Significantly reduced sludge volume with SOLITAX highline sc

The agricultural utilisation of dried sludge from municipal sewage treatment plants is becoming more difficult and therefore more expensive. The costs of sewage sludge disposal in Europe are estimated at 2.2 billion euros, provided the current high level of utilisation for agricultural and landscaping purposes is maintained (60%). If thermal disposal becomes mandatory, the costs will rise by 40% to more than 3 billion euros*.

The volume of sludge can be significantly reduced with the help of the SOLITAX highline sc solids probe. This has been demonstrated at the sewage treatment plant in Papenburg (PE 48,000; Fig. 1).

Papenburg WWTP	
Design capacity	48,000 PE
Configuration	Primary treatment, 3-channel activated sludge stage, UCT process
Digester	Volume = 2700 m³
Detention time	20 days at 35°C
Flocculant	Prepared on site, delivered as salt
Outflow values 2006	
COD	41 mg/l
Ptot.	0.8 mg/l PO_4-P
Nitrate	11.0 mg/l NO_3-N
Nitrite	~0.0 mg/l NO_2-N
Ammonium	0.2 mg/l NH_4-N

Table. 1

Annual savings of more than 30,000 euros thanks to optimised sludge treatment

What could be more logical than to reduce the volume of the sludge? The Papenburg sewage treatment plant (48.000 PE) achieved this improvement in efficiency in an impressive manner with the help of the SOLITAX highline sc solids probe.

Fig. 1: WWTP Papenburg, Germany

Not everything was better in the old days

The previous sludge dewatering system at the Papenburg sewage treatment plant (see Fig. 2) looks manageable. To improve the nutrient supply of the secondary treatment stage, the primary treatment stage was taken out of operation, so no primary sludge was produced. The excess sludge was not treated in the digester, but spent only a short time in the thickener before it was fed through the belt filter press. The sludge input to the belt filter press had a total solids (TS) content of 1-1.5% and thanks to the addition of polymer-based flocculants, the output sludge contained 12-14% total solids. Two thirds was used for agricultural purposes and one third was composted using a process that involved the addition of large amounts of lime. This converts ammonium into ammonia, giving rise to penetrating odour nuisance and a real safety problem for inadequately ventilated buildings.

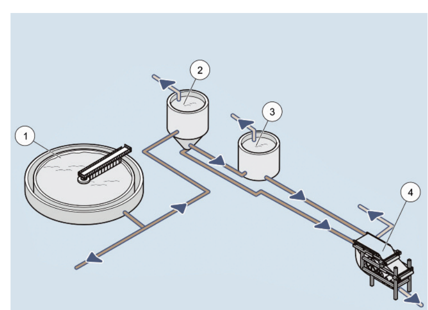

Fig. 2: Sludge dewatering previously
1 Secondary settlement, 2 Traditional thickener, 3 "Trickling filter" thickener, 4 Belt filter press

Another challenge was the limited capacity of the thickener, which was barely able to cope with the increased amount of sludge in summer. The necessary additional storage capacity was obtained by using a former trickling filter. This did not have a funnel design, a fact which resulted in a nasty surprise. Since the removal outlet was at the side and the base was flat, after a while only water (TS <1 %) emerged from the trickling filter, as the sludge was unable to slide evenly towards the outlet. There was no solids measurement device, so this development remained undetected and the filter cake obtained from the belt filter press was of a very poor quality.

The turbid water from the thickener and the belt filter press caused fewer problems. It was discharged into an open tank, from which it was pumped into the raw water container and then gradually and evenly fed into the plant inflow.

The situation today

Fig. 3 shows the sludge dewatering system today:

- The primary treatment is in operation again
- The digester processes the excess sludge and primary sludge (= raw sludge)

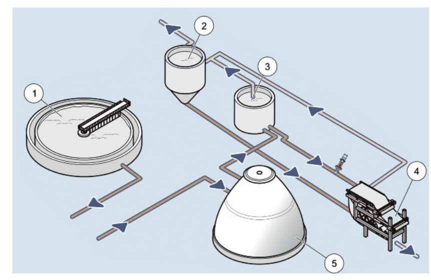

Fig. 3: Sludge dewatering now 5 Digester

- The former trickling filter functions as a post thickener. Its structural disadvantages are compensated by a SOLITAX highline sc and a stirrer
- The turbid water from the post thickener and the belt filter press is processed in a traditional thickener, to which iron chloride sulphate is added to precipitate phosphorus.

This processing method is the result of extensive and varied tests, not all of which were successful. It took two whole years to achieve the successes of which the plant operator can now be justifiably proud.

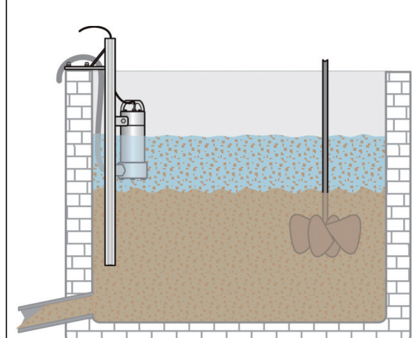

Fig. 5: Start of sludge and turbid water extraction

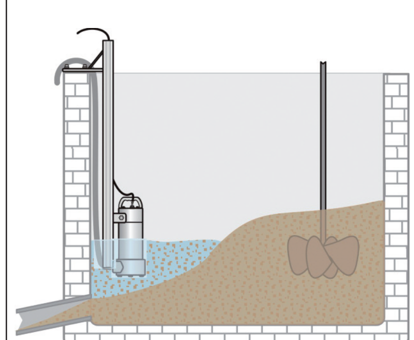

Fig. 6: TS content at the extraction point <1 g/l

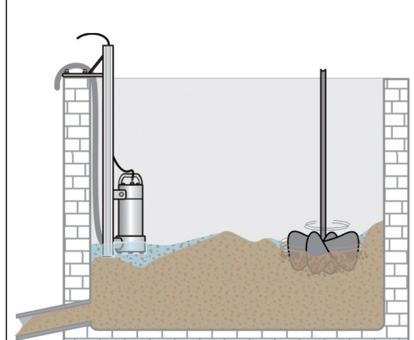

Fig. 7: Improvement with the help of active stirrer

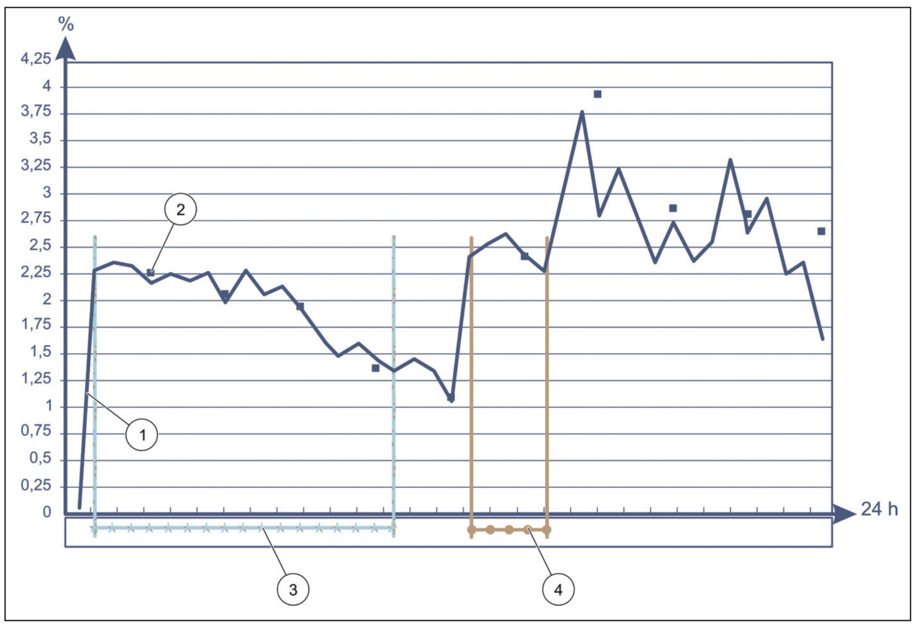

Fig. 4: TS content measured with SOLITAX highline sc (1) in comparison with laboratory measurements (2). The run times for turbid water extraction (3) and the stirrer (4) are also charted.

The path to success

The reduction in the volume of sludge starts in the post thickener, where flocculants are added to promote the formation of coarser flocs, so that the subsequent dewatering can proceed more efficiently. As a result, the TS content has been doubled from 0-1.5% to 3%. Thanks to the smaller volume of sludge, machinery running times are much shorter (38%) and it has been possible to operate without a night shift.

A SOLITAX highline sc in-pipe solids probe from HACH LANGE is installed in the inflow to a rotary pump, where it determines the TS content of the sludge on its way to the belt filter press. The addition of more flocculants at this point promotes flocculation, improves the filter cake and causes most small particles to be held back from the process water and therefore from the inflow. The total amount of added flocculants has been reduced by 9%. Adding the flocculants at two locations has proved to be much more advantageous.

Process measurement technology

Figure 4 shows a typical TS concentration graph and makes the processes in the thickener transparent (Figs. 5-7). Only the targeted use of a stirrer can ensure a steady

Fig. 8: Belt filter press for sludge

inflow to the belt filter press. When sludge extraction starts with the stirrer switched off, the TS content initially remains stable in the range from 2.0-2.5% (Fig. 5). This value then falls to about 1%, as the sludge is unable to flow evenly towards the extraction point, where an increasing volume of turbid water collects (Fig. 6). As a precaution, the extraction of turbid water is stopped. The stirrer then brings about an improvement in the distribution of the sludge (Fig. 7) and the TS content rises above 2% again. Regular comparative measurements confirm that there is a reassuring correspondence between the SOLITAX highline sc and the laboratory results (2006: 120 measured values).

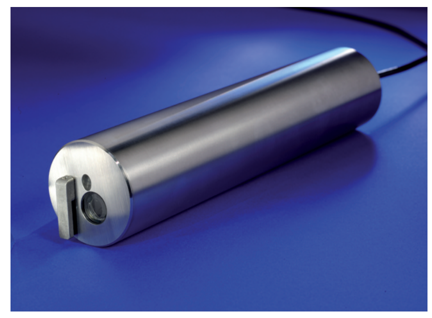

Fig. 9: SOLITAX highline sc in-process probe

The pay-off

17% less sludge per day and a TS content of 18%, so that the amount of added lime can be reduced (49%!). Lime has to be paid for twice: firstly in the form of the purchase price and then in the form of the disposal costs of the mixture of lime and sludge. Almost as a side effect, energy costs were reduced by 30%! All in all, the annual cost savings amount to €30,000.

* *[Source: Fachtagung Klärschlamm [Sewage Sludge Conference], Bonn, 6./7.12.2006]*

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Waste-Water Treatment at IFAT 2008 – Millions of Mini Waste-Water Treatment

The treatment of waste water in decentralised plant will remain an important component in waste-water management in Europe. Long term it is expected that the number of small-scale waste-water treatment plants in the EU will reach around ten million. **The international environmental fair IFAT 2008** brings together the users and suppliers of this technology and these services.

The environmental trade fair IFAT 2008 taking place next year, the most important trade event in the world for environmental technology, recycling and the treatment of water, waste water and sewage, offers a superb opportunity for trade visitors to compare the various technical and economic concepts for decentralised waste-water treatment.

Reader Reply Card no 80

Innovative Products for Water Laboratories

Founded in the year 2000, **TCS Water Sciences** (UK) has emerged as Europe's leading specialist supplier of Cryptosporidium and Giardia positive controls, reagents and equipment and was the first to be granted Drinking Water Inspectorate (DWI) approval to supply a fluorescent monoclonal antibody stain for the detection of Cryptosporidium and Giardia. TCS Water Sciences is proud to work in partnership with Cellabs (Pty) Ltd. and Biotechnology Frontiers (Pty) Ltd. and have succeeded in building a product range that includes high quality, innovative products which is unrivalled by any other supplier of Cryptosporidium and Giardia related products in Europe. TCS Water Sciences products are approved for use in DWI regulated laboratories.

Reader Reply Card no 82

Flow Monitoring with Acoustic Methods

Hydrovision GmbH (Germany) is an independent manufacturer serving water and environmental organizations, governments and industries. Since its foundation in 2002, the company has developed a comprehensive range of products for flow monitoring with acoustic methods. Hydrovision GmbH offers specialist expertise in the monitoring and management of water resources and waste water systems. Together with distributors and export operations, the company supplies customers in more than 30 countries worldwide. The company director and specialist senior staff have more than 15 years of experience backed by a team of highly trained professionals.

As environmental organizations and governments throughout the world enforce and introduce stricter conservation laws, and as water becomes more of an expensive and rare commodity, ultrasonic flow meters will have great opportunities for growth in the sensor market. Ultrasonic flow meters are improving their accuracy and application versatility with an excellent price/performance ratio, and are in position to replace more and more traditional flow meters.

Reader Reply Card no 81

New In-Line TOC Monitor For Laboratory Applications

Siemens Water Technologies (USA) has introduced the stand-alone Total-check 900 in-line TOC monitor. The monitor can be connected to any high-purity water laboratory system to provide an accurate measurement of product water TOC (total organic carbon) levels from 1 to 999 ppb (parts per billion) with repeatability of ±5% and accuracy of ±1 ppb. Available in North America and Europe, it is designed for laboratory personnel who need to measure the TOC in high-purity water produced by systems that do not feature a built-in monitor.

For critical applications in the clinical, analytical or municipal laboratory, it is essential to monitor organic impurities, measured as the TOC, in high-purity water produced by a laboratory water polishing system. TOC is a measure of the concentration in aqueous solutions of carbon from oxidizable organic compounds. Measuring the TOC will give a clear picture of the water quality produced. Even low TOC levels of less than 50 parts per billion (ppb) can negatively affect some laboratory experiments.

Three operating modes are easily accessed with the push of a button: the automatic analysis mode gives a continuous sample analysis and displays each stage of the cycle; the manual analysis mode prevents repeated analysis of a stagnant sample; the standby mode prevents sample water from flowing through the monitor. Other benefits of the Total-check 900 monitor include fast, easy installation; easy to read single-line LCD display; and the ability to be wall mounted.

The Total-check 900 monitor measures levels of TOC in purified water to help laboratories meet or comply with guidelines specified in internationally recognized U.S. standards organizations such as ASTM (American Society for Testing and Materials), USP (U.S. Pharmacopoeia), CLSI (Clinical and Laboratory Standards Institute) or CLRW (Clinical Laboratory Reagent Water). The monitor can be re-calibrated upon the user's request, and has been designed to take into account the suitability test requirements as specified in USP 643.

Reader Reply Card no 83