

salsnes
Filter™

Eco-Efficient Solids Separation

Benchmarking **water solutions**

THREE CRITICAL PROCESSES

In a Salsnes Filter system **SOLIDS SEPARATION, SLUDGE THICKENING and DEWATERING** are performed in one compact unit, removing, on average, **50% TSS, 20% BOD and producing drier sludge (20–30% DM)**. A Salsnes Filter system provides primary treatment in a fraction of the footprint, at 30 – 60% lower capital cost and with significantly lower total lifecycle costs when compared to conventional primary treatment. **What's more, sludge handling, transportation and disposal costs are drastically reduced.** Today, Salsnes Filter systems are installed around the world in a variety of applications within municipal wastewater treatment plants and in challenging industrial solids separation applications.

Cost-effective, compact, high-performing, chemical-free and sustainable – the Salsnes Filter system defines eco-efficient.

Seemingly Endless **Applications**

Municipal Wastewater Treatment

- Enhance primary treatment performance
 - without adding chemicals
- Solids separation upstream of secondary processes such as:
 - Oxidation Ditches
 - Sequencing Batch Reactors
 - Biological Aerated Filters
 - Dissolved Air Flotation
 - Moving Bed Bio Reactors
 - Membrane Bio Reactors
- Primary treatment for new plants
- Grit removal after a coarse screen
- Increase primary or secondary process capacity
- Plant expansion where land is expensive or unavailable
- Dig-free, concrete-free solution for mountainous or earthquake-prone areas
- Combined sewer overflow (CSO) treatment
- Stormwater treatment

Industrial Wastewater Treatment

- Aquaculture
- Tanneries
- Pulp & paper
- Slaughterhouses
- Food processing
- Breweries and wineries

All The **Flexibility** You Need

With both Enclosed and Open modular systems, unlimited design flow capacity and the option to install indoors or outdoors, a Salsnes Filter system provides all the flexibility you need.



SF systems are free-standing and enclosed



SFK systems are open for concrete channel installation

The only filter **Design** that can replace conventional primary treatment

Modular, Flexible Design

The modular design of the Salsnes Filter system allows for installation configurations to serve practically any capacity requirement. Single or multiple filters can be easily installed in new or existing facilities thanks to flexible design options.

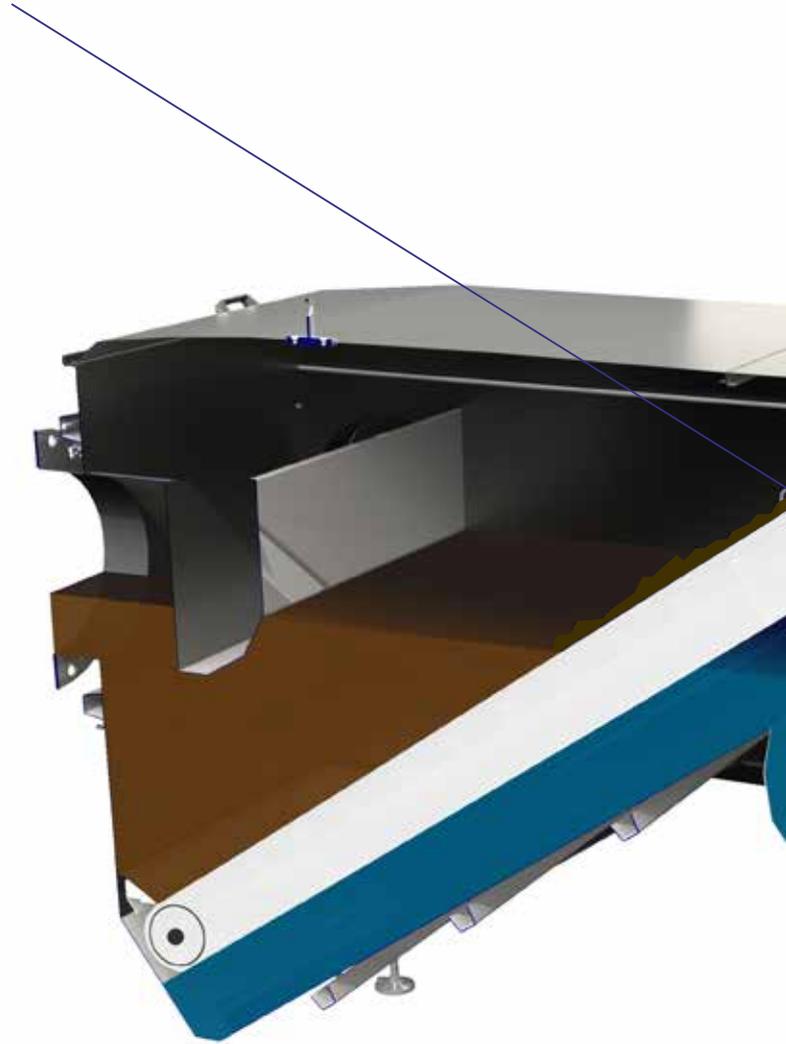


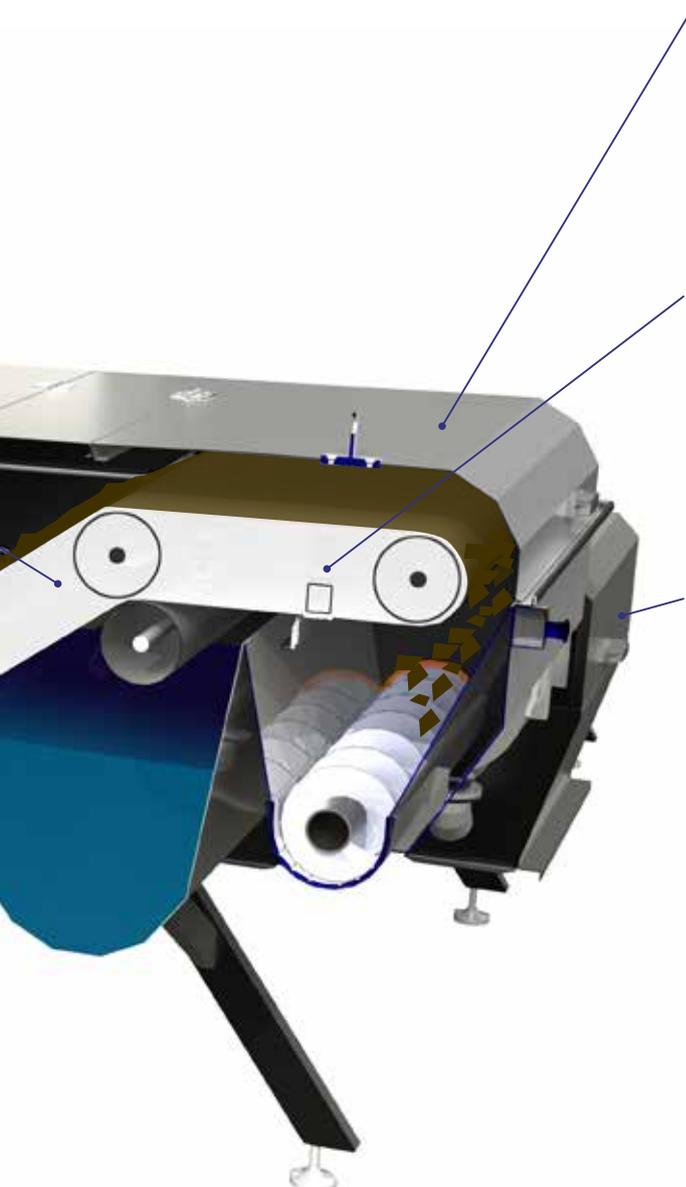
Filtermesh & Cogwheel

The filtermesh is made of polyethylene and is very durable. The way it's mounted and tensioned to the cogwheel is patented - it improves performance and allows the filter to handle higher flow rates and solids loadings, increasing treatment capacity in a smaller footprint.

Control Power Panel (CPP)

The CPP houses a Programmable Logic Controller (PLC) that makes this a completely automated system, ideal for remote or unstaffed facilities. A water pressure sensor tells the unit when to rotate the filtermesh (and at what speed), while the PLC simultaneously starts the Air Knife and sludge screw press.





Access Hatch

Enables quick visual inspections of performance and internal components.

Air Knife

The Air Knife filtermesh cleaning system starts automatically when the mesh begins to rotate. It uses compressed air to clean, which has many benefits compared to scrapers, brushes or water-based cleaning systems. Air is gentler on the mesh (to elongate its life) and on particles (so they don't break into smaller pieces). Air cleaning also keeps sludge drier for more effective dewatering.

Integrated or Stand-alone Dewatering Unit

To save space and money, the enclosed SF system contains an optional integrated dewatering process. Sludge drops into the collection area from the thickening process at 3–8 % DM and



is conveyed across the unit by an auger. It can then be fed to a sludge stabilization process (e.g. direct digester feed); Or processed further through the dewatering unit to produce sludge that is 20 – 30% DM (without the need for any additional dewatering equipment).

For larger installations, a stand-alone dewatering unit is available to dewater sludge from multiple filters. It can apply a higher pressure to produce even drier sludge (20 – 40% DM typical).

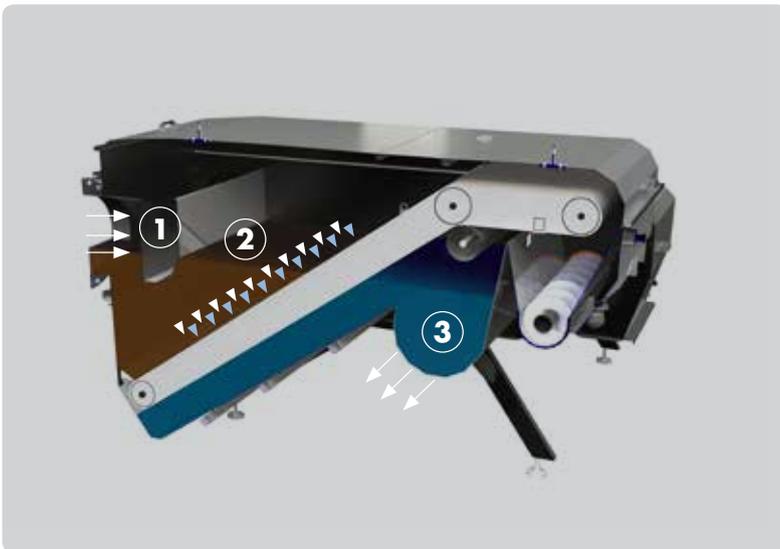
Quick Connects

Allow for fast and easy maintenance.

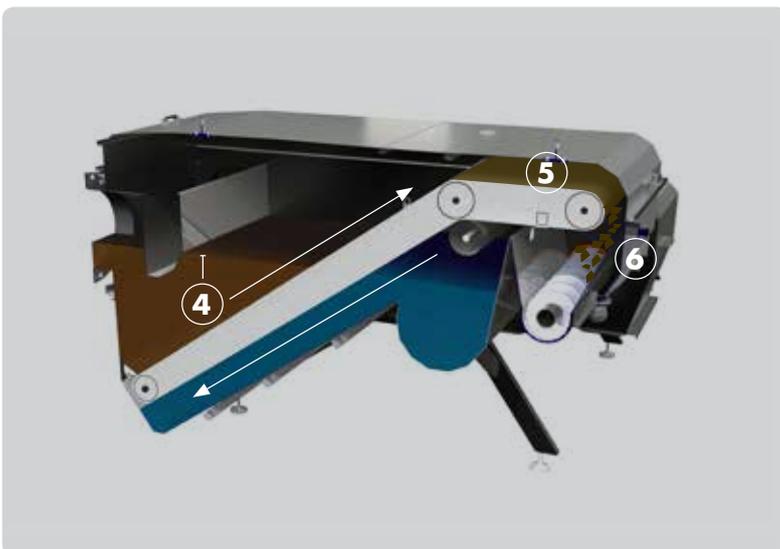


Fully-Automated and Integrated **Process**

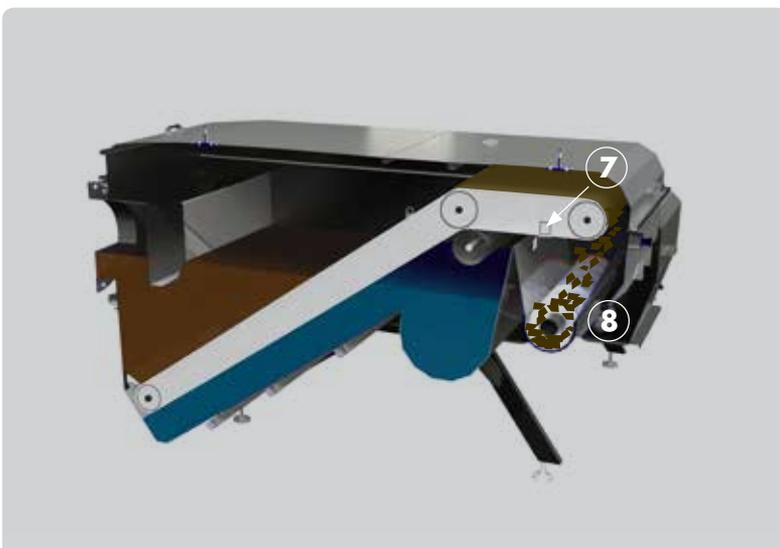
Separation, Thickening and Dewatering - All in one compact unit.



- ① Wastewater enters the inlet chamber.
- ② The solids above the filtermesh create a "filter mat." The mat enhances separation performance as particles build-up on the mesh, creating progressively smaller holes that retain increasingly smaller particles.
- ③ Water that is filtered past the mesh exits through the outlet.



- ④ Wastewater influent rises to a certain level (measured by a sensor) and the filtermesh starts to rotate like a conveyor belt, transporting sludge and enabling the thickening process.
- ⑤ Gravity thickens the sludge to 3–8% DM.
- ⑥ Sludge drops into the collection area.



- ⑦ Using air (not water), the Air Knife automatic cleaning system removes any remaining sludge from the filtermesh into the collection area.
- ⑧ A screw press further dewateres the sludge to 20–30% DM before it exits the unit.

What Are The Overall **Cost** Benefits?

Compared To Conventional Primary Treatment, a Salsnes Filter System Can Offer:

- 30–60% lower investment cost. See **Figure 1**.
 - 1/10th the land requirements. See **Figure 2**.
 - Integrated thickening and dewatering
 - The additional benefit of grit removal in the separation stage
 - Significantly lower lifecycle costs
 - Smaller volume of drier sludge that reduces disposal costs. See **Figure 3**.
 - Less civil works (no concrete basins required)
 - Equal to, or greater removal of TSS & BOD (on average 50% and 20% respectively)
 - Smaller secondary/biological treatment processes (less aeration and/or space needed)
 - Primary sludge with higher energy value
 - Fully-automated equipment
 - Fast and easy maintenance
 - Lower operating costs (no chemicals to purchase)
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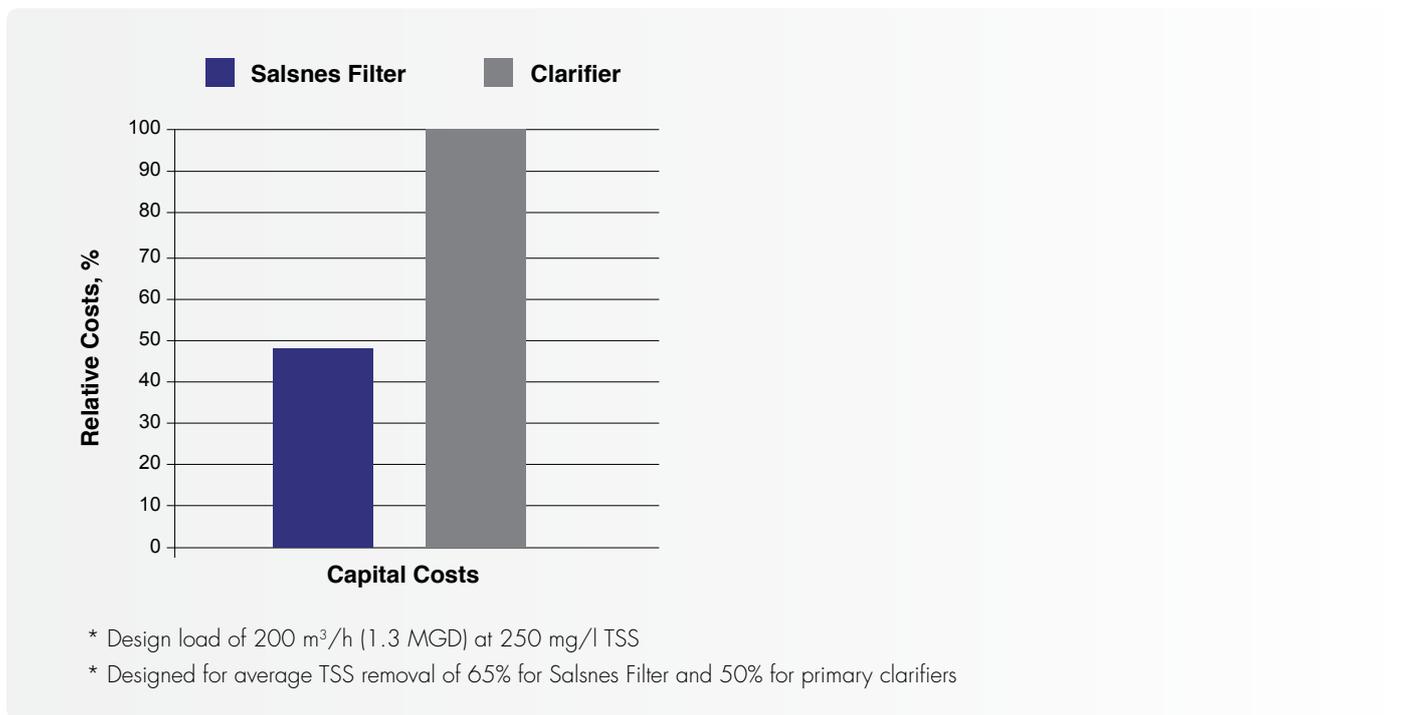


Figure 1. Cost Comparison

The above evaluation was completed by the Norwegian State Pollution Control Agency to discover cost efficient technology that could fulfill the European Union's stringent criteria for primary treatment. As you can see, the savings are substantial. A Salsnes Filter system costs half that of conventional primary sedimentation and clarification.

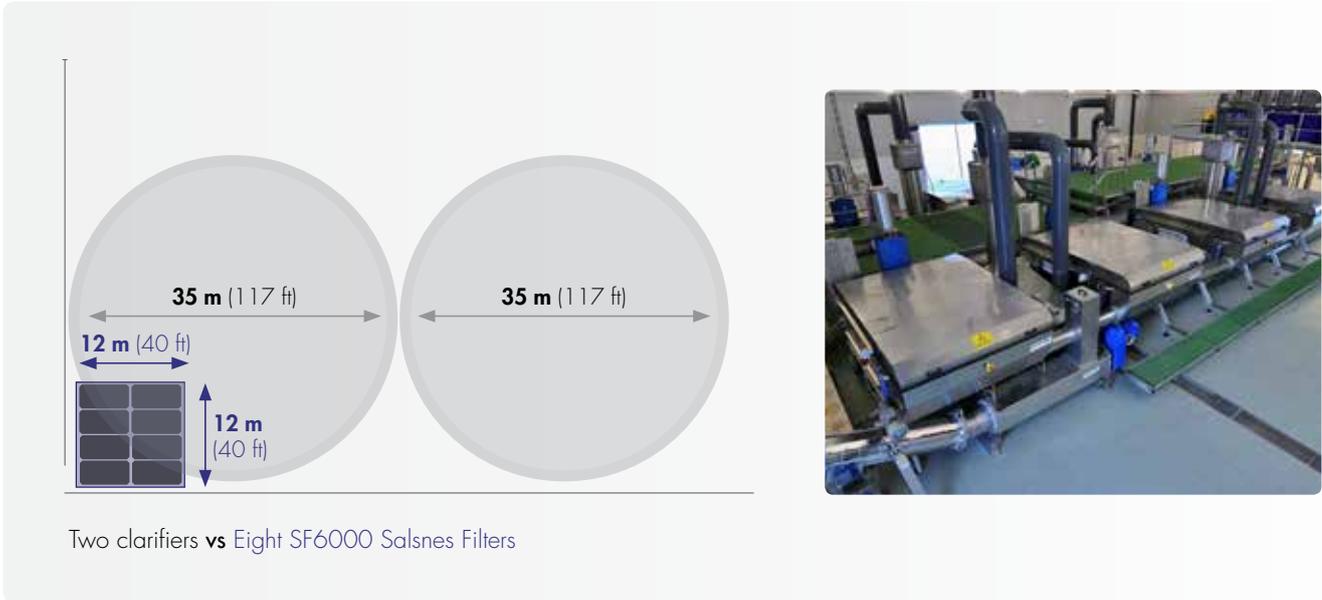


Figure 2. Land Requirements Comparison
 Tomasjord WWTP, Norway - 1,650 m³/h (10.5 MGD)

For those expanding primary or secondary capacity where land is expensive or unavailable, a Salsnes Filter system is ideal. It will typically use 1/10th the land of conventional treatment systems. The Tomasjord WWTP in Norway, shown above, would have needed 2,000 m² (21,530 ft²) of land to install clarifiers. Instead they installed a Salsnes Filter system and only used 150 m² (1,600 ft²) of land.



Figure 3. Sludge Volume Comparison

The integrated thickening and dewatering processes of the Salsnes Filter system can drastically reduce sludge handling, transportation and disposal costs. The dry sludge exiting a Salsnes Filter system is 20 – 30% DM, while primary clarifier sludge can be 2% DM.

There Are Even **Environmental** Benefits

- Less CO₂ produced during construction and operation. See **Figure 4**.
- Less concrete for installation due to small footprint

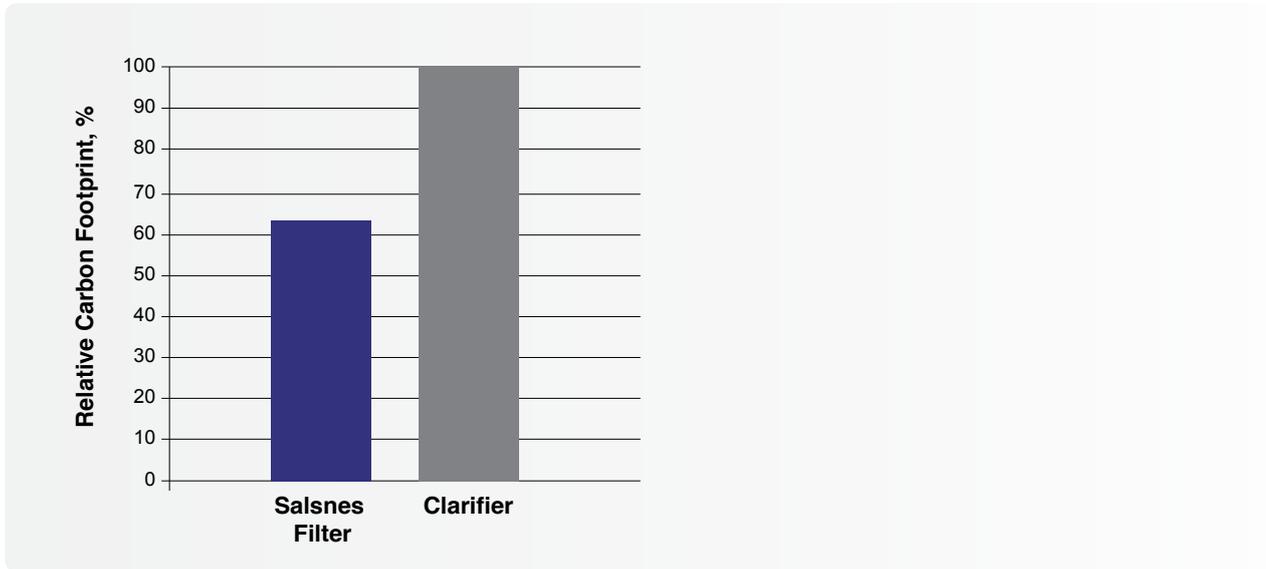


Figure 4. Carbon Footprint Analysis

This carbon footprint analysis compares the Salsnes Filter SF6000 to a clarifier in a 315 m³/h (2 MGD) municipal wastewater treatment plant in North America. It reveals that the Salsnes Filter system has a substantially lower environmental impact mainly because less concrete is required for installation.

| Clarifier | Carbon Footprint (kg CO ₂ e) |
|---|---|
| Making rebar, scrapers and concrete for tanks | 195,033 |
| Scraper replacement | 98,495 |
| Energy requirement (for scrapers, pumps and dewatering) | 428,560 |
| Total (20 years) | 722,088 |

| Salsnes Filter | Carbon Footprint (kg CO ₂ e) |
|--|---|
| Making chamber, filtermesh and building surrounding infrastructure | 4,418 |
| Filtermesh replacements | 2,920 |
| Energy requirement (for filtermesh, Air Knife and screw press) | 452,720 |
| Total (20 years) | 460,058 |

Customer Testimonials



"Our real driver was to reduce the loading on the downstream processes, which was successfully accomplished."

– *Ralph Martini, Plant Operator*
Heyburn WWTP, Idaho, USA



"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, Daphne, AL

Our Company

Operating from Norway since 1991, we have focused on perfecting our solids separation filter technology through research, product development, testing, and quality initiatives. This focus and dedication has produced a highly efficient and reliable filter that maximizes solids separation, while dramatically decreasing costs including capital, operating, maintenance and land. With installations around the world and in a variety of municipal and industrial applications, the Salsnes Filter system is synonymous with eco-efficient solids separation technology.

Salsnes Filter is a brand in the Trojan Technologies group of businesses. www.salsnes-filter.com

About Trojan Technologies

The Trojan Technologies group of businesses offers products under the brands Aquafine, Salsnes Filter, Trojan Marinex, TrojanUV, USP Technologies and VIQUA. Applications and markets served include municipal wastewater, drinking water, environmental contaminant treatment; ballast water treatment; residential water treatment; ultrapurification of water used in food and beverage manufacturing, pharmaceutical processing and semiconductor applications; filtration and solids separation.

Trojan Technologies has offices in the U.K., Canada, Germany, China, France, Australia, Italy, Spain, United Arab Emirates and the U.S. www.trojantechnologies.com

System Specifications

| Model | SF1000 | SF2000 | SF4000 | SF6000 |
|--|--|-------------------------------------|---------------------------------------|--|
| Style | Enclosed, free-standing | | | |
| Material of Construction | 316L Stainless Steel | | | |
| Weight (Dry) | 480 kg (1,058 lbs) | 530 kg (1,168 lbs) | 890 kg (1,962 lbs) | 1,230 kg (2,711 lbs) |
| Standard Electrical Voltages | 480/277V 3 ph, 3 wire + gnd, 60 Hz 400/230V 3 ph, 3 wire + gnd, 50 Hz | | | |
| Typical Operating Power Consumption | 1.4 - 2.8 kW | 1.8 - 3.6 kW | 2.1 - 4.5 kW | 2.8 - 5.5 kW |
| Accreditations (Electrical) | CE, UL, UL approved for Class 1 Div1 | | | |
| Performance | | | | |
| Maximum Hydraulic Flow | 54 m ³ /h (0.3 MGD) | 144 m ³ /h (0.9 MGD) | 288 m ³ /h (1.8 MGD) | 576 m ³ /h (3.7 MGD) |
| Treated Flow (Municipal Wastewater) | 35 m ³ /h (0.2 MGD) | 90 m ³ /h (0.6 MGD) | 160 m ³ /h (1.0 MGD) | 325 m ³ /h (2 MGD) |
| Maximum Head Loss | 440 mm (17") | 300 mm (12") | 330 mm (13") | 350 mm (14") |
| TSS Removal Efficiency | 30 – 80% (design dependent) | | | |
| BOD Removal Efficiency | 15 – 40% (design dependent) | | | |
| Sludge Dry Matter After Thickening | 3 – 8% | | | |
| Sludge Dry Matter After Integrated Dewatering Unit | 20 – 30% | | | |
| Dimensions | | | | |
| Length x Width x Height (complete unit) | 1.5 x 1.3 x 1.5 m (5 x 4.4 x 4.9') | 2 x 1.7 x 1.3 m (7 x 5.5 x 4.5') | 2.5 x 2.0 x 1.6 m (8 x 6.5 x 5.2') | 2.8 x 2.5 x 1.8 m (9 x 8.1 x 6') |
| Inlet Diameter (pumped/gravity) | 100 mm DIN (4" ANSI) | 150/200 mm DIN (6"/8" ANSI) | 200/350 mm DIN (8"/14" ANSI) | 250/400 mm DIN (10"/16" ANSI) |
| Outlet Diameter | 150 mm DIN (6" ANSI) | 250 mm DIN (10" ANSI) | 350 mm DIN (14" ANSI) | 400 mm DIN (16" ANSI) |
| Overflow Diameter | Combined with outlet | | | |
| Bottom Drain Diameter | N/A | 100 mm DIN (4" ANSI) | | |
| Water Connection | 13 mm BSP (½" NPT) | | | 19 mm BSP (¾" NPT) ½" NPT for UL Div1 |

| Model | SFK200 | SFK400 | SFK600 |
|---|--|---------------------------------------|--|
| Style | Concrete open channel (by others) | | |
| Material of Frame | 316L Stainless Steel | | |
| Weight | 510 kg (1,124 lbs) | 630 kg (1,389 lbs) | 745 kg (1,642 lbs) |
| Standard Electrical Voltages | 480/277V 3 ph, 3 wire + gnd, 60 Hz 400/230V 3 ph, 3 wire + gnd, 50 Hz | | |
| Typical Operating Power Consumption | 1.3 - 3.1 kW | 1.6 - 4.0 kW | 2.3 - 5.0 kW |
| Accreditations (Electrical) | CE, UL, UL approved for Class 1 Div1 | | |
| Performance | | | |
| Maximum Hydraulic Flow | 144 m ³ /h (0.9 MGD) | 288 m ³ /h (1.8 MGD) | 576 m ³ /h (3.7 MGD) |
| Treated Flow (Municipal Wastewater) | 90 m ³ /h (0.6 MGD) | 160 m ³ /h (1.0 MGD) | 325 m ³ /h (2 MGD) |
| Head Loss | 400 mm (16") | | |
| TSS Removal Efficiency | 30 – 80% (design dependent) | | |
| BOD Removal Efficiency | 15 – 40% (design dependent) | | |
| Sludge Dry Matter after Thickening | 3 – 8% | | |
| Sludge Dry Matter After Stand-alone Dewatering Unit | 20 – 40% | | |
| Dimensions | | | |
| Length x Width x Height (frame) | 2.4 x 1 x 1.2 m (8 x 3.3 x 4.2') | 3 x 1.3 x 1.3 m (9.6 x 4.3 x 4.5') | 3 x 1.8 x 1.4 m (9.6 x 5.9 x 4.7') |
| Overflow | Arranged in channel wall | | |
| Water Connection | 13 mm BSP (½" NPT) | | 19 mm BSP (¾" NPT) ½" NPT for UL Div1 |