

Fiber Disc Filter



MAAGAN FILTRATION
Pure Innovation - Clear Solutions



Filter Characteristics:

Filtration Degree	3 micron
Unique Features	High filtration surface area Extremely low delta pressure Small foot print
Recommended usage	Desalination pre treatment Industrial WW reuse Municipal Tertiary treatment Industrial Utility water reuse



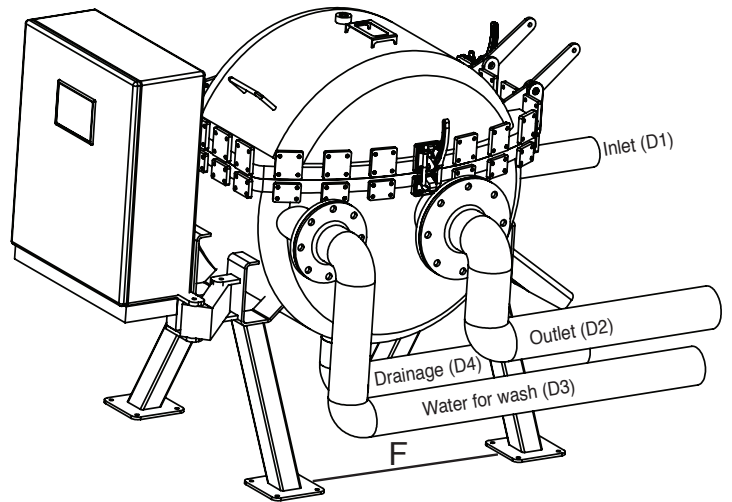
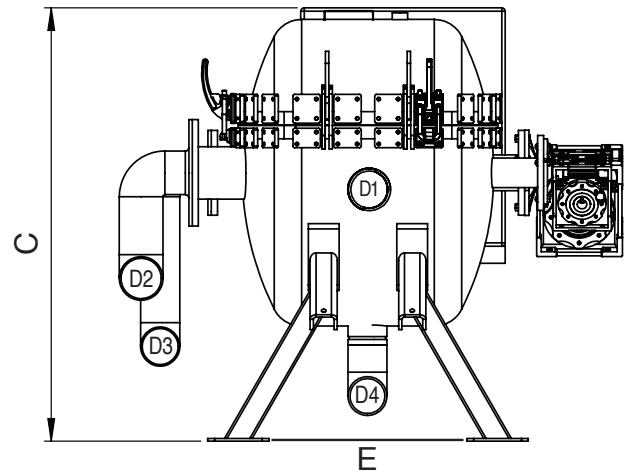
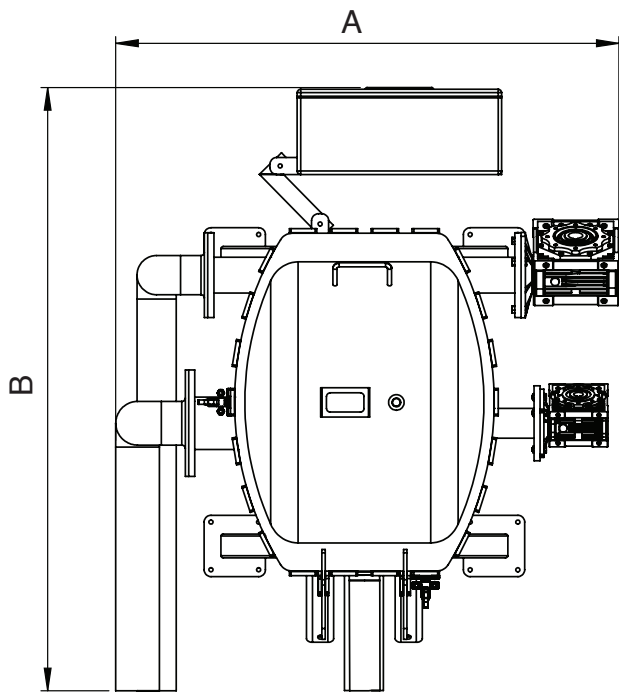
Scan for technical illustration movie

Technical Specifications:

Parameter	Model	FDF 50	FDF 100	FDF 150
Recommended Capacity (M ³ /h)		30 - 50	60 - 100	120 - 150
Filtration Degree (Micron)		3		
Filtration Surface Area (cm ³)		55,000 - 88,000	110,000 - 175,000	220,000 - 265,000
Working Pressure (Bar)		0.5 - 8		
Working Temperature (°c)		10 - 80		
Self Cleaning Capacity (M ³ /h)		2 - 3	4 - 6	7.5 - 9
Self Cleaning Duration		Up to 8 Minutes		
Self Cleaning Initiating Parameters		Differential Pressure, Time Intervals, Manual		
Weight (Kg)		Approx. 420	Approx. 550	Approx. 700
Electrical Panel		220/380/440 VAC 50/60 Hz, 3 Phase. IP64		
Control Unit		24 V AC/DC		
Housing Material		Cast Iron / Steel with Epoxy coating		
Fibers Material		Polyester		
Internal parts Material		Reinforced PP		
Seals Material		NBR		
Connections		Threaded		



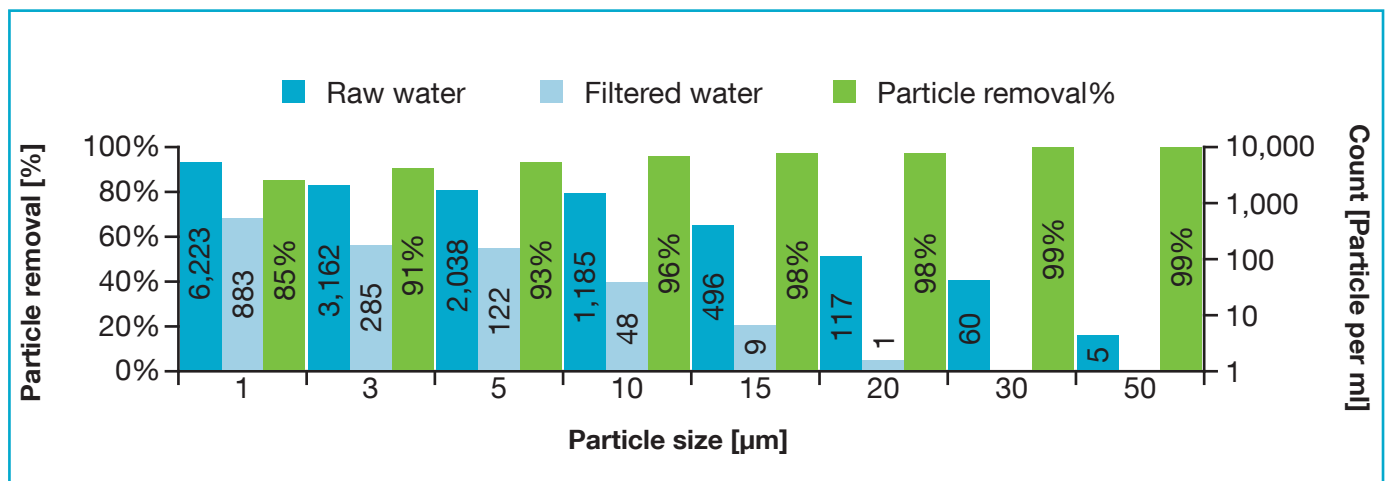
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Dimensional Drawings:

Model	Max. Flow (M ³ /h)	D1 / D2 Inlet / Outlet	D3 Wash Inlet	D4 Drainage	A (mm)	B (mm)	C (mm)	E (mm)	F (mm)
FDF 50	50	3"	2"	4"	1500	1771	1272	650	780
FDF 100	100	4"	2"	4" / 5"	2200	1771	1272	950	780
FDF 150	150	6"	3"	6"	2900	1771	1272	1150	780

Fiber Disc Filtration Efficiency



Aqua culture application (most particles are phyto planktons) January 2018



Project ID



The array of Sand filters in Afkey Mayaim Desalination plant

IDE Technologies | 

Location: Afkey Mayim – ISRAEL

Year: 2020

Application: Brackish Water Reverse Osmosis (BWRO) Pre-Filtration

Goal: SDI and Particles Reduction

Pilot Capacity: 2 m³/h

Full Scale Capacity: 350 m³/h

The Challenge

- Frequent clogging of existing Reverse Osmosis membranes (RO) and Cartridges pre-treatment as a result of organic and biological fouling that led to extensive operational costs.
- High SDI and particles concentration. Most particles are in the 1-7 micron range.
- Variation in water quality (two different water sources). SDI varied between 6 to over 40 (immeasurable).

Parameter	Existing Values	Required Values
Removal of Particle of 2 microns and above	Particle concentration of 2 microns or more varied between 900-29,000 particles per ml	> 80% @ 90% of measurements
SDI ₁₅	Up to > 40 (immeasurable)	< 5 @ 80% of the measurements
Hydraulic Stability		Stable process of the filter (defined by flow rate and pressure drop)

Solution

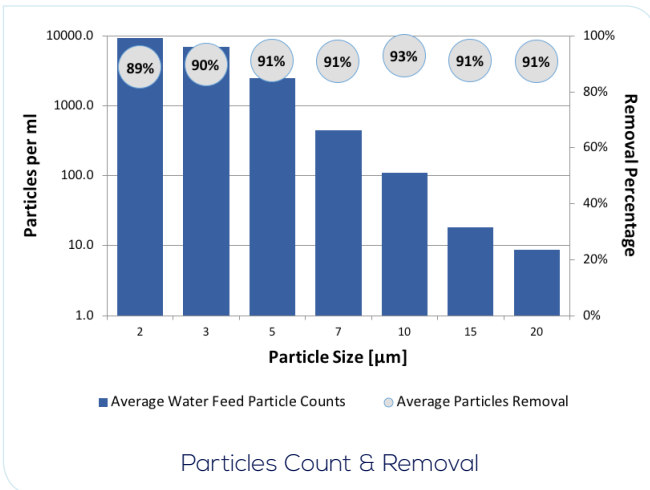
A 2 m³/h Fiber Disc Filter pilot unit which is designed for efficient filtration of fine particles in high containment water sources was running for 5 consecutive weeks at 'Afkey Mayim' desalination plant. The Fiber Disc Filter was located on a downstream of sand filters.

The Fiber Disc Filter constantly recorded the hydraulic parameters of flow and differential pressure. Manual testing of particle counts (on filter inlet and outlet) and SDI₁₅ (on filter inlet and outlet) was performed a few times every week.

Results

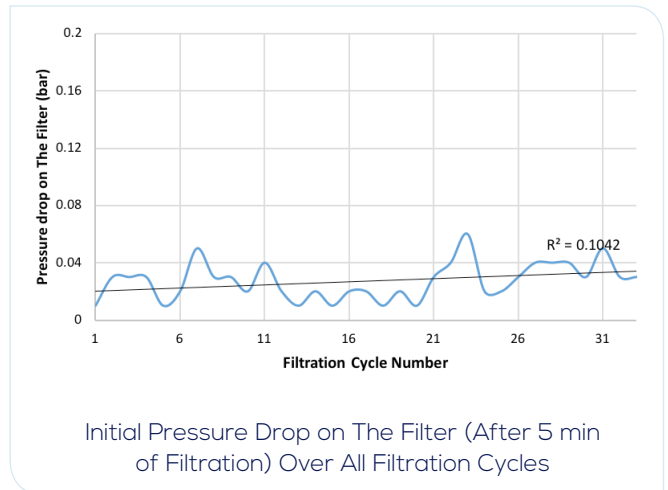
The Fiber Disc Filter achieved, on average, 89% removal of 2 or more micron particles with highly challenging inlet particle concentration (the max. removal of 2 micron particles was 98%).

The outlet SDI was between 3.08-5.44 (average of 4.1), and SDI < 5 for more than 80% of the data collected, while inlet SDI was between 5-40.



The initial pressure drop on the filter (after washing) remain around 0.03 bar, which indicates good cleaning of the filter. The pressure drop on the filter does not surpass 0.3 bar and even with hard water conditions, the filter performs the same.

Backwash frequency was in average every 9 hours, resulting in less than 1% yield for backwash (comparing to more than 4% for Sand filters).



Parameter	Required Values	Values Achieved
Particle removal of 2 or more microns	> 80% @ 90% of measurements	✓
SDI ₁₅	< 5 @ 80% of the measurements	✓
Hydraulic stability (defined by flow rate and pressure drop)	Filter had a stable process for the entire pilot period	✓



Conclusions

The consistent particle and SDI removal rates, with the stability of the initial pressure drop at 0.03 bar throughout the test period indicates that the Fiber Disc Filter is able to perform steadily and efficiently as a pre-filtration stage in very harsh brackish water Desalination. That is especially promising given the challenging water conditions on site.

The extremely low pressure drop throughout the tests indicates the low energy requirement for filter operation, and the filter ability to operate even at very low inlet pressure conditions.



Brackish Water Desalination

Case Study



Project ID



Maagan Desalination is the largest Brackish water desalination plant in Israel. Almost 1000 cartridges are dumped every time.

Maagan Desalination

Location:	Maagan Michael – ISRAEL
Year:	2020
Application:	Brackish Water Reverse Osmosis Pre-Filtration
Goal:	Particles Reduction (less cartridges and membranes replacement)
Pilot Capacity:	24 m3/h
Full Scale Capacity:	1,650 m3/h

The Challenge

- Existing treatment of 25 micron screen filters and 1 micron cartridges, do not succeed in retaining the small particle concentration and turbidity (most particles are in the 1-5-micron range), which enter the RO membrane.
- Mix of dissolved iron with silt minerals (sand) and organic particles result in the need for frequent cartridge replacement (every few weeks) due to intensive fouling.
- Recurrent clogging of existing Reverse Osmosis membranes (RO) due to bio-fouling and mechanical wear caused by micron size sand particles.

The plant intends to replace the 25 micron screen in the coming years, and therefore, checked few alternatives; among them a 10 micron screen filter and our Fiber Disc filter.

Parameter	Required Values
Removal of particle of 1 micron and above	> 85% removal rate @ 90% of measurements
Comparing particle's removal with existing 1-micron cartridges	≥ Removal rate compared to two cartridges systems @ 80 % of measurements
Comparing particle's removal with a 10-micron pilot screen filter	> Removal rate compared to 10-micron screen filter @ 95% of measurements
Hydraulic stability	Stable process of the filter (Defined by flow rate and pressure drop)

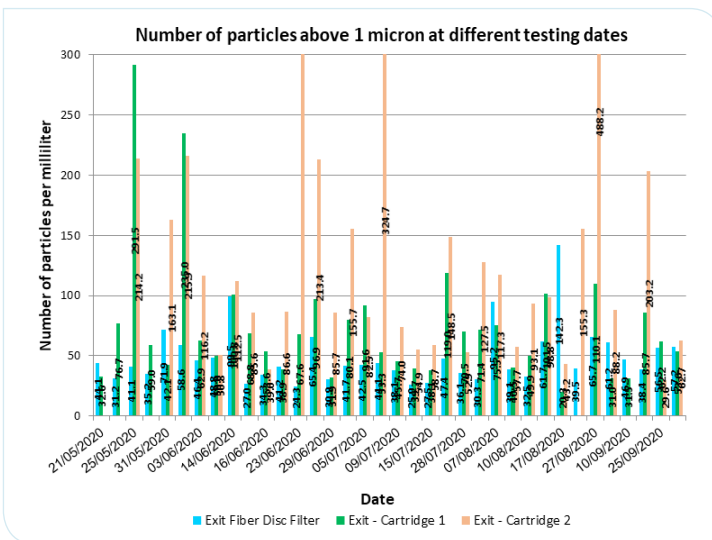
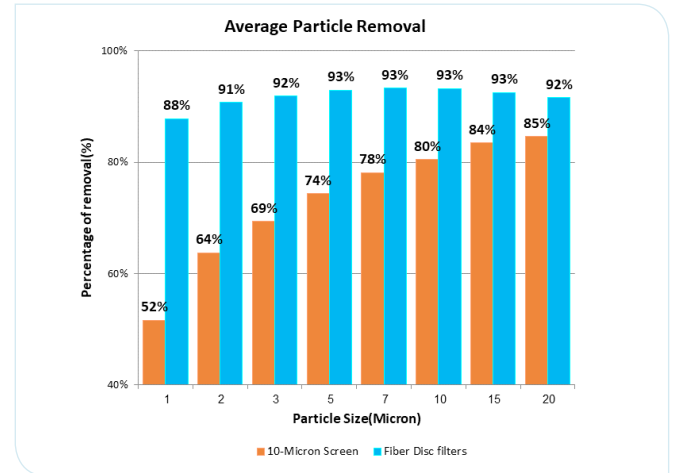
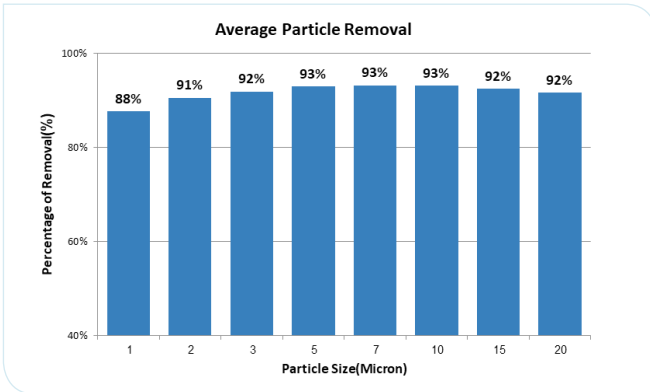
Solution

A 24m³/h Fiber Disc Filter, of Maagan Filtration, which designed for efficient filtration of fine particles, was purchased, installed and running since May 2020, at the Maagan Desalination plant. The Fiber Disc Filter was located on the entrance point to the pre-RO treatment in parallel to 25-micron screen filter by Amiad. The Fiber Disc Filter constantly recorded the hydraulic parameters of flow and differential pressure. A manual testing of particle counts and turbidity was performed at least once a week on the filter inlet and outlet and on two systems of cartridges. Results were also compared to a 10 micron screen filter pilot that was installed earlier at the same point on site.

Results

The Fiber Disc Filter achieved, on average, 88% removal of 1 micron particles or more, when max. removal of 1 micron particles was 98%. Above 2 micron, and despite a very low number of particles, the filter has reached removal greater than 90% in all sizes measured.

In comparison to the 10-micron screen filter that was tested as well, the Fiber Disc Filter provided a much better filtration result. The smaller the particle size was; the greater the difference in performance. The actual number of particles of all sizes at the Fiber Disc Filter filtrate was 3 to 5 times less than on the screen filter.



The quality of the Fiber Disc filtered water was as good or better than existing 1-micron cartridges filtrate, in almost all tests and in total average.

The initial pressure drop on the filter (after washing) remained at around 0.03 bar, which indicates good cleaning of the filter. The pressure drop on the filter did not surpass 0.1 bar, and was 0.05 bar on average as compared to 0.15 bar of the screen filter, and the same dP on the cartridges system.

Backwash frequency was every 8 hours, as compared to the washing frequency of once every hour with the 25-micron and 10-micron screen filters.

Parameter	Required Values	Values Achieved
Particle removal of 2 or more microns	> 80% @ 90% of measurements	✓
Comparing to existing 1 micron cartridges	Removal ≥ @ 80% of measurements	✓
Comparing to Screen filter of 10 micron	Removal > @ 95% of measurements	✓
Hydraulic stability (Flow rate and pressure drop)	Stable process during entire operating period	✓



Conclusions

The Fiber Disc filter filtration results were extremely efficient, reflecting much better and finer filtration than the existing screen filter (and a potential 10 micron screen filter), proving fiber filtration is superior to screen filter technology. The low frequency of backwashes (due to our large filtration area) resulted in less than 0.4% yield for backwash (comparing to more than 2% for the screen filters). Energy demand of our filter is about 1/6 of the combined solution of screen filter + cartridge. The removal of particles above 1 micron was as efficient with the Fiber Disc Filter as it was with the entire chain of filtration combining screen filters and 1-micron cartridges.

The Fiber Disc Filter can be a viable solution for pre-RO treatment of brackish water, replacing screen filters, or even both stages of screen filters and cartridges filters.



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Project ID

Company:	Tuaspring Seawater Desalination Plant	
Location:	Singapore	
Year:	2018	
Application:	SeaWater Reverse Osmosis (SWRO) Pre-Filtration	
Goal:	Turbidity, suspended solids and SDI reduction	
Pilot Capacity:	2.5 m ³ /hour	
Full Scale Capacity:	10,000 m ³ /hour	



The Challenge

- Variation in sea water quality. For example: turbidity varied between 1-20 NTU.
- Frequent clogging of existing Ultra-Filtration (UF) and cartridge pre-filtration as a result of organic and biological fouling. That led to intensive operation costs.
- Frequent clogging of RO membranes. That led to intensive operation costs.

Parameter	Existing Values	Required Values
Turbidity (NTU)	< 20	< 1 @ 90% of the time
Total Suspended Solids(TSS) (mg/L)	< 40	< 1 @ 80% of the time
SDI	Non Magerable	< 5@ 80% of the time

Solution

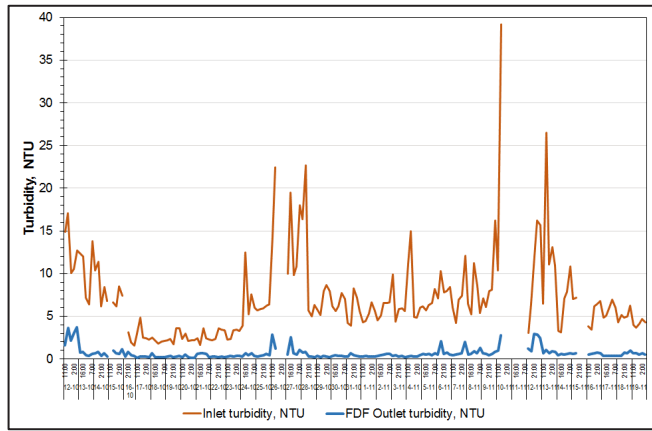
A 2.5 m³/h Fiber Disc Filter pilot unit ran at Tuaspring Desalination plant for 6 consecutive weeks. The Fiber Disc Filter was located on a side stream after a preliminary filtration of 150 micron.

The Fiber Disc Filter ran in automatic mode, constantly recording the hydraulic parameters of flow and differential pressure, with daily manual sampling of TSS, Turbidity (on filter inlet and outlet) and SDI (on filter outlet).



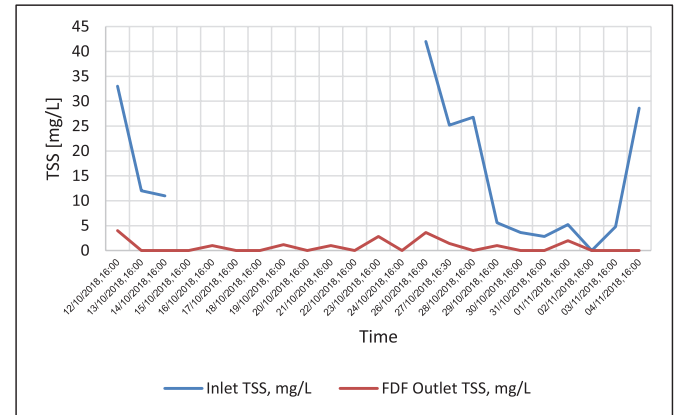
Results

The filter achieved >93% turbidity removal with highly challenging inlet turbidity (average of 7-8 NTU), and SDI15 < 5 for 78% of the data collected, corresponding to inlet turbidity of less than 10 NTU.



Fiber Disc Filter performance - inlet vs. outlet turbidity over time

Throughout these six consecutive weeks, the general filtrate suspended solid concentration was consistently low, < 1 mg/L while the inlet concentration was above 10 mg/L most of the time.



Fiber Disc Filter performance - inlet vs. outlet TSS over time

Delta pressure throughout the tests was extremely low-around 50 cm of water.

Parameter	Required Values	Values Achieved
Turbidity (NTU)	< 1 @ 90% of the time	✓
Total Suspended Solids (TSS) (mg/L)	< 1 @ 80% of the time	✓
SDI	< 5 @ 80% of the time	✓

Conclusions

The consistent turbidity and suspended solids removal, and achieving the required SDI indicates that the filter is able to perform steadily and efficiently as a pre-filtration stage in Tuaspring Seawater Desalination Plant. That is especially promising given the challenging sea water conditions which were detected on site.

The extremely low delta pressure throughout the tests indicates the low energy requirement for filter operation, and the ability to operate it even with very low inlet pressure conditions.



Project ID



Hadera Paper Industries is the largest plant in Israel for the production and recycling of paper.

Hadera Paper Industries



Location:	Israel
Year:	2018- to date
Application:	Industrial effluent filtration for reuse
Goal:	Turbidity, Suspended solids and fine particles reduction before Ultra Filtration
Pilot Capacity:	6 m ³ /hour
Full Scale Capacity:	450 m ³ /hour

The Challenge

The effluent of Hadera Paper Industries is going through the following processes:

- Biological anaerobic-aerobic treatment.
- Softening.
- Coagulation-flocculation- lamella separation.
- Sand filtration.

Effluent contains substantial amount of calcium carbonate crystals+ high load of suspended solids and colloidal matter. Consequently the sand filter tends to block, hence, its performance deteriorates.

Also , from time to time, there are peaks of very high influent turbidity (containing high load of starch), which irreversibly defers the functionality of the sand filters.

Parameter	Existing Values	Required Values
Turbidity (NTU)	< 80	Above 80% reduction @ 80% of the time
Total Suspended Solids(TSS) (mg/L)	< 50	Above 80% reduction @ 80% of the time
Particles above 5 micron	Less than 100,000	> 90% reduction @ 80% of the time
Delta pressure on the filter	Non stable. Sometimes above 1 bar	Stable. < 0.5 bar @ 80% of the time

Solution

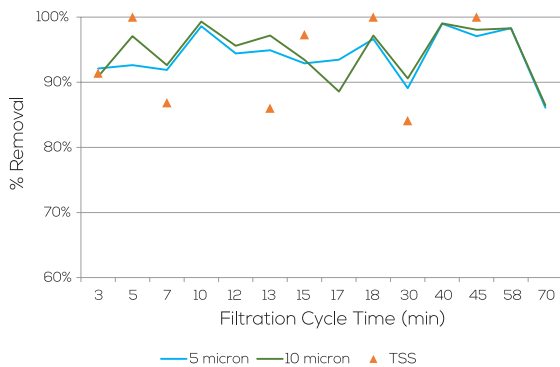
For the last 8 months, a 6 m³/hr Fiber Disc Filter pilot unit has been running at Hadera Paper Industries, parallel to existing sand filter. The fibers were specially adjusted to operate with high TSS loaded effluent.

The Fiber Disc Filter runs in an automatic mode, constantly recording the hydraulic parameters of flow and differential pressure, with manual sampling of TSS & Turbidity (on filter inlet and outlet) every few days.

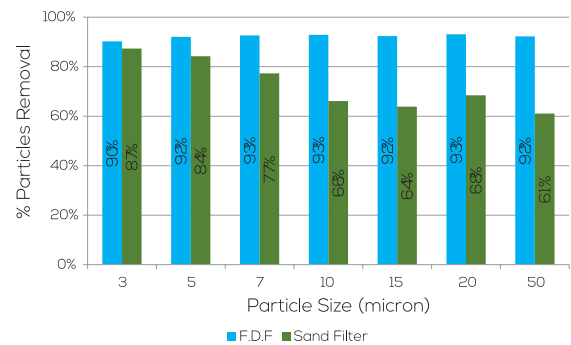


Results

The Fiber Disc Filter achieved on average above 93% reduction of particles above 10 micro, above 91% reduction of particles above 5 micron and above 90% reduction of TSS. Hydraulically the Fiber Disc Filter is performing much better than the sand filter throughout the tested period. Delta pressure on the filter does not surpass 0.3 bar and the filter performs even on hard water conditions. During that period, the sand filter is frequently blocked.



Average 5 & 10 micron particles and TSS percentage reduction in a filtration cycle (average of 80 constitutive filtration cycles).



Particles percentage reduction - comparison with sand filter.

Parameter	Achieved Values
Turbidity (NTU)	Above 90% reduction @ 80% of the time ✓
Total Suspended Solids (TSS) (mg/L)	Above 90% reduction @ 80% of the time ✓
Particles above 5 micron	> 90% reduction @ 80% of the time ✓
Delta pressure on the filter	Stable < 0.5 bar @ 80% of the time ✓

Conclusions

The consistent turbidity, TSS and particles removal, with delta pressure not rising above 0.3 bar throughout the test period indicates that the Fiber Disc Filter performs much better than the existing sand filters.

That is especially promising given the challenging Effluent conditions. During these peaks the Sand Filters were clogged while the Fiber Disc Filter did not.



Municipal Waste Water | Case Study



Project ID



TNUVOT Municipal Wastewater Treatment Plant treats around 7,000 m³/day of effluent, which is used for nearby fruits and vegetable non-limited irrigation. The plant is operated by Electra Greentech.

Tnuvot Municipal Wastewater Treatment Plant



Location:	TNUVOT, Israel
Year:	2019
Application:	Municipal Wastewater Tertiary Treatment
Goal:	Suspended solids, Turbidity and fine particles reduction for agriculture irrigation, compared with existing sand filters
Pilot Capacity:	6.5 m ³ /hr
Full Scale Capacity:	300 m ³ /hr

The Challenge

Tnuvot effluent tertiary treatment plant consist of 6 multi media filters, 2.5 meter diameter each. Total filtration area is 30 m². That gives 10 m/h of filtration velocity which is on the low conservative side for this application.

The sand filters requires high operational costs:

- around 10% of water yield for back wash.
- High concentration of chlorine requirement for the quartz sand media functionality preservation.
- high energy demand, mainly as a result of high delta pressure development on the filters and frequent demand for backwash.

Delta pressure on the sand filters is not stable and tend to rise above 0.5 bar, mainly as a result of:

- Biological fouling development within the media.
- Peaks of sludge coming from the secondary clarifier from time to time. Consequently, the functionality of the sand filters deteriorates.

Parameter	Existing Values before sand filtration	Existing Values after sand filtration	Required Values after tertiary filtration
Total Suspended Solids (TSS) (mg/L)	< 15 @ 80% of the time	< 5 @ 50% of the time	< 5 @ 80% of the time
Turbidity (NTU)	< 10 @ 80% of the time	< 5 @ 50% of the time	< 3 @ 80% of the time
Particles above 5 mi-cron (per ml)	< 15,000	> 50% reduction @ 80% of the time	> 90% reduction @ 80% of the time
Delta pressure on the filter (bar)		Non Stable. < 0.5 @ 50% of the time	Stable. < 0.5 @ 80% of the time

Solution

For over then 3 months, a 6.5 m3/hr MAAGAN FILTRATION Fiber Disc Filter pilot unit is running at TNUVOT WWTP, parallel to an existing sand filtration system.

The Fiber Disc Filter operates in automatic mode, constantly recording the hydraulic parameters of flow and differential pressure, with routine manual sampling of TSS, Turbidity and particles counts (on filters inlet and outlet). Chlorinated filtrate is used as the source for the back wash.



Effluent Tertiary Treatment plant- General view

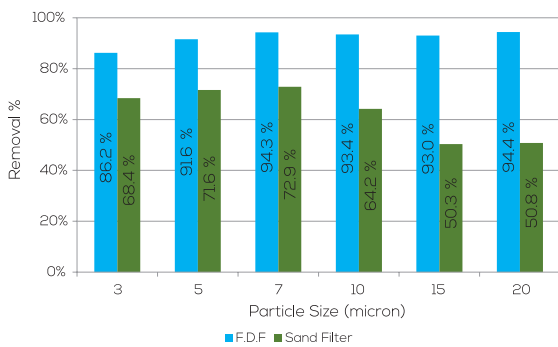
Results

The Fiber Disc Filter achieved, on average, above 93% reduction of particles above 10 micron and above 91% reduction of particles above 5 micron.

Average concentration of TSS after the Fiber Disc Filter was 2.1 mg/L, while average of TSS inlet was 6.7 mg/L. Average of turbidity after the Fiber Disc Filter was 2.6 NTU.



Fiber Disc Filter pilot unit- General view



Comparison between Sand Filters and Fiber Disc Filter particles average percentage removal

Parameter	Achieved Values
Total Suspended Solids (TSS) (mg/L)	< 3 @ 80% of the time ✓
Turbidity (NTU)	< 3 @ 80% of the time ✓
Particles above 5 micron (per ml)	> 90% reduction @ 80% of the time ✓
Delta pressure on the fil-ter (bar)	Stable. < 0.5 bar @ 80% of the time ✓

Conclusions

During the tested period the FIBER DISC FITLER of MAAGAN FILTRATION hydraulic performance was steady.

That is impressive especially given a two weeks period during which a peak of high load of sludge (measured with turbidity above 60 NTU) ran through the filter, with no damage to filter functionality. During that period delta pressure on the sand filter rose to around 1 bar, and its performance deteriorated. Given results so far MAAGAN FILTRATIONS' FIBER DISC FILTER can be used as a better alternative to sand filters in effluent tertiary treatment application, with the following advantages:

- Better performance regarding TSS, Turbidity and fine particles removal
- Hydraulic stability
- Lower foot print
- Lower operational costs