

salsnes  
Filter™

## Municipal Installations



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Eco-efficient **solids separation**

## ABOUT SALSNES FILTER

Over 25 years ago, we designed the first rotating belt filter to provide customers with a highly efficient and reliable technology that could maximize solids separation and decrease costs. Today, we continue to lead the development of this technology from our office and manufacturing facilities in Namsos, Norway. We are a brand in the Trojan Technologies group of businesses, located in Ontario, Canada.

### The Salsnes Filter system provides an alternative to conventional primary treatment and can offer:

- 30-60% lower investment costs
- 1/10th the land requirements
- Integrated thickening and optional dewatering
- Significantly lower lifecycle costs
- Smaller volume of drier sludge that reduces disposal costs
- Less civil works
- Fully automated equipment
- Optimal removal of TSS to ease demand on downstream biological treatment
  - 30-60% removal in a typical municipal installation
  - up to 80% removal when a polymer is used
- Higher Volatile Solids content in primary sludge for biogas production
- Fast and easy maintenance
- Lower operating costs

### Product Overview

#### Enclosed Models

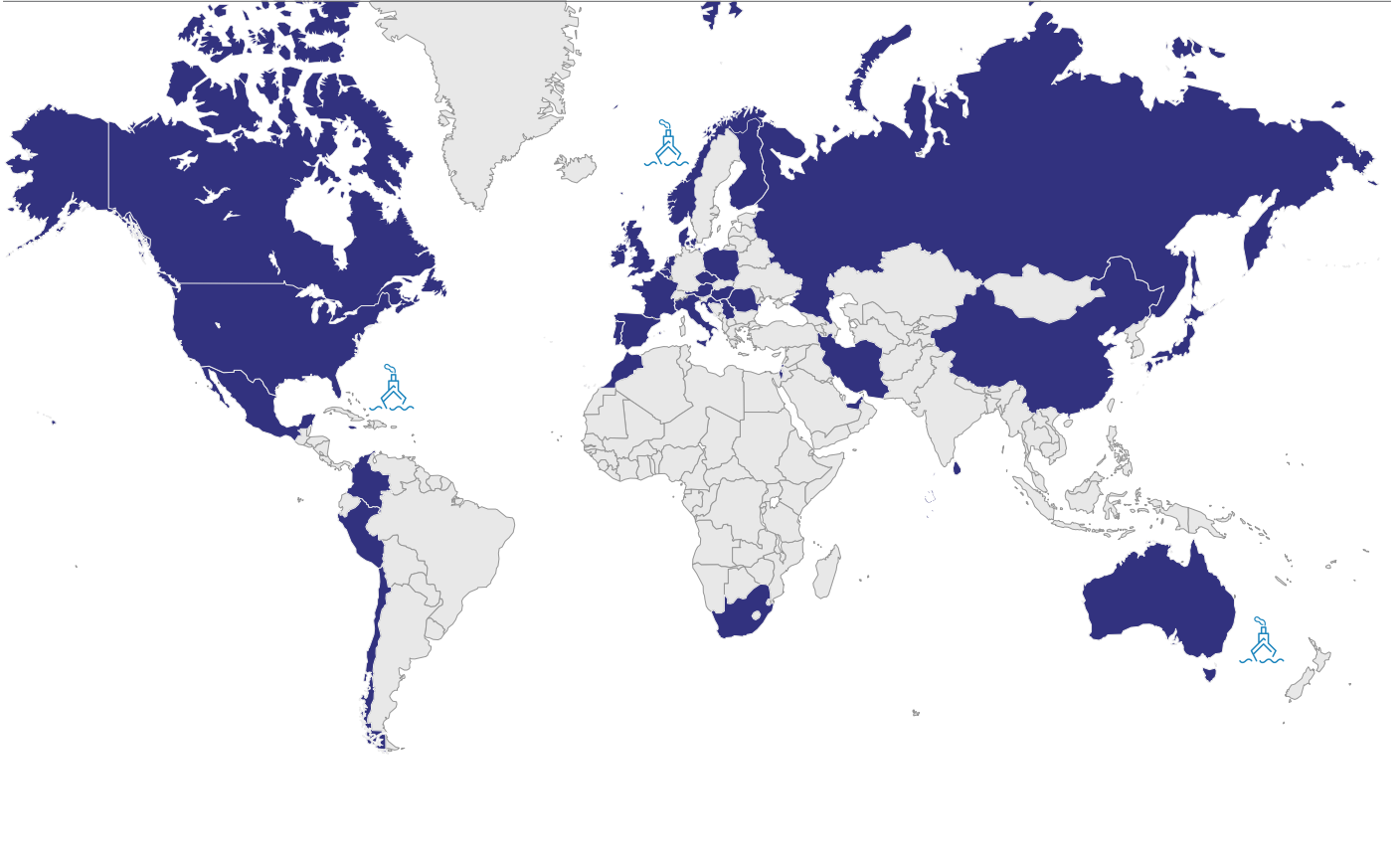
#### Channel Model



Maximum Hydraulic Flow	Up to 54 m <sup>3</sup> /h (0.3 MGD)	54 - 576 m <sup>3</sup> /h (0.3 - 3.7 MGD)	Up to 576 m <sup>3</sup> /h (3.7 MGD)
Average Treated Flow	35 m <sup>3</sup> /h (0.2 MGD)	90 - 325 m <sup>3</sup> /h (0.6 - 2 MGD)	90 - 325 m <sup>3</sup> /h (0.6 - 2 MGD)

## SALSNES FILTER SYSTEMS AROUND THE WORLD

We have installed over 900 filters around the world, giving us a global footprint in municipal and industrial markets. Our customers use the Salsnes Filter system in municipal wastewater treatment plants, and for a host of industrial applications such as tanneries, cruise ships, aquaculture, biofuel production, pulp & paper and food & beverage.







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## MUNICIPAL INSTALLATION | Cellulose Recovery

### Aarle-Rixtel Wastewater Treatment Plant Netherlands

The European Commission has offered grants through its Eco-innovation program since 2008. The program was developed to give companies the opportunity to reduce their environmental impact and make better use of their resources.

#### The Challenge

The Aarle-Rixtel Wastewater Treatment Plant (WWTP) wanted to utilize funds from the Eco-innovation program to install a Salsnes Filter system for:

- optimization of their current treatment processes
- increasing plant capacity
- recovering cellulose from the wastewater

#### The Solution

Eight SFK600 Salsnes Filters, with 350 micron filtermesh and integrated sludge dewatering, were installed into channels. The system treats one of the two activated sludge trains at the WWTP. They left the second train untreated which allows them to see the effect of the Salsnes Filter system.

Removal efficiencies are 30-50% TSS and 10-25% COD, which has helped to increase plant capacity and ease demand on the activated sludge system. The cellulose recovered from the raw wastewater can be processed further to create other products such as bioplastics and biofuels.

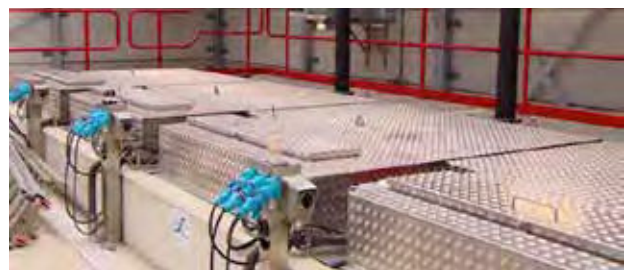
An added benefit is the small footprint of the Salsnes Filter system, which is 1/10th the size of conventional primary treatment. Installation required much less concrete which reduced construction costs and environmental impact.



#### System Parameters

**Salsnes Filter:** SFK600  
**Type of Treatment:** Primary Treatment & Cellulose Recovery

**P.E.:** 320,000  
**Particle Size:** 0 - 100 mm  
**Dry Weather Flow Rate:** 1600 m<sup>3</sup>/h (10 MGD)  
**Max. Flow Rate:** 3200 m<sup>3</sup>/h (20.2 MGD)  
**TSS Removal:** 30 - 50%  
**COD Removal:** 10 - 25%  
**Dewatered Sludge:** 28% Total Solids



Four of the eight SFK600 Salsnes Filters installed at the plant



Filters are installed in channels and have integrated dewatering.



## MUNICIPAL INSTALLATION | Primary Treatment

### Breivika Wastewater Treatment Plant

Tromsø, Norway

Tromsø Municipality, with a population of over 70,000 people, is considered one of the largest urban areas north of the Arctic Circle. The Municipality operates several wastewater treatment plants, five of which have Salsnes Filter systems.

#### The Challenge

The influent at the Breivika Wastewater Treatment Plant (WWTP) is a typical mix of wastewater from schools, households, shops, restaurants, hospitals, gas stations and small and medium-sized industry.

They discharge wastewater to the fjord, which requires them to comply with the very stringent criteria of the European wastewater directive for less sensitive recipients. Removal rates for primary treatment must be at a minimum 50% TSS and 20% BOD.

#### The Solution

The Breivika WWTP installed sand and grit removal, followed by three SF6000 Salsnes Filters with 350 micron filtermesh. TSS removal rates are 50-65%, allowing the Plant to comply with the European wastewater directive. The system's external dewatering unit treats sludge from all three filters to a dry content level of 27%.



#### System Parameters

Salsnes Filter: SF6000  
Type of Treatment: Primary Treatment

P.E.: 18,700  
Influent TSS: 100 - 350 mg/L  
Effluent TSS: 50 - 120 mg/L  
Particle Size: 0 - 100 mm  
Dry Weather Flow Rate: 230 L/s (5.25 MGD)  
Dewatered Sludge: 27% Total Solids







## MUNICIPAL INSTALLATION | Cellulose Recovery

### Beemster Wastewater Treatment Plant Middenbeemster, Netherlands

Wastewater treatment plants have traditionally been a cost-center for municipalities as treated effluent is often discharged back into the environment with little to no beneficial reuse. This is starting to change as wastewater professionals are finding innovative ways to produce a resource to use or sell. By doing this, operating costs can be cut and ideally Plants can become profit-centers.

For the Netherlands, resource recovery is a main priority and the Beemster Wastewater Treatment Plant (WWTP), near Amsterdam, is an example of this. They decided to optimize their treatment plant by taking advantage of funding from the Eco-innovation program through the European Commission.

#### The Challenge

With funding from the Eco-innovation program, the Beemster WWTP wanted to put into place equipment that would generate sludge with a high concentration of cellulose. Recovered cellulose would be reused for the production of other products.

#### The Solution

Eight SFK600 Salsnes Filters were installed - with 350 micron filtermesh and integrated sludge dewatering - to separate fine cellulose fibers from toilet paper in the wastewater. Fibers are collected and further processed into sugar and in a next stage to lactic acid as a base material for bioplastic.

The WWTP also discovered an added benefit of removing cellulose from the wastewater. The organic loading on their downstream biological process has been reduced, which has lowered the Plant's aeration requirements and energy consumption.



#### System Parameters

**Salsnes Filter: SFK600**  
Type of Treatment: Primary Treatment & Cellulose Recovery

P.E.: 170,000  
Particle Size: 0 - 100 mm  
Dry Weather Flow Rate: 1200 m<sup>3</sup>/h (7.6 MGD)  
Max. Flow Rate: 3600 m<sup>3</sup>/h (22.8 MGD) Rain weather flow  
TSS Removal: 50%  
COD Removal: 30%  
Dewatered Sludge: 40% Total Solids



Eight SFK600 Salsnes Filters installed into channels

Integrated system dewatering produces sludge with 40% Total Solids.





## MUNICIPAL INSTALLATION | Primary Treatment

### Geiranger Wastewater Treatment Plant Stranda, Norway

The Geiranger Wastewater Treatment Plant (WWTP) is located in Norway's Stranda municipality, which for many years has been a popular tourist destination. Geiranger is visited by 160 cruise ships every summer making it the second largest cruise ship port in Norway.

#### The Challenge

On a typical day, the WWTP treats the wastewater for 300 permanent residents. However, in the summer months, treatment capacity must increase substantially to account for a large influx of over 7000 tourists per day.

Treated wastewater is discharged to the Fjord of Geiranger, which is a UNESCO world heritage site. This requires them to meet removal rates of at least 50% TSS and 20% BOD stipulated by the European wastewater directive for less sensitive recipients.

#### The Solution

The Geiranger WWTP installed two SF2000 Salsnes Filters that remove 55-70% TSS from the wastewater. Each filter has a 350 micron filtermesh and integrated sludge dewatering. The way in which the Salsnes Filter system is designed allows it to handle the significant variations in incoming flow that the Plant experiences.

A Control Power Panel that houses a Programmable Logic Controller (PLC) automates system operation. A sensor tells the unit when, and at what speed, to start rotating the filtermesh based on the amount of incoming wastewater. The PLC will then simultaneously start the Air Knife filtermesh cleaning system and the sludge dewatering unit.



#### System Parameters

Salsnes Filter: SF2000  
Type of Treatment: Primary Treatment

P.E.: 2000  
Influent TSS: 100 - 400 mg/L  
Effluent TSS: 45 - 120 mg/L  
Particle Size: 0 - 100 mm  
Max. Flow Rate: 40 L/s (0.9 MGD)  
Dewatered Sludge: 25% Total Solids







## MUNICIPAL INSTALLATION | Primary Treatment

### Daphne Utilities Water Reclamation Facility Daphne, Alabama

Daphne Utilities, situated on the eastern shore of Mobile Bay in Alabama, provides water, sewer and natural gas service to a population of approximately 25,000. Their Water Reclamation Facility (WRF) treats residential and light commercial wastewater at a peak flow of 9 MGD.

Two independent biological treatment trains (activated sludge systems) are serviced by a common headworks and a TrojanUV disinfection system. Treated wastewater is then discharged by gravity into Blakely River.

#### The Challenge

During a process review in 2009, the headworks and effluent outfall lines were found to be areas of concern that were preventing the WRF from reaching its permitted capacity of 4.17 MGD. Peak flows were exceeding hydraulic capacities and high influent BOD and TSS concentrations exceeded design and were negatively impacting downstream treatment processes. Sand and trash were making their way through the headworks which plugged and damaged aerators.

Permit compliance was being maintained since flow and ammonia loadings had not yet exceeded design parameters. However, Daphne Utilities knew they had improvements to make. An upgrade project began, starting with staff members and consulting engineers reviewing various equipment options.

#### Equipment Selection

The foundation of Daphne Utilities centers on providing uninterrupted service to their customers using innovative, efficient and cost-effective solutions. As a result, equipment reliability, durability and ease of maintenance were important considerations. Small footprint was also a key factor, as the WRF had space limitations for expansions. Overall, finding a long-term solution with the lowest possible cost would help provide the best value to their customers.

The Salsnes Filter system met their criteria and was piloted for grit removal, solids separation, sludge thickening and dewatering. It proved to be highly effective delivering significant BOD (30%) and TSS (50%) reductions in influent loading during normal operating conditions. This outcome was able to reduce total loading back to within original plant design. With these positive pilot results, two SF:6000 Salsnes Filters were added to the upgrade plan.



#### System Parameters

Salsnes Filter: SF6000  
Type of Treatment: Primary Treatment

Treatment Capacity: 5 MGD (220 l/s)  
TSS Removal: 50 - 65%  
BOD Removal: 30 - 40%



*Daphne Utilities' Water Reclamation Facility had space limitations for new equipment*



## The Solution

Once installed, their Salsnes Filter system was even more effective than during piloting. Today, BOD loadings are reduced by 30 - 40% and TSS is reduced by 50 - 65%. Sludge is thickened and dewatered within the unit and then transported by screw conveyors into a dumpster. These operations are all automated by a Programmable Logic Controller (PLC). A sensor tells the PLC when to initiate filtermesh rotation which then automatically starts the Air Knife filtermesh cleaning system and sludge dewatering.

The Air Knife cleaning system automatically cleans the rotating filtermesh using a blade of compressed air. Compared to scrapers, brushes or water-based cleaning systems, air is gentler on the mesh to prolong its life and keeps sludge drier for more effective dewatering.

TSS and BOD reductions from the Salsnes Filter have improved the performance of downstream processes. Aerators are virtually trash and sand free which has drastically cut back on maintenance and repairs. It has also eased the demand on blowers which has reduced energy consumption.

Loading reductions have not only restored previously lost capacity but have created surplus capacity. This gained capacity, while not reflected in the current permit, can be utilized in the future to reduce the amount of "new plant construction" required during future upgrades.

## Conclusion

The Salsnes Filter system was able to cost-effectively integrate with other complex and innovative systems in the plant upgrade to successfully address the concerns identified in the headworks. It is part of the best long-term solution for Daphne Utilities, designed to meet current and future wastewater flows, loadings, and wet weather flows.

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"We are extremely pleased with the performance of our Salsnes Filter system. It has been reliable, easy to maintain and it has significantly reduced TSS and BOD loadings. This has enabled us to recover lost treatment capacity at our facility in a cost effective manner. Another plus is the small footprint of the system which allowed it to easily fit into a very limited space within our plant."

**Danny Lyndall**  
General Manager  
Daphne Utilities

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## Egå Wastewater Treatment Plant Aarhus, Denmark

Aarhus Water is a large inter-municipal company responsible for water and sewage in the Aarhus Municipality of Denmark. Wastewater treatment plants can be large consumers of energy, and Aarhus Water's vision is to turn their Plants into modern, energy-producing facilities that are both self-sufficient and even provide green energy to the grid.

To make their vision a reality, they set up an International Ideas Competition that acted as a non-traditional procurement process for the refurbishment of one of their plants; the Egå Wastewater Treatment Plant (WWTP). The winners of the competition would tender their equipment for the plant.

### The Challenge

One of the objectives of the Egå WWTP refurbishment was to install energy-producing treatment equipment that could generate 50% more electricity than what was needed for daily plant operation. At the same time, they wanted to recover 50% of the phosphate load to be reused as fertilizer.

This meant that primary treatment would need to remove and send 60% of incoming carbon to digesters.

### The Solution

Salsnes Filter was one of three winners of Aarhus Water's International Ideas Competition, and in 2016 installed a system for primary treatment at the Egå WWTP. The system consists of eight SFK600 units in a single module treating 2000 m<sup>3</sup>/h (12.6 MGD).

The system helps to produce energy for the plant by providing carbon-rich solids to the digester. A filtermesh with a 350 micron pore size was chosen to allow the system to capture the required 60% of carbon from the wastewater.



### System Parameters

Salsnes Filter: SFK600  
Type of Treatment: Primary Treatment

Influent TSS: 290 - 390 mg/L  
TSS Removal: 60 - 80%  
Influent COD: 400 - 550 mg/L  
COD Removal: 45 - 60%  
Max. Flow Rate: 2000 m<sup>3</sup>/h (12.6 MGD)







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## MUNICIPAL INSTALLATION | Primary Treatment

### Saulekilen Sewage Plant

Arendal, Norway

#### The Challenge

The Saulekilen Sewage Plant in Arendal, Norway is an existing wastewater treatment plant treating a typical municipal mix of wastewater from households, and small and medium-sized industry. The Plant was looking to upgrade plant capacity from 45,000 p.e. to 80,000 p.e, while meeting the following criteria.

Equipment needed to be:

- Compact - in order to fit inside the existing building
- Capable of optimizing sludge production to produce more biogas
- Cost-effective compared to alternatives
- A proven, reliable technology
- Easy to operate

#### The Solution

The Plant chose to install biofilters and a Salsnes Filter system to meet the new 80,000 p.e. capacity requirement.

The Salsnes Filter system performs primary solids separation and consists of six SFK600 units, each with a 350 micron filtermesh and integrated sludge dewatering unit.

Due to its small physical footprint, the system easily fit into the existing building. It was installed on top of the biofilters so that former basins could be available for new bioreactors and clarification of biological solids by Dissolved Air Flotation.

The system removes TSS to reduce loadings on the downstream biological treatment process. The resulting dewatered sludge is sent to methane reactors where biogas is produced for electricity to operate the Plant. Sludge will also be sold as fertilizer to the agriculture market.

Saulekilen estimates that the upgrade cost half that of conventional treatment technologies, saving them approximately 4\$ million USD (25 million NOK).



#### System Parameters

Salsnes Filter: SFK600 Hybrid  
Type of Treatment: Primary Treatment

P.E.: 80,000  
Influent TSS: 234 mg/L  
Effluent TSS: 95 mg/L  
Particle Size: 0 - 100 mm  
Max. Flow Rate: 589 L/s (13.4 MGD)  
Dewatered Sludge: 25% Total Solids



Three of the six SFK600 Salsnes Filters installed at the Plant



## MUNICIPAL INSTALLATION | Primary Treatment

### Tiendeholmen Wastewater Treatment Plant Namsos, Norway

The Tiendeholmen Wastewater Treatment Plant (WWTP), located in Namsos, Norway, was the first plant in the country to install primary treatment to meet the European Commission's wastewater directive 91/27/EEC in May 1991. The WWTP is fully automated and electronically supervised, which allows the operator to run the plant remotely.

#### The Challenge

Influent at the Tiendeholmen Wastewater Treatment Plant (WWTP) is a mix of municipal and small to medium-sized industrial wastewater, including a nearby dairy. Septic and external chemically treated sludge is also delivered to the Plant and mixed with incoming wastewater in the pump station. Periodically, high concentrations of the industrial wastewater comes into the WWTP.

Wastewater is discharged to the fjord, which means the WWTP has to comply with the very stringent criteria of the European wastewater directive for less sensitive recipients. Removal rates for primary treatment must be at a minimum 50% TSS and 20% BOD.

#### The Solution

A 6 mm screen, a sand trap and six SF6000 Salsnes Filters were installed for primary treatment. Each filter has a 350 micron filtermesh and sludge from the system is pumped to dewatering screw presses located above sludge containers.

Removal efficiencies meet or exceed the requirements of the European wastewater directive; 50% TSS and 35% BOD. Due to the flexibility in which the system can operate, it can maintain these removal rates even when the large concentrations of industrial wastewater enter the Plant.



#### System Parameters

Salsnes Filter: SF6000  
Type of Treatment: Primary Treatment

P.E.: 18,000  
Influent TSS: 120 - 360 mg/L  
Effluent TSS: 60 - 180 mg/L  
Particle Size: 0 - 100 mm  
Max. Flow Rate: 300 L/s (6.8 MGD)  
Dewatered Sludge: 26 - 27% Total Solids







## MUNICIPAL INSTALLATION | Primary Treatment

### Tomasjord Wastewater Treatment Plant Tromsø, Norway

#### The Challenge

The Tomasjord Wastewater Treatment Plant (WWTP) is required to comply with the European Commission's wastewater directive for less sensitive recipients, as they discharge into the fjord. This requires that before discharge, they remove at a minimum 50% TSS and 20% BOD.

#### The Solution

Eight SF6000 Salsnes Filters are installed - with 350 micron filtermesh - removing 40-60% TSS. A custom dewatering unit was built for the WWTP. Each line of filters shares one auger that transports sludge to dewatering screw presses, producing sludge with 30-40% dry content.

Cameras, connected to The Cloud, are installed inside the filters to monitor their operation.



#### System Parameters

Salsnes Filter: SF6000  
Type of Treatment: Primary Treatment

P.E.: 38,400  
TSS Removal: 40 - 60%  
Particle Size: 0 - 100 mm  
Max. Flow Rate: 470 L/s (10.7 MGD)  
Dewatered Sludge: 30 - 40% Total Solids





## MUNICIPAL INSTALLATION | Primary Treatment

### Uithuizermeeden Wastewater Treatment Plant Netherlands

#### The Challenge

The Uithuizermeeden Wastewater Treatment Plant (WWTP) needed to expand their existing treatment capacity because a neighbouring WWTP was closing down.

#### The Solution

They chose to install two SF6000 Salsnes Filters with 350 micron filtermesh and integrated sludge dewatering. The system allows them to meet their new capacity requirements and reduce TSS by 30-50% and COD by 15-30%.

The WWTP also uses the system to separate fine cellulose fibers from toilet paper in the wastewater. This recovered cellulose can be used as an ingredient in the production of asphalt to create roadways. The cellulose helps to stabilize the main component of asphalt - bitumen – preventing it from draining away during transportation and placement.



#### System Parameters

Salsnes Filter: SF6000

Type of Treatment: Primary Treatment & Cellulose Recovery

P.E.: 21,300

Particle Size: 0 - 100 mm

Dry Weather Flow Rate: 120 m<sup>3</sup>/h (0.75 MGD)

Fine Screen Capacity: 750 m<sup>3</sup>/h (4.7 MGD) Rain weather flow

TSS Removal: 30 - 50%

COD Removal: 15 - 30%

Dewatered Sludge: 25% Total Solids





With installations around the world and in a variety of applications, the Salsnes Filter system is synonymous with **eco-efficient solids separation technology.**



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