

Optoseven FSA-CT1000 analyzer in wastewater treatment flotation process control and purified wastewater quality monitoring

Ekokymppi, Municipal Waste Authority of Kainuu, Kajaani, Finland



Optoseven 

Majasaari waste centre, wastewater treatment system

The Municipal Waste Authority of Kainuu operates throughout the Kainuu region and in the municipality of Vaala. The Majasaari waste center of the consortium is located in Kajaani and serves the needs of about 76,000 inhabitants.

Majasaari's new wastewater treatment plant, completed in 2018, treats all water generated at the landfill that requires treatment. The design flow of the plant is approximately 52,500 m³ / year. The majority of the wastewater has seeped through the landfills and the water is collected for treatment by leachate pipelines around the landfills. In addition, wastewater is collected from an oily soil composting field, a biowaste field and a mixed waste storage area. Similarly, the wastewater generated in the office is led to the treatment plant.

Like the typical leachate from waste centers, the wastewater treated is challenging for the equipment, as it contains a lot of e.g. dissolved organic matter from the waste, nitrogen in the form of ammonium, iron, and phosphorus. The waters to be purified are also completely oxygen-free.



" Operating conditions in an environment such as landfill water are not suitable for probe-type measuring devices," says Eero Piirainen, Environmental Manager.

Photo: Majasaari's new wastewater treatment plant

Cleaning process

Majasaari wastewater treatment plant removes nitrogen, phosphorus and oxygen-consuming organic matter from the water.

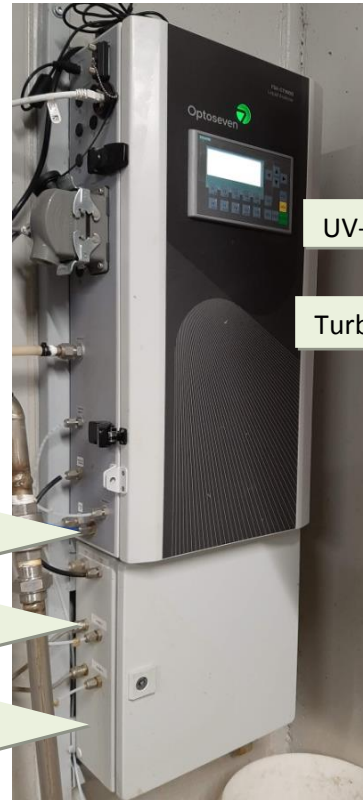
The purification process can be roughly divided into three parts: incoming water **coagulation, flotation process** and **nitrogen removal**:

1. In the **flotation process**, organics and solids are removed from the wastewater before the denitrification process.
2. The removal of solids and organic matter, **coagulation**, is enhanced by adding a coagulant chemical into the wastewater. In dissolved air flotation (DAF) treatment process, the dispersion water is conducted through the nozzles into the wastewater. The microscopic air bubbles adhere to the sludge flocs formed by the coagulant chemical and the dirt contained in the water lift them to the surface. The sludge is removed with a surface sludge scraper and the water is passed on for nitrogen removal.
3. **Nitrogen removal** is accomplished by passing water through regenerable zeolite filters.

Advanced adjustment and monitoring

In Masaari the FSA-CT1000 liquid analyzer supplied by Optoseven Oy is equipped with multi-point sampling. In this way, one analyzer measures both the water entering the purification process and the water leaving the flotation and purification process.

1. The organic load of the water is measured from the **incoming water** using UV-COD. Based on this and the flow, the amount of flotation coagulant chemical is adjusted.
2. Measurement **after flotation** ensures successful coagulation and can be used to fine-tune the control of the cleaning process.
3. The measurement of **purified water** complements the laboratory measurements in accordance with environmental regulations, giving a continuous picture of the reduction of the process.



UV-COD

Turbidity

Control and Monitoring

1. Influent water to the cleaning process

2. Water after the flotation unit

3. Effluent water from the cleaning process

Ekokymppi environmental manager Eero Piirainen's comments

"The Optoseven analyzer was chosen due to its extractive sampling method," says Eero Piirainen, Environmental Manager at Ekokymppi, Municipal Waste Authority of Kainuu. Based on long-term practical experience, Piirainen states that operating conditions in an environment such as landfill water are not suitable for probe-type measuring devices. The need for washing of a probe-type device by maintenance personnel would be continuous, despite automatic wiping or blowing of the measuring cells. In addition, one analyzer can now be used to measure at all points relevant to process control and monitoring, reducing the need for maintenance. UV-COD has proven to be a suitable measurement parameter for the control of flotation coagulation chemical.



Coagulant chemicals for water treatment

The most commonly used coagulation chemicals are ferric sulfate, aluminum sulfate and polyaluminum chloride. The use of chemicals aims to improve the flocculation of water contaminants into larger flocs that can be more easily removed from water by flotation or sedimentation-based clarification.

The benefits of precise control of coagulation chemicals are not limited to chemical costs. Proper dosing improves the stability of the particles that have accumulated together, making it easier to remove sludge or flocs from the process. The amount of sludge decreases as it remains denser and its further treatment becomes more economical. The migration of the coagulation chemical to the later stages of the purification process is reduced when there is no need to add too much of the chemical to ensure flocculation.

Applications for adjusting the dosing of coagulation chemicals can be found in several different application areas:

- plants using surface water
- municipal wastewater treatment plants
- wastewater treatment in the food industry
- forest industry wastewater treatment
- wastewater treatment in the oil and process industries

Optoseven Oy

Optoseven Oy develops and manufactures instrumentation and analyzer systems for reliable real-time detection of liquids. The company exploits the latest developments in optoelectronics and engineering to meet our customers' needs. Main application areas are the control and monitoring of industrial processes.

We utilize our thorough experience of measurement technology and the latest technology in our products in an innovative way. Our expertise is utilized in Optoseven measurement method, which guarantees the reliability of the measurement results and the cleanliness of the analyzer even in the most challenging measurement applications.

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