Vilhelmina
A Mellifiq reference project

Full Scale API Removal Plant to Comply with EU Active Pharmaceutical Removal Directive

Installation of a complete quartenary treatment stage using particle filtration, ozonation and adsorption

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Introduction

In line with its green strategy, Vilhelmina municipality has recently intensified efforts to protect the environment, with a strong focus on preventing pharmaceutical residues from entering local waterways. The municipality's largest treatment facility, Vilhelmina Wastewater Treatment Plant, is centrally located near Lake Volgsjön. Although renovated in recent years, the plant lacks a biological treatment stage, resulting in pharmaceutical residues passing through largely untreated and being discharged into the recipient.

Facts

Location:	Vilhelmina, Storuman
Application	Advanced Pharmaceutical Residues Treatment
Industry	Municipal wastewater treatment plant

Solution

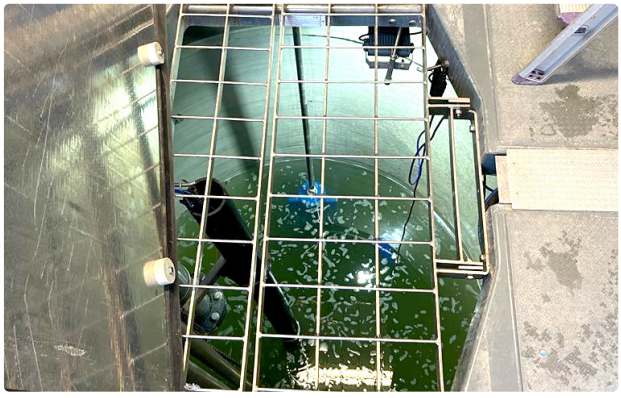
Mellifiq delivery:	A fully containerized advanced water treatment system featuring WaterMaid FlexKarb and Ozonetech RENA Tellus bespoke system. The system includes sand filtration, ozonation, and activated carbon adsorption, along with particle filtration and final polishing using adsorption beds. Delivered with a complete pump station with commissioning, sampling, and an initial pilot project.
Capacity:	80 m^3/h
Performance:	> 95% API-treatment
Brands:	ozonetech. a MELLIFIQ brand watermaid a MELLIFIQ brand

The Problem

Traditional wastewater treatment plants are not equipped to handle micropollutants such as active pharmaceutical ingredients (API), as their primary function is to treat organic material. This means pharmaceutical substances often pass through untreated, accumulating in the environment and causing long-term harm. To address this, and also to comply with the pharmaceutical removal standards set by the EU-directive, a full-scale containerized pharmaceutical treatment facility was implemented at the Vilhelmina municipal wastewater treatment plant in northern Sweden.

This plant is the northernmost of its kind to feature advanced pharmaceutical removal and was specifically developed to endure harsh winter conditions and extreme seasonal variations in water flow. The existing facility lacked a biological treatment stage, making the addition of pharmaceutical treatment especially critical. Treated effluent is discharged into Lake Volgsjön, the primary recipient and buffer before the water reaches the Ångerman River — Sweden's third-largest river by volume.

Volgsjön currently has poor chemical and ecological status, with known contaminants such as PFOS from a nearby firefighting training site. The lake is a vital hub for the local community, used for fishing, swimming, and winter activities, and is home to sensitive species like noble crayfish, freshwater pearl mussel, minnow, and trout. By introducing advanced pharmaceutical treatment, the project aims to significantly reduce environmental impact, improve water quality, and ensure the long-term protection of local ecosystems.



API removal plant pump station, designed and installed by Mellifiq.

The municipality's largest treatment facility, Vilhelmina Wastewater Treatment Plant, is centrally located near Lake Volgsjön

The Solution

The project began with a thorough preliminary study, including detailed sampling and operational analysis to assess the current state of the facility. These findings formed the basis for the design, dimensioning, and implementation of a robust treatment system, developed in close collaboration with Mellifiq. Drawing on experience from similar installations across Sweden, the system was tailored to Vilhelmina's specific environmental and operational challenges.

To ensure seamless integration, the new system was installed on adjacent land, as the existing site lacked sufficient space. Special attention was given to the preparation of the terrain — prone to waterlogging — with excavation work carried out to secure stable conditions for piping and installation. The system is designed to handle a flow capacity of up to 80 m³/h, well above the plant's average of 69 m³/h, and is capable of maintaining high treatment efficiency even during peak spring flows from snowmelt.

After conventional wastewater treatment, the water enters a fourth and final purification step — known as quaternary treatment — where pharmaceutical residues are removed. This stage is housed in two insulated 40-foot containers, specifically engineered to operate year-round in subzero temperatures and heavy snowfall. The containers are fitted with heating, ventilation, and air conditioning systems, and feature aluminum decking for added protection against moisture and freezing.

Because of the absence of a biological step, the process begins with multimedia filtration to remove suspended solids that remain after conventional treatment. The core of the system is ozonation, where ozone is injected into degassed, pressurized oxidation tanks to oxidize and break down pharmaceutical substances at the molecular level. This step achieves a reduction of at least 90–95% of pharmaceutical compounds. A final polishing stage ensures any remaining contaminants are removed.

This advanced treatment process not only meets but far exceeds the pharmaceutical removal standards set by the EU Urban Wastewater Treatment Directive. By combining ozonation with granular activated carbon and sand filtration, the system leverages the synergistic effects of oxidation and adsorption for maximum efficiency. The result is a cost-effective, resilient, and future-proof solution — delivering exceptional environmental performance even under the toughest northern conditions.

Advanced quaternary treatment stage for pharmaceutical residues installed in two 40' containers, specifically engineered to operate year-round

Evaluation

After the installation and commissioning of the pharmaceutical treatment plant at Vilhelmina, an evaluation period of 6–12 months was carried out to ensure that the plant meets the project target of at least 80% reduction of pharmaceutical substances and operates stably under varying flow conditions.

During this period, operating parameters for ozonation and GAC polishing will be optimized through continuous fine-tuning based on analysis results. Monthly sampling of influent and effluent water has been conducted for pharmaceutical residues, transformation products, PFOS, and other water chemistry parameters. The sampling covered various operating conditions, including high-flow periods, to verify the plant's performance throughout the year.

In parallel, operational stability, energy consumption, and maintenance requirements was documented. The results was compiled in a final report, evaluating the achievement of project objectives and the expected long-term impact on the receiving water body. The report also provided recommendations for the plant's continued operation and optimization.

By using advanced purification technologies, we have significantly reduced the pollutant load into the local waterways. Our facility in Vilhelmina is not just a solution for local pharmaceutical pollution. It's a model for how northern communities can effectively address these challenges. Through advanced oxidation, activated carbon filtration and clever process design, we have achieved over 95% reduction.

A fully containerized advanced water treatment system featuring WaterMaid FlexKarb and Ozonetech RENA Vivo technologies.

About Mellifiq

Mellifiq is a multi-awarded environmental service company group, that has since the early nineties evolved into a world leading system and solution provider with multiple groundbreaking applications for industrial, municipal, and real estate clients. We supply cutting-edge technologies to manage the most sophisticated air, water, and energy challenges.

Mellifiq offers a complete range of air and water treatment technologies and solutions across multiple industries such as processing industry, energy sector, food and beverage, pharmaceutical, wastewater treatment and commercial real estate.

Mellifiq offers strong and renowned brands, such as Ozonetech, Nodora and Water Maid, and world-class engineering services combined an excellent track record of more than 40 years of innovation. We help our clients achieve the most efficient and sustainable solutions while creating the maximum value for their businesses.

With several business units across Europe, Mellifiq is headquartered in Stockholm where research and development, production, QA and certification all take place. Our unique technology and our extensive expertise have made us the Center of Excellence for the world's most complex projects, and a global player with installations on all six continents.

Everyday millions of people rely on our solutions for ventilation, disinfection, sanitation, and odor control. We are committed to raising the bar for the concept of clean and the industry standard for engineering, technical services and general contracting.

For additional information, visit our website at www.mellifiq.com

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