ifm electronic

Project:

Wastewater treatment plant Bad Reichenhall

AS-i and sensors from ifm electronic gmbh in wastewater 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 toilet, 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.

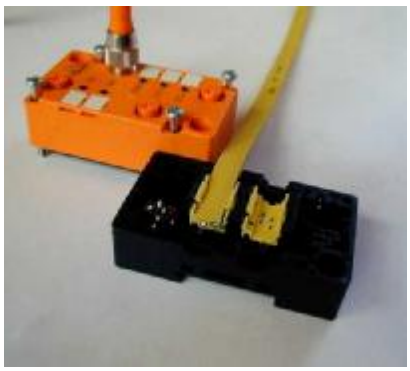
Tasks of a wastewater treatment plant

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 and control systems reducing wiring complexity. Here the technology provided by ifm electronic gmbh creates new standards.

Description of AS-interface (AS-i)

AS-interface is a control system which reduces wiring complexity and has been on the market for about 14 years now. AS-interface was developed by a consortium of companies (Festo, SIEMENS, ifm electronic, etc.) who founded the AS-interface International Association. Originally, it was only developed for the field of industrial automation. Today, AS-i is used in many different areas (process technology, conveyor technology, etc.). Most importantly, the development of AS-interface is based on the compatibility of all AS-i components regardless of who fabricated them. Moreover, the transmission of data and supply voltage to the sensors and actuators in the field via an unscreened two-wire cable is another major feature of the system.

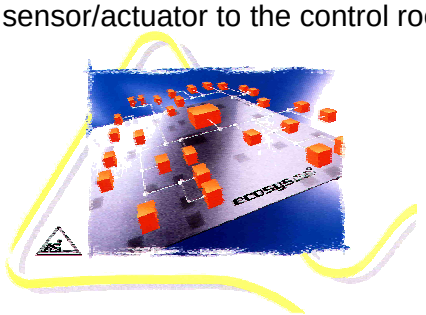


Picture 3: AS-i Classic module (2DI/2DO) with standardised module lower part for intelligent wiring technology

Picture 4: AS-i ControllerE with Profibus DP interface

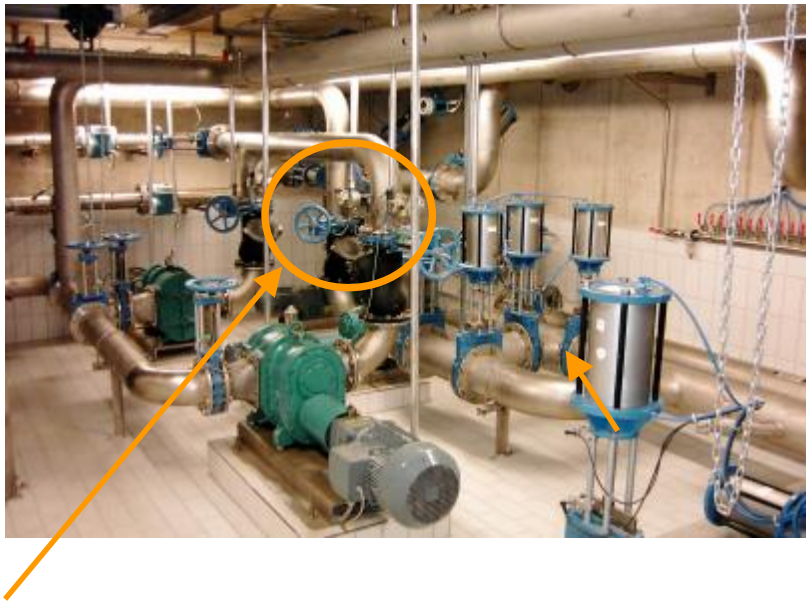
The two-wire cable can either be a standard round cable (e.g. NYM 2 x 1.5 mm^2 or NYM-J 3 x 1.5 mm^2) or a yellow profiled cable. The latter is the AS-i flat cable which is connected to the AS-i slaves via standardised flat cable lower parts by means of the insulation displacement technology (similar to the system used for chains of lights). The AS-i flat cable ensures fast and reverse polarity protected wiring – thus time and money can already be saved during the installation of the system. AS-i is controlled via a central control unit, AS-i ControllerE (with one or two AS-i masters). The masters in the AS-i ControllerE ensure the communication of the controller with the up to 62 A/B AS-i slaves (I/O modules and AS-i system solutions) per AS-i master, which are installed locally distributed in the whole system.

AS-i system solutions can for example be AS-i AirBoxes for the pneumatic control of valves and actuators, AS-i valve islands, proximity switches with integrated AS-i slaves etc. Another prerequisite of AS-i is a standardised connection of the system to other systems (e.g. Profibus DP etc.) via the AS-i controller. This enables the establishment of consistent systems from the sensor/actuator to the control room.

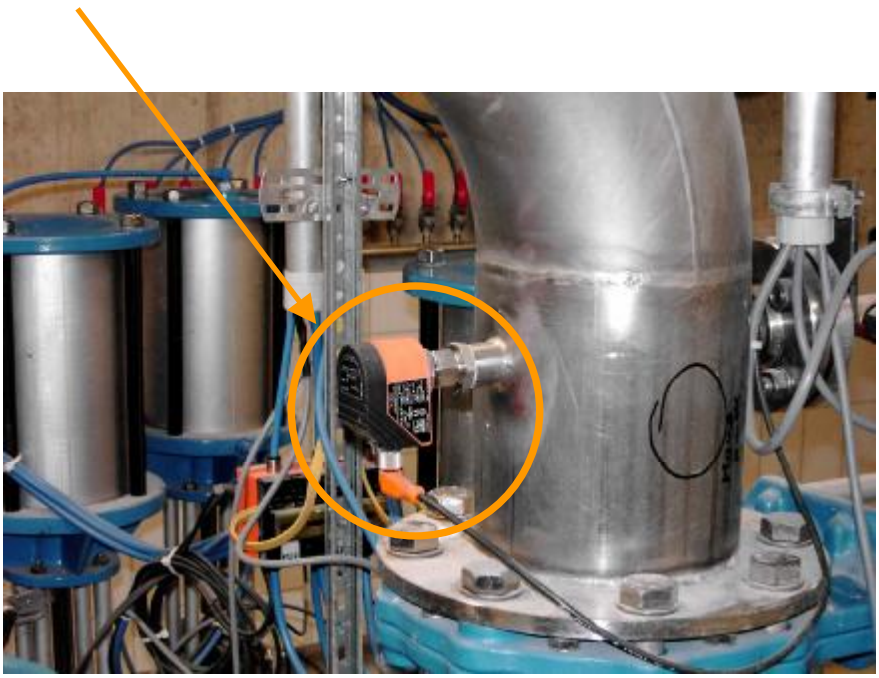


Pumping station (see diagram, 1)

In the pumping station the pumps must be protected. Defective pumps are a major cost factor which can be minimised at any time by means of inexpensive monitoring sensors.



Flow monitors, type SI, are used for run-dry protection of circulating pumps. Here, they prevent expensive repairs due to their very fast switching. The calorimetric measuring principle of the SI1000 is perfectly suited for this application. Moreover, the easy handling of the unit as regards switch point setting is also very convenient. Flow can be monitored on site by means of the chain of 11 LEDs.



Macerators (see diagram, 2)

Pressure sensors are used to provide run-dry protection for macerators for raw sludge transport. Here again, the failure of the pumps represents a high cost factor which can be minimised at any time by means of inexpensive monitoring sensors.

The pressure side of the pumps is monitored for overpressure to protect the plant. The ifm pressure sensors switch the pumps off reliably in case of overpressure. The pressure sensors type PN used for seal water monitoring protect the mechanical seals of the pumps in case of too low pressure.

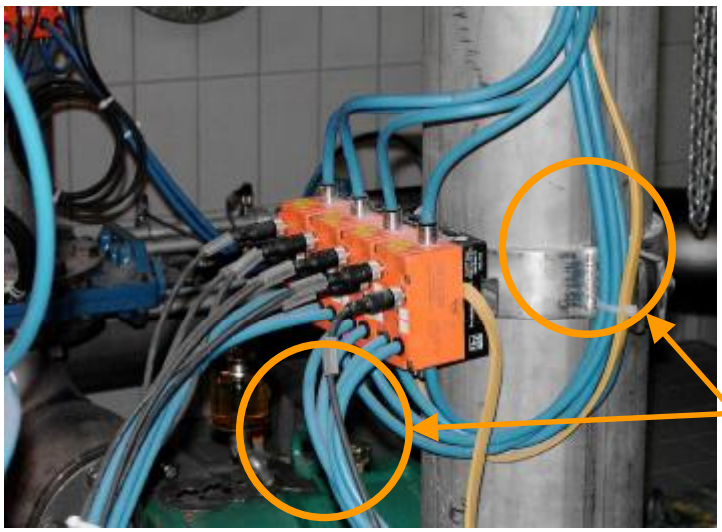
Flush-mounted pressure sensors from ifm electronic monitor the suction side of the pumps. This ensures that they are reliably switched-off if no medium is conveyed any more. Pressure transducer and pressure display are implemented on site using one process connection. The high protection rating of the units provides sufficient safety even in wet environments.

Sludge pump system (see diagram, 3)

The sludge pump system is run at a pressure of 4 to 8 bar. Pressure transducer and pressure display are implemented here using only one process connection. The ifm pressure sensor type PN3024 has a binary output as well as an analogue output. This facilitates the control of the machine. Moreover, no additional flanges for display units are required and thus excluded as sources of leakage.

A clearly visible 7-segment display facilitates the work of the user. Even if the lighting conditions are bad, the lit displays can be clearly read. Using the two operating buttons all relevant settings are made on site. Due to the menu guidance, setting of the sensor is carried out quickly and at a low cost.

Slide valve control in pumping station (see diagram, 4)



All slide valves from the company Auma are operated with compressed air in the pumping station. Due to the use of the 4/2-way valves type AC2055 (AirBox) with AS-i capability only the yellow AS-i cable and a central air supply are required. As a consequence, the compressed air pipes leading to the actuators are very short. The lower losses in the pipes result in important cost savings as regards the generation of compressed air.

The AS-i AirBoxes are screwed onto standardised lower parts into which the AS-i cable is inserted. They control the slide valves and, moreover, the end positions are transmitted to the controller via the two binary inputs. A high protection rating (IP67) and stainless-steel screws ensure reliable operation even in wet environments. With the jack plug in the standardised AS-i module lower part addressing of the modules is made easy. Thus, valuable time is saved during commissioning. Power supply and the input states are indicated by the integrated LEDs.

Inductive sensors

The inductive sensors type IGT200 from ifm electronic are used on the slide valves to monitor the end positions. A high protection of IP68/IP69K and the robust modular design make this sensor ideally suited for this application. The M12 connector with gold-plated contacts moreover facilitates handling when exchanging an actuator. Easy setting of the units is ensured by the increased sensing range of 12 mm [nf].

The connection of the sensors to the controller can be quickly and reliably established by means of prewired cables type E11409 with a length of two metres. There are two binary inputs per AS-i AirBox AC2055. The power supply for the sensors also comes from the AS-i modules. Signal processing is carried out in the controller. Here again, IP68 is guaranteed.

Binary input modules

To pick up the various binary signals and to transmit them to the controller, AS-i input modules type AC2451 are used. Here, up to four sensors with standardised M12 connectors are connected. The power supply of the connected sensors is generated from the AS-i module. Having a high protection of IP67 and stainless-steel screws this module is very well suited for this application. Power supply and input states are indicated on site by means of the integrated LEDs.

ControllerE for process control support

AS-i power supplies:

One AS-i power supply is required per AS-i line to ensure the power supply of the modules. In this application the power supply type AC1218 from ifm electronic is used. Robust rail mounting and high quality are two features of this series.

A freely programmable AS-i ControllerE (type AC1305) to IEC-61131-3 from ifm electronic can be used for signal preprocessing to relieve the higher-level controller (process control system). Due to the connection as a slave in the Profibus DP network preprocessing of binary as well as analogue I/O signals is possible in the AS-i ControllerE. Only information which is important for the process control system is transmitted by the ControllerE. All control tasks for AS-interface are assumed by the ControllerE. Information relevant for AS-i is displayed on the integrated multifunctional display. Moreover, the LEDs provide important information for the AS-i network. The AS-i ControllerE can also be used as a pure Profibus DP gateway to transmit all AS-i data to the process control system. Programming then has to be carried out in the process control system.

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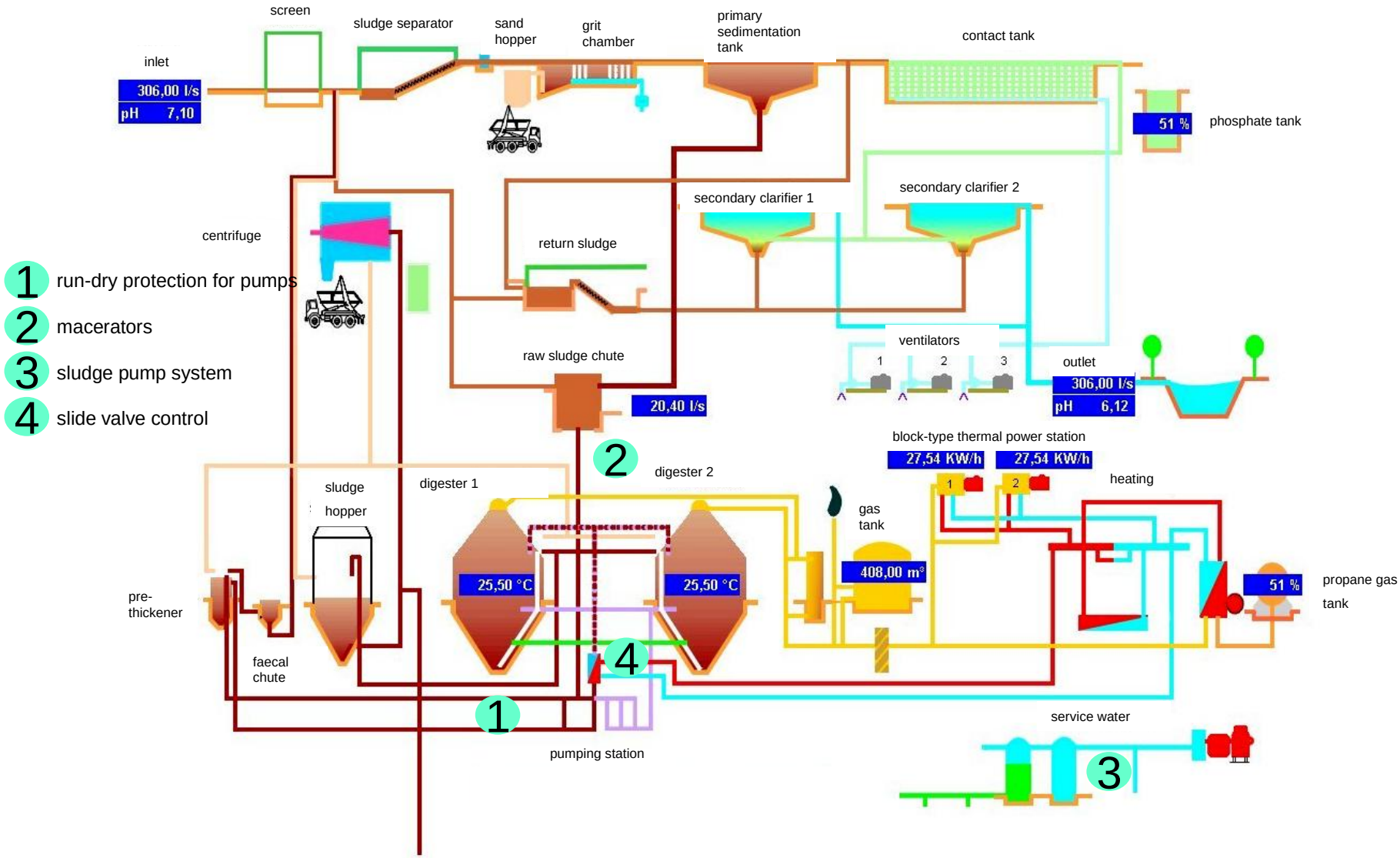
Wastewater treatment plant, Bad Reichenhall



ifm electronic gmbh essen Environmental Technology and Building System Autom.	The diagram is an extract from publications made by the association. The latter is responsible for the correctness.	Project: Wastewater treatment plant Bad Reichenhall	Plan: AS-i and sensors in wastewater technology	Date: **24.05.2004** Originator: **KIE - ar** Plan nr.**SC_ABW_3.ppt**