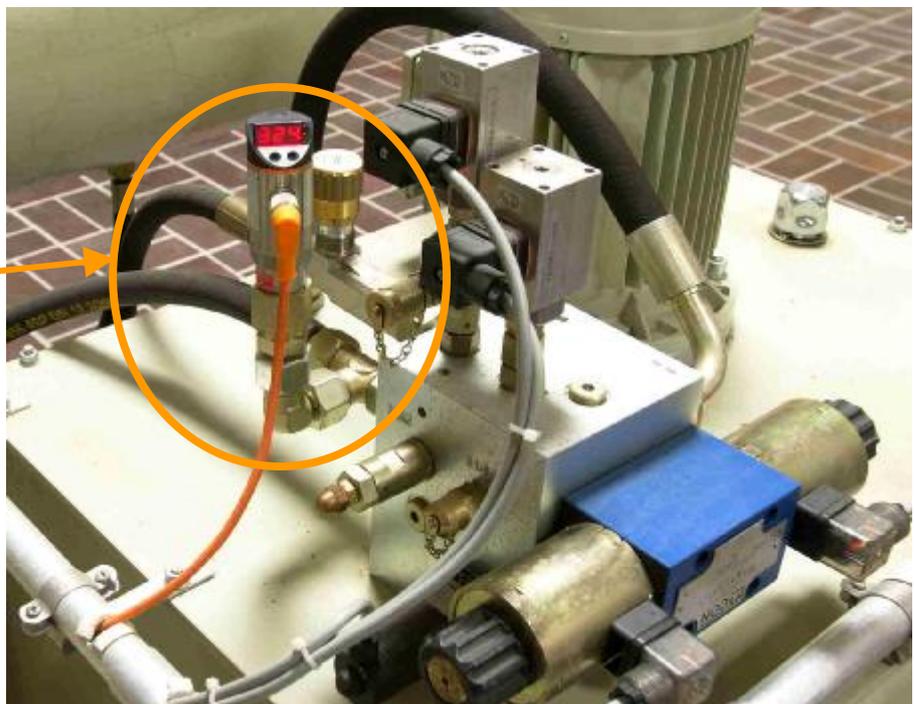
Chamber filter press (see diagram point **3**)

The chamber filter press dewateres the digested sludge in 2 hours at a pressure of 15 bar to a solids content of 32% .



The previous constellation, mechanical pressure switches and manometer, led to increased failures due to build-up of deposits. Due to the use of flush mounted ifm pressure sensors, type PF the flush-mounted membrane prevents failures caused by build-up. Time-delay relays to compensate for pressure peaks of the feed pumps are no longer necessary as this can be adjusted in the unit. The display indicates the pressure on site and the analogue signal is used to regulate the chamber filter press.

The hydraulics of the chamber filter press utilises pressures up to 380 bar. The display and the sensor are integrated in one housing and can be set directly on site.



Thickening of excess sludge (see diagram point **4**)

The increase of activated sludge due to the multiplying of the bacteria (excess sludge) is thickened mechanically and pumped into the digesters.



Various ifm sensors are used in the supply pipes of the excess sludge thickening system. Inductive proximity switches are used to monitor the limit position of slide valves. High protection rating, vibration and shock resistance as well as temperature-stable characteristics ensure trouble-free operation.



On pneumatic actuators the detection of the limit position is greatly simplified by the dual sensor IND with target puck and standardised hole spacing.

Here the AS-Interface field bus system could be used as well. The mounted valve could be controlled directly via the sensor and the wiring complexity of the whole plant could be reduced to the 2-wire flat cable of AS-i.

Emergency cooling block-type thermal power station (see diagram point **5**)

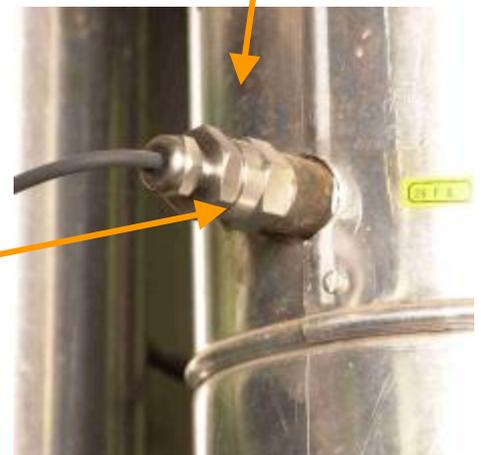
In the digesters the organic components (e.g. grease, protein and carbohydrates) are biologically degraded in enclosed tanks. During this process biogas (methane) and water are created. After intermediate storage in the gas tank the biogas is transformed into electricity and heat in the block-type thermal power station which consists of three gas motors. The electricity covers part of the plant's energy requirements.



Previously a mechanically very complex standard solution with a thermostat was used here. The setting of the seven independent thermostats could take up to 10 hours and was susceptible to very small changes. This resulted in frequent re-adjustments and constant malfunctions.

The temperature sensor from ifm electronic gmbh can replace the complete thermostat system. Either an analogue signal can be applied to a group of standard signal contacting instruments or the temperature sensor with 4 switching outputs is used to fulfill the task. Simple switch point setting, hysteresis and further features simplify the handling of the sensor.

The sensors can be mounted separately from the control monitor. Welding adapters or thermowells simplify mounting. The sensors, calibrated PT1000 probes, the setting of which can easily be carried out on the evaluation system, are connected to the control monitor by means of a cable with plug. Further applications with this solution are areas around the sludge drying, heat distribution and the digester.



Central compressor



A lot of compressed air is required for the various processes in the wastewater treatment plant. This is generated by two compressors. A mechanical pressure switch with manometer per compressor previously monitored the function. This resulted in frequent failures caused by very strong vibration. Now ifm pressure sensors are used in the wastewater treatment plant in Weinheim.

The pressure sensor monitors the compressor tank pressure of 8 bar. Full potting and pcbs in film technology enable high protection rating and high shock resistance. As an overpressure protection valve has been mounted, a TÜV approval was granted for this monitoring system. The sensor controls the motor via the set switch points and transmits the values to the control station using the analogue output.

Grit washer

In order to clean the settled sand from further organic substances it is rinsed again thoroughly in the grit washer. A booster pump system supplies the water to the grit washer. In the past it was equipped with two mechanical pressure switches.

The pressure sensor can monitor several pressures using both switch points and the respective hysteresis. Thus it already replaces two conventional pressure switches. The integrated 7-segment display enables visualisation on site and simplifies menu navigation in the sensor. The set points and reset points can be adjusted by means of two push buttons.



De-centralised pumping stations



In order to connect the many associated communities to the wastewater treatment plant de-centralised pumping stations are required as well. As there is not always staff present, trouble-free automatic operation has to be ensured. The sensors are used to carry out monitoring and regulating tasks, thus considerably increasing the efficiency of the pumping stations.

The compact flow sensor SI1000 which functions according to the calorimetric principle indicates the flow status on site by means of LEDs. The switch point can easily be set via two push buttons. If the set value is reached the output switches the connected units. Thus the energy consumption and the wear of the pumps can be reduced considerably.

Sludge drying (see diagram point **6**)



Here a PT100 was installed in a 8 mm thermowell. This solution was susceptible to mechanical damage. The wastewater treatment plant wanted to evaluate the temperature on a recording instrument in the control station. Longer lifetime and the possibility to record the data are facts which considerably increase the efficiency of the sensors in these areas. The cost-savings resulting from this are only a secondary aspect. In these times of high energy costs the sludge drying systems in many sewage treatment systems have been stopped completely.

The temperature monitor TR2430, equipped with a sensor from the TT series, is mounted in the sludge pipe with a thermowell. The analogue output enables the signal to be passed on to the recording instrument in the control station and at the same time to a display from ifm electronic gmbh which is located in the controller of the sludge drying system.

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