The Käppala Association and the Käppala Wastewater Treatment Plant
Käppala wastewater treatment plant

The Käppala wastewater treatment plant is located in the city of Lidingö, just east of Stockholm. Wastewater from over half a million people is treated here. Eleven member municipalities are connected to the plant. The Käppala plant employs a very effective treatment process, and is Sweden’s third-largest wastewater treatment plant.

The red line shows the tunnel system for wastewater transport.
More than 50 years ago, before the Käppala plant started operating, huge amounts of raw sewage were discharged into local watercourses, lakes and the Stockholm archipelago. This caused problems involving disease transmission and environmental pollution. So in 1957, several municipalities north of Stockholm joined forces and formed the Käppala Association, a local federation, to treat their wastewater.

Twelve years later, in 1969, the Käppala wastewater treatment plant in Lidingö was completed – including the 65 km long tunnel system that carries wastewater to the plant from the association’s member municipalities. Following a major rebuilding and extension project, the plant was re-inaugurated in 2000.

Nowadays, you can swim and fish in clean water in and around Stockholm, which is unusual compared with many other major European cities. The Käppala Association has been one of the key players behind this positive development.

Very effective treatment process

The Käppala plant more than meets the discharge requirements stipulated by the regulatory authority, the County Administrative Board. However, we are not content with that. In accordance with our quality and environmental management system, we strive for continuous improvement and to be able to contribute to a sustainable society. We are keen to test new technologies, partly to make our treatment process even more efficient, partly to increase biogas production, and to be able to produce high-quality sludge.

We treat wastewater in the Käppala plant every day of the year, 24 hours a day, and always with a combination of mechanical, biological and chemical treatment. It takes about 1.5 days to treat the wastewater before it is returned to nature at a depth of 45 m outside the island of Lidingö.

Our goal is clean water in lakes and the archipelago

The Käppala Association treats wastewater from over half a million people in eleven municipalities located north and east of Stockholm. Our treatment plant, the Käppala wastewater treatment plant, is Sweden’s third-largest, and employs a very effective treatment process.

Wastewater treatment in Sweden

Approximately 85 percent of Sweden’s population live in areas connected to municipal wastewater treatment facilities. There has been an expansion in municipal sewage treatment since the 1940s. Initially, mechanical treatment was entirely dominant. Biological treatment was introduced on a large scale in the 1960s, and chemical treatment in the 1970s. Today approximately 95 percent of urban wastewater undergoes both biological and chemical treatment. Since the late 1990s, the major treatment plants in the southern part of Sweden have been augmented with a special nitrogen removal step.

Source: The Swedish Environmental Protection Agency
The wastewater treatment process

The treatment process at the Käppala wastewater treatment plant includes five major steps:

- Pre treatment
- Primary sedimentation
- Biological treatment
- Secondary clarifier
- Sand filtration

1. Fine screens
2. Odour control
3. Grit chamber
4. Primary sedimentation
5. Biological treatment
6. Secondary clarifier
7. Sand filter
8. Chemical dosage
9. Digesters
10. Upgrading facility for vehicle fuel
11. Sludge dewatering
12. Gas boiler
13. Heat pump

Screens and grit removal
Debris is removed from the sewage with rotating step screens. Sand and grit is settled on the bottom of aerated grit chambers.

Odour control
The ventilation air from the screens, grit chambers and the primary sedimentation tanks is collected and treated with UV light and activated carbon filters before it is released to a 149.5 m tall chimney.
**Primary sedimentation**
Particulate matter is settled to the bottom of the primary sedimentation tanks. The produced primary sludge is collected with sludge scrapers and thickened before it is pumped to the digesters for production of biogas.

**Biological treatment**
Microorganisms consume the organic material in the water and produce a biological sludge. By controlling the living conditions for the microorganisms nutrients as nitrogen and phosphorus are removed. Nitrogen is transformed to nitrogen gas and is released to the atmosphere. Phosphorus is bound to the biological sludge.

**Secondary clarifier**
The produced biological sludge is settled to the bottom of the secondary clarifier tanks where it is collected with sludge scrapers and pumped back to the biological treatment. A portion of the biological sludge, excess sludge, is pumped to the digesters for production of biogas.

**Chemical precipitation**
Some of the phosphorus that is not removed in the biological treatment is precipitated with ferrous sulphate.

**Sand filters**
The final treatment step is filtration where particulate matter is removed from the water with sand filters. The treated water is released to the Stockholm archipelago at a depth of 45 m.

**Sludge treatment**
The sludge is pumped into the digesters, where biogas is formed. The biogas is upgraded to vehicle fuel quality, and used as fuel for public transport buses. The digested sludge is dewatered, quality checked and then used as an agricultural fertilizer.
Every year, we treat about 50 million cubic metres of wastewater
The Käppala plant is an underground facility. Wastewater is treated in large chambers blasted into the rock. Every year, we treat approximately 50 million cubic metres of wastewater. This represents approximately 700 000 full bathtubs per day.

Treating wastewater is our main task. But we also exploit the nutrients and energy contained in the wastewater, and produce sludge and biogas that are recycled to the community.

Our sludge is used as fertilizer by farmers …
Our sludge is certified annually in accordance with the Swedish Water & Wastewater Association’s (our industry organisation) certification system REVAQ, and can be used on arable land as an alternative to mineral fertilizers. The sludge is rich in nutrients, among them phosphorus and nitrogen. It undergoes continuous quality control. All of the nutrients is returned to the ecological cycle and used on arable land.

… and we process the biogas into environmentally friendly fuel for public transport buses
We produce the biogas in the digesters of the Käppala plant. We upgrade the biogas to vehicle fuel quality in our upgrading facility. The gas is used as an environmentally friendly fuel for public transport buses. In this way, we help reduce the emissions of fossil carbon dioxide in the Stockholm region.

Environmentally certified
The Käppala Association is environmentally certified in accordance with ISO 14001. Our own laboratory is accredited by SWEDAC in accordance with ISO 17025.
• At the Käppala plant, 99 percent of the organic pollutants and 97 percent of the phosphorus are removed. Nitrogen in the wastewater is reduced by 80 percent.

• The Käppala plant started operating in 1969. Between 1994 and 2000, the plant was modernised and a new section was built. Today, the plant has the capacity to treat wastewater from 700,000 people.

• The Käppala Association owns and maintains a 65 km long tunnel system with pumping stations that transport wastewater from the member communities’ own sewer systems to the Käppala plant in Lidingö.
Eleven municipalities are behind the Käppala Association

The Käppala Association is a local federation consisting of eleven municipalities that have joined forces to solve a shared problem: managing and treating the member municipalities’ wastewater. We work in accordance with the cost price principle, on a non-profit basis. The Käppala Association’s board consists of politicians from the member municipalities. We have approximately 70 employees.

If you would like to know more about our activities, please visit our website at www.kappala.se.