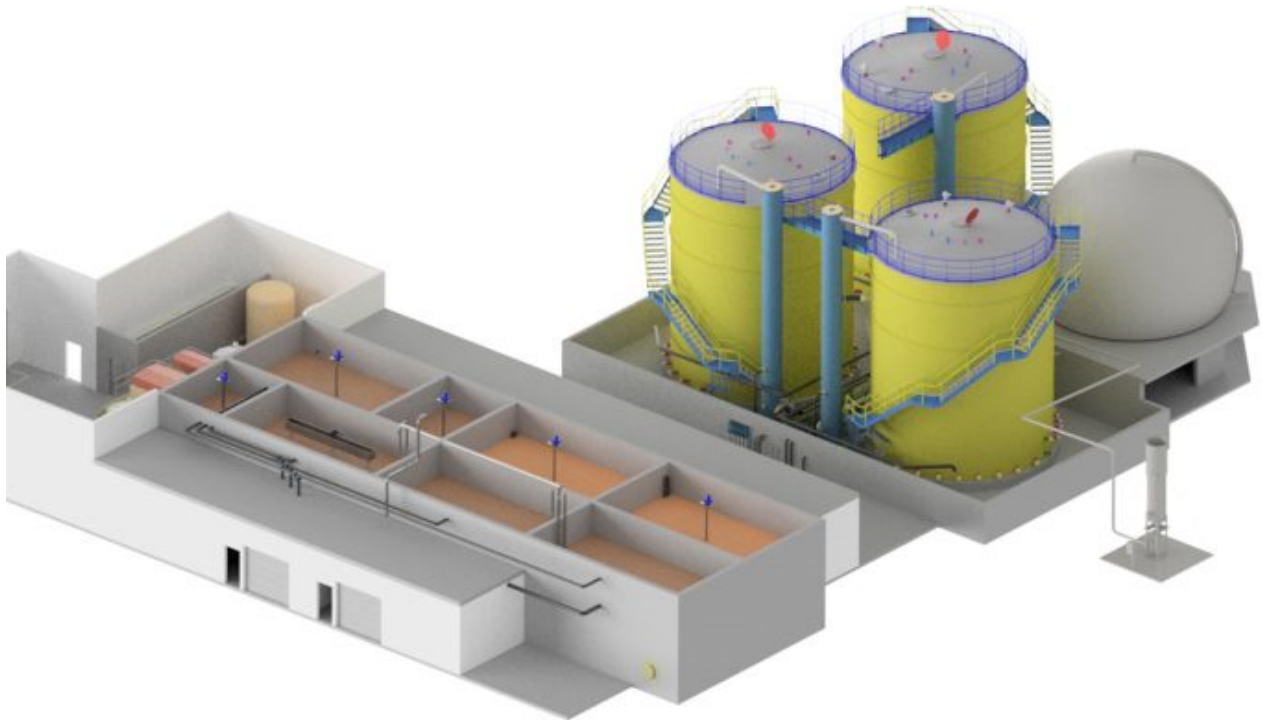




3D-model the complete biological treatment plant by Biowater Technology AS including EGSB-reactors, Biowater Technology CFIC®, DAF and sludge dewatering and biogas handling.

Generating biogas from concentrated wastewater with two-stage biotreatment

GE Healthcare in Lindesnes, South Norway (GEHCLI) are preparing to produce 22 GWh per year from the biogas generated from their wastewater. The equivalent organic concentration of this waste stream is that of a city of 150 000 people. With a two-stage biological reactor arrangement they will achieve up to a 98 % reduction in COD. The solution and its effectiveness are already proven in a pilot trial.

GEHCLI has one of the world's most advanced production facilities for X-ray contrast media. The production takes place over several stages, which provides a wastewater of various chemical compounds, besides several by-products.

GEHCLI is one of the world's largest producers of medical imaging products. The company has high environmental requirements for its activities and sees resource utilization and circular thinking as vital for sustainable business operation. In 2016, the Zero Emission project was started, which set out to meet the Norwegian environmental authorities' requirements and look to zero emissions as a long-term ambition. The first step for the facility in Lindesnes has been to develop a solution for reduced emissions of acetate, nutrients and gases, and to look at new solutions for the treatment of

wastewater. The goal is to reduce emissions of total COD by at least 95% as well as to achieve low-emission potentials of suspended matter (TSS), nitrogen (TN) and phosphorus (TP).

Resources

GEHCLI also sees opportunities in utilizing the resources of the wastewater, where the most relevant method is the production of biogas. A number of attempts in 2016 showed that this was possible. In 2017, they began to look for a supplier of biological treatment technology with expertise in biogas. Following several recommendations, Biowater Technology AS in Tønsberg was drawn in as a potential partner. However, the wastewater was of a nature not previously trialled in biological reactors. Wastewater properties included high salinity and demanding chemical compounds.



Turn-key supply and collaboration: Biowater Technology AS Project team: Shuai Wang – Chief Technology Officer, Jon Siljudalen – Chief Process Engineer, Ilya Savva – CEO, Kees Rodenburg – Project Engineer, Jon Gotfredsen (bak) – Chief Finance Officer, Katia Aparecida da Silva – Process Engineer, Frode Rindedal – Project Manager, Atle Ødegaard – CAD Engineer, Karolina Korczyk – Process Engineer.

Biowater was asked to build a pilot plant to demonstrate their proposed solution to treat the wastewater. For this purpose, Biowater designed a container-based pilot solution, with water preconditioning, chemical dosing, two-step biological reactors, a fully automatic remote control system and biogas flare.

The process arrangement included anaerobic expanded granulated sludge reactor (EGSB) for the first step and Biowater's patented energy-saving aerobic biofilm process (CFIC®) as step two. The pilot was put into operation the first half of 2018.

Robust Process

The pilot trial demonstrated this unique combination of treatment steps was very stable and robust, and exceeded the requirement for a 95% reduction in COD. Under stable effluent conditions, the pilot plant achieved 97 - 98% reduction in COD. A considerable amount of biogas was also produced, which was combusted in the pilot flare to prove the energy generation potential. After commissioning, the pilot has had more than 10 months with the same good results. GEHCLI eventually chose to purchase the pilot plant from Biowater Technology AS in order to test the process on different wastewater streams in the future.



Inside the containerised pilot, built and tested offsite and run for 10 months continuously at GEHCLI.

After it was established that the solution worked thoroughly, GEHCLI chose to award the full-scale wastewater treatment plant contract to Biowater Technology AS. As well as demonstrating the treatment potential, the pilot was used to optimize the full-scale design; monitor performance and find optimal operation in relation to parameters such as system temperature, pH and reactor volumes.

"Biowater emerged as a competent supplier of a solution that meets GEHCLI's needs. Robust technical solutions and a competent, flexible and forward-thinking team of professionals were important factors when we selected Biowater," says Peter Haaland, Project Manager at GE Healthcare Lindesnes.

Construction underway

The first stage of the constructed plant will be the two parallel EGSB reactors with biogas handling. Downstream of this are two parallel CFIC® reactors, which demonstrate whole life cost savings over conventional biofilm reactors. The last step of the process is the removal of suspended matter by flocculation and sludge dewatering. The biogas to be produced will be used within the plant, and will provide a potential energy saving of up to 22 GWh / year at full load. The energy offers application in district heating, among other uses, including make steam in boiler plants and in drying plants. The GEHCLI project is the largest commercial project delivered by Biowater Technology AS, and marks a significant step forward in the strategy of being a leader in aerobic and anaerobic wastewater treatment in Scandinavia.

"Our cooperation with GEHCLI has provided a platform for ambitious thinking in both project development in the development of new and advanced solutions. The use of wastewater as a resource is in line with the common philosophy of both GEHCLI and Biowater Technology AS" says Ilya Savva, CEO of Biowater Technology AS.

The facility will be operational during December 2019.



The EGSB reactor in the pilot scale plant demonstrated the full potential for biogas generation.