



AQUAMETRICS ENVIRONMENTAL

Master Distributor Watch Water® Products



CRYSTOLITE™

MICROFILTRATION MEDIA, SDI REMOVAL

Crystolite™ Filtration

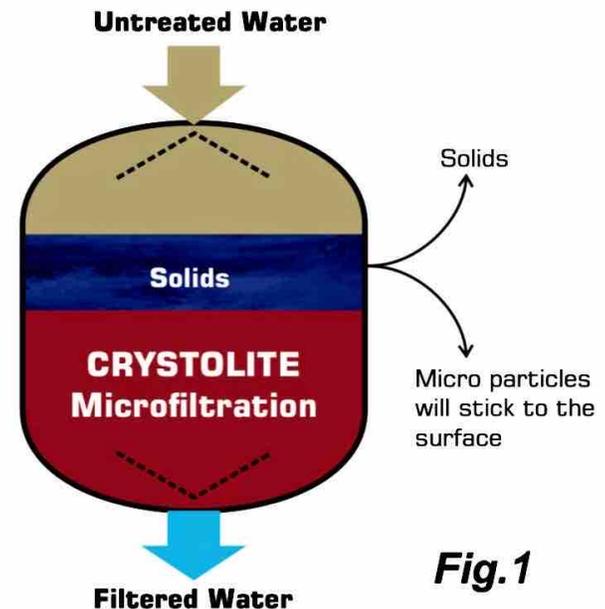
As a global leader in absorbents technology and iron and manganese removal filtration, Watch-Wate® has developed a unique industrial water and waste water treatment filtration solution.

For micro filtration, filtration media **Crystolite™** (CFM) is very robust, long life, back washable filter media.

Crystolite™ filtration media meets the needs of all industrial, municipal, residential and water reuse for any application. This unique, high-capacity media is designed to reduce the waste of expensive cartridges and plastic filter housings.

Working Principle

Using **Crystolite™** media in a pressure vessel to provide a micro filtration effect, the **Crystolite™** media allows the water to flow through the top distributor on the top of media layer, when suspended solids are held on the highest surface area of the media allows only clean water to flow through the **Crystolite™** media. As a result, **Crystolite™** can be used to filter down **0.5 microns** with out clogging. It allows all suspended solids to accumulate on the surface of the **Crystolite™** media and are easily back washed to drain. The system can be designed either manual backwash or by using automatic backwash cycle, the backwash cycle is maximum 10 minutes which uses 80% less water then any traditional anthracite or multimedia filters, it is because 90% of the solids are captured on surface and not inside of the **Crystolite™** media-bed. This results if the High-tech filtration that can filter solids and particles down to submicron levels at 10 to 15 times the flow rate of all traditional filters. Backwash water reduction is up to 80%.



Applications

- Ammonia removal
- Trace heavy metal removal
- Pretreatment of RO
- Power stations
- Steel and iron mills
- High solids waste water
- Zero blown down
 - ◆ Cooling towers
 - ◆ Boiler water
- Swimming pools
- Circulation plants for
 - ◆ Plating processes
 - ◆ Printed circuits



CRYSTOLITE™

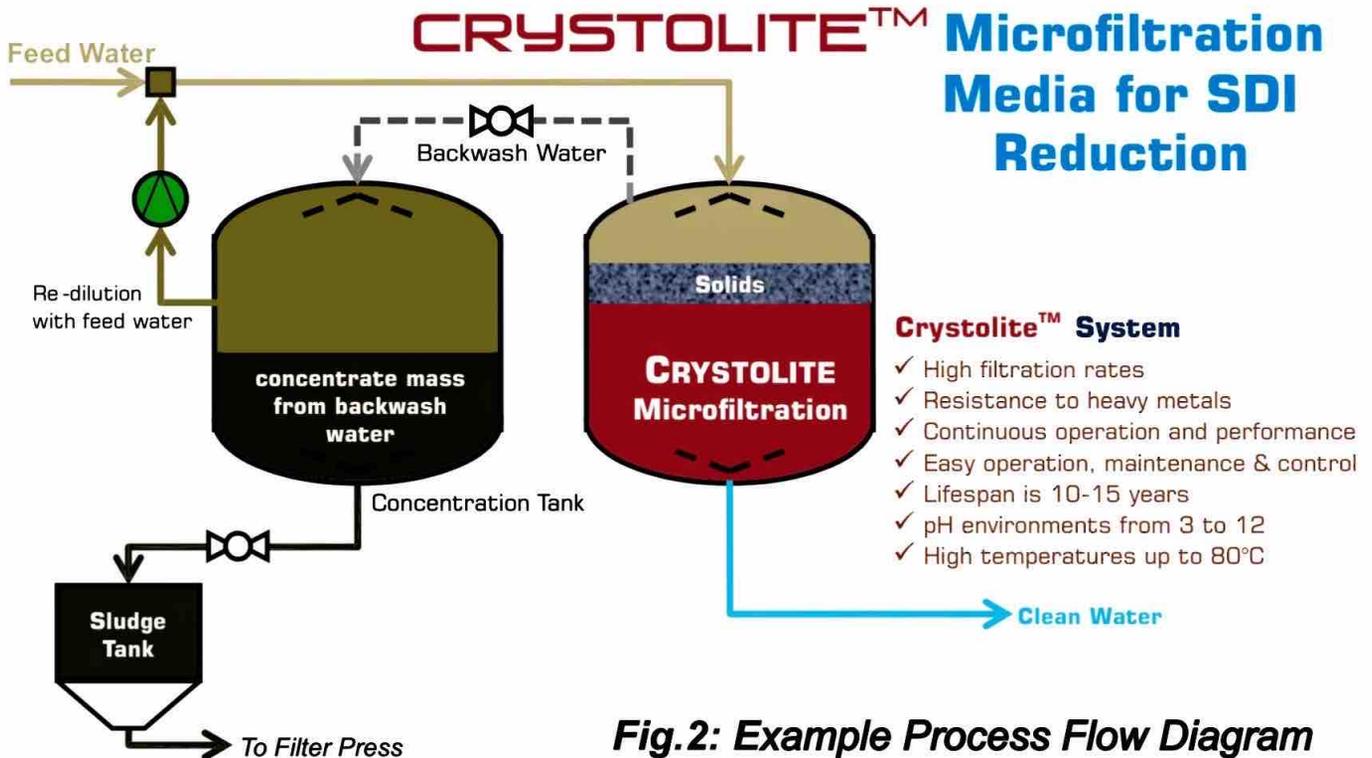


Fig.2: Example Process Flow Diagram

Designing a CMF System

Solids and SDI removal system based on **Crystolite™** microfiltration media technology are very similar to sand, anthracite or multimedia filtration systems, where piping, valves and pressure vessels are mounted in the same way. But **CMF** systems are much more compact because of higher filtration rates. 20 to 25 bed volumes can be easily achieved using **CMF** media. Backwash water is collected in the concentration tank. Typically, 90% of feed water and 10% of backwash water passes through the **CMF** system (see Fig. 2). The concentrate is recycled up to 10 backwashes and is re-diluted with feed water. Solid concentration is kept at bottom of the concentration tank. Solid concentration is kept at 3-5% and with the excess solids it's sent to filter press for disposal. The number of **Crystolite™** systems required is dependent on the total flow rate of the system needed and the pressure vessels are typically placed in parallel of up to 20 pressure vessels.

Benefits to Reduce SDI

When **Crystolite™** is used to reduce SDI to a reverse osmosis or ultra filtration, operating a **Crystolite™** filtration system will immediately yield a significant process improvement, typically resulting in much longer ultra filtration or reverse osmosis membrane life, reduced cleaning cycles, chemicals costs, reduced antiscalant and less membrane blockage. **Crystolite™** media provides better filtration and cost effective alternative to changing filter cartridge on a weekly or daily basis. For solids removal up to **0.5 microns** **Crystolite™** systems offer a compact alternative to extensive membrane systems which are requiring significant electrical and chemical costs.

Crystolite™ filtration media (**CFM**) that can handle any process streams with a high solids concentration.

Crystolite™ is a challenge to other sand or multimedia filtration based technologies

**CRYSTOLITE™ FILTRATION MEDIA IS AN
EXCELLENT ALTERNATIVE TO ALL
MICROFILTRATION MEMBRANES.**



Heavy Metal Adsorption by **CRYSTOLITE™**

Technical Data

Base material	Iron oxide based minerals
Appearance	reddish crystalline granule
Grain size	US 14 x 30
	SI 0.6 - 1.4 mm
Bulk density	US 65.5 lb/ft ³
	SI 1050 kg/m ³
Flow direction	Down-flow or Up-flow
Inlet water pH	3 - 12
Freeboard (downflow)	25 - 35%
Min. Bed Depth	US 29.5 inches
	SI 75 cm
Optimal Bed. Depth	US 47 inches
	SI 120 cm
Service flow	US 6 - 12 gpm/ ft ²
	SI 15 - 30 m/h
Backwash velocity	US 8 - 10 gpm/ ft ²
	SI 20 - 25 m/h
Backwash time	5 - 10 minutes
Rinse time	1 - 2 minutes

Multiple regeneration is possible with **OXYDES** & **OXYDES-P** for a long service life (estimated 10 - 15 years)

Packaging:

28.3 Liters (1 ft³) bags
40 bags on a pallet

Effect of pH & Contact Time

Removal/Adsorption of heavy metals on conventional technologies like ion-exchange, reverse osmosis and such as activated carbon have been used worldwide with very expensive and high cost of regeneration, high concentrates and activation process which limits to use these technologies

Water pollution due to industrial waste waters and disposal of heavy metals is the biggest and global concern since this waste water collected from municipalities, communities for drinking. Heavy metals pollution occurs in much industrial waste water such as that produced by metal facilities, mining industry and battery manufacturing processes, the production of paints and pigments. These waste waters are acidic and contain Cd, Pb, Cu, Zn, Ni and Cr. Toxic metals are everywhere in surface water, ground water. Therefore Watch-Water® has developed **Crystolite™** Microfiltration Media to prevent these heavy metals to our food chains. Other huge problem is phosphate ion and **Crystolite™** adsorption behaviour of phosphate either with **OXYDES** and **OXYDES-P**

The surface area of **Crystolite™** is 600-620 m²/g, this value is as high as comparison with normal activated carbons. The chemical composition of **Crystolite™** is Al₂O₃·FeO₃·CaO and SiO₂. Splitting ions in the water and raising pH without adding chemicals is its strength to remove Cu²⁺ and Zn²⁺ ions. The rate of uptake of all metals is quite rapid; at equilibrium 98% of copper and 95% of zinc the metal concentration of 15 mg/L

In short, all waste waters, drinking water can be treated in a simple, economical process with **Crystolite™**. SDI reduction, ammonium removal and heavy metal adsorption with **Crystolite™**

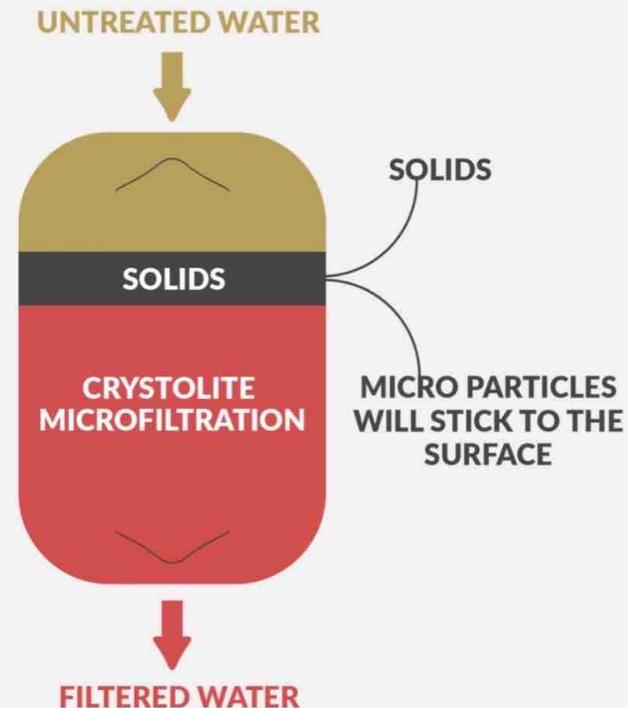
Application

CRYSTOLITE – Microfiltration Media has been developed after several years of extensive, real-world and field-testing to ensure an unrivaled degree of harmful solids and heavy metals removal from water systems. It reduces conductivity levels which is caused by micro-solids. Additionally, **CRYSTOLITE** – Microfiltration Media can provide water filtration 5 – 8 times greater reduction of harmful-solids & SDI reduction than its closest competitors. Using **CRYSTOLITE™** media in a pressure vessel to provide a microfiltration effect, the **CRYSTOLITE™** media allows the water to flow through the top distributor on the top of media layer, when suspended solids are held on the highest surface area of the media allows only clean water to flow through the **CRYSTOLITE™** media. As a result, **CRYSTOLITE™** can be used to filter down 0.5 microns without clogging. It allows all suspended solids to accumulate on the surface of the **CRYSTOLITE™** media and are easily backwashed to drain.

The system can be designed either manual backwash or by using automatic backwash cycle, the backwash cycle is maximum of 10 minutes which uses 80% less water than any traditional anthracite or multimedia filters, it is because 90% of the solids are captured on the surface and not inside of the **CRYSTOLITE™** media-bed. This results if the High-tech filtration that can filter solids and particles down to submicron levels at 10 to 15 times the flow rate of all traditional filters. Backwash water reduction is up to 80%.

Applications

- ✓ Ammonia removal
- ✓ Trace heavy metal removal
- ✓ Pretreatment of RO & RO reclaim
- ✓ Power stations
- ✓ Steel and iron mills
- ✓ Zero blown down
- ✓ High solids wastewater
- ✓ Zero blown down
 - o Cooling towers
 - o Boiler water
- ✓ Swimming pools
- ✓ Circulation plants for
 - o Plating processes
 - o Printed circuits





Test Report

Name: GRUPO COMERCIALIZADOR HIDROAQUA
Address: Colonias # 638 Col Moderna 44190 Guadalajara, Jal.
Date of receipt of the sample: January 18th, 2019
Start date of the analysis: January 18th, 2019
Report date: January 23rd, 2019

Filtration tests with Crystolite (Watch Water) and highly-reputed commercial Zeolite materials "A" & "B".

1. Equipment and filter material

- Test column with an overall height of 70cm
- Turbidity meter HACH 2100P
- Crystolite (Watch Water)
- Zeolite "A"
- Zeolite "B"

2. Test development and turbidity analysis

20 liters of water were prepared with NOMINAL 5-80 MICRON ARIZONA TEST DUST, until obtaining a turbidity of approximately 100 NTU.

The filtration tests with CRYSTOLITE were carried out, placing 580 ml of CRYSTOLITE in a column with a total height of 70 cm, resulting in a media bed depth of 40 cm. Then, the column was connected to a hose and backwashed until the turbidity of the output water was equal to or less than the input water. Afterwards, 4 liters of the prepared sample with 108.2 turbidity were filtered. While the first liter of filtered water was disposed, the remaining 3 liters were passed 5 times through the CRYSTOLITE column with a TCCV of 3 minutes and the turbidity was measured and documented after each step.

TURBIDITY OF UNFILTERED WATER = 108.2 NTU

Test results with CRYSTOLITE column

	Turbidity
1. Pass	3.33 NTU
2. Pass	2.21 NTU
3. Pass	1.67 NTU
4. Pass	1.23 NTU
5. Pass	1.07 NTU

The test was repeated with the same procedure with a Zeolite "A" column

The results were:

	Turbidity
1. Pass	8.85 NTU
2. Pass	8.68 NTU
3. Pass	6.13 NTU
4. Pass	6.10 NTU
5. Pass	7.67 NTU

The test was repeated with the same procedure with Zeolite “B” column

The results were:

	Turbidity
1. Pass	6.49 NTU
2. Pass	5.12 NTU
3. Pass	4.69 NTU
4. Pass	3.54 NTU
5. Pass	3.49 NTU

Table 1: Comparison Table

	CRYSTOLITE (Watch Water)	Zeolite “A”	Zeolite “B”
Turbidity after 1. Filtration pass	3.33 NTU	8.85 NTU	6.49 NTU
Turbidity after 2. Filtration pass	2.21 NTU	8.68 NTU	5.12 NTU
Turbidity after 3. Filtration pass	1.67 NTU	6.13 NTU	4.69 NTU
Turbidity after 4. Filtration pass	1.23 NTU	6.10 NTU	3.54 NTU
Turbidity after 5. Filtration pass	1.07 NTU	7.67 NTU	3.49 NTU

3. Conclusion

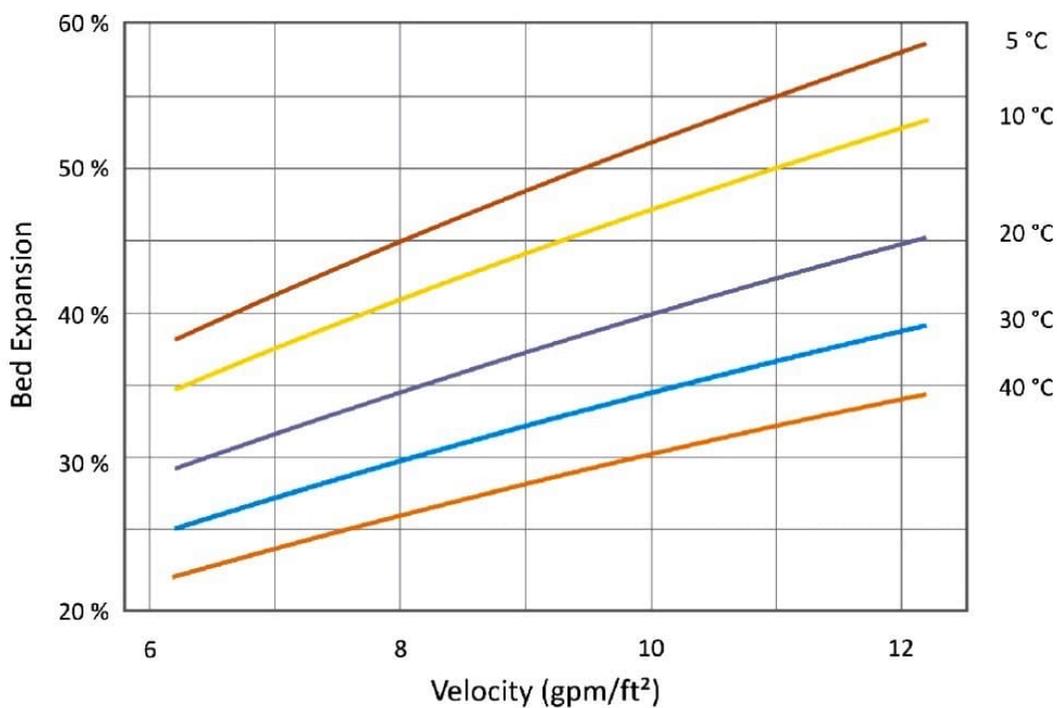
According to the data obtained above, with the tested highly-reputed Zeolite materials of our competitors, it would be necessary to pass 5 times through the filtration process in order to achieve a result close to turbidity obtained with CRYSTOLITE in only one simple filtration step.

4. Reference

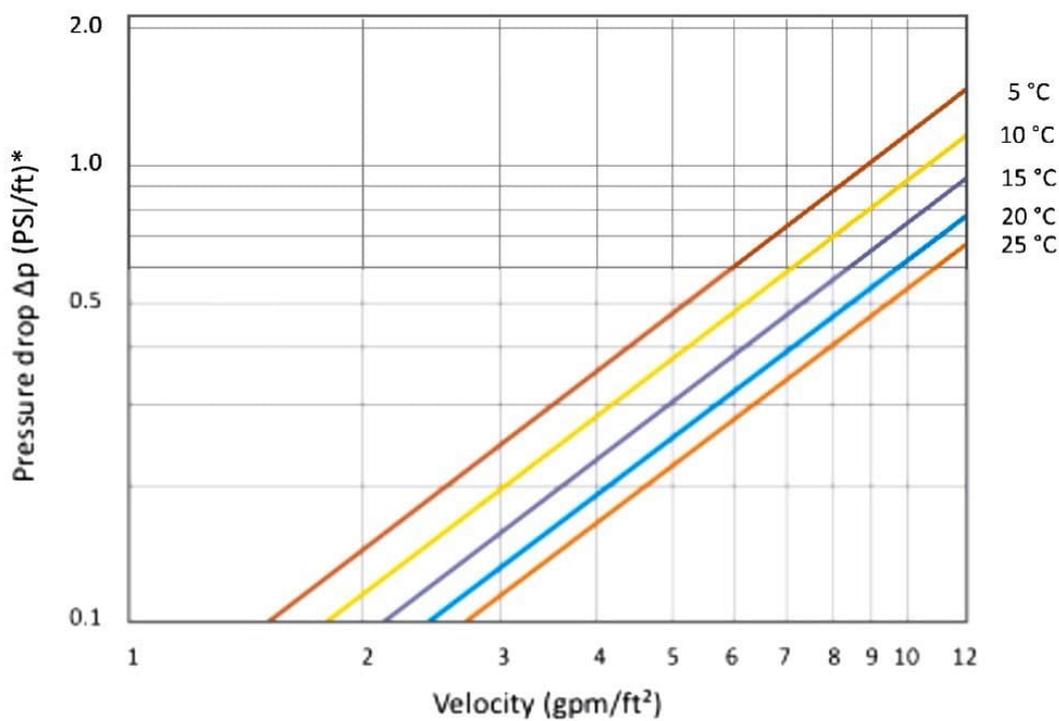
Reference can be found in the following original document from (2019) Grupo Comercializador Hidroaqua Guadalajara, Mexico.

Curves

Bed Expansion



Pressure drop



* Note: The diagram above does not include the pressure drop caused by other components of the filter system.