

Crystolite™

Microfiltration Media

Crystolite™ Filtration

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

For microfiltration, Crystolite™ filtration media (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. This Crystolite™ filtration media is an excellent alternative to all microfiltration membranes.

Technology

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 10 minutes which uses 80% less water than 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%.

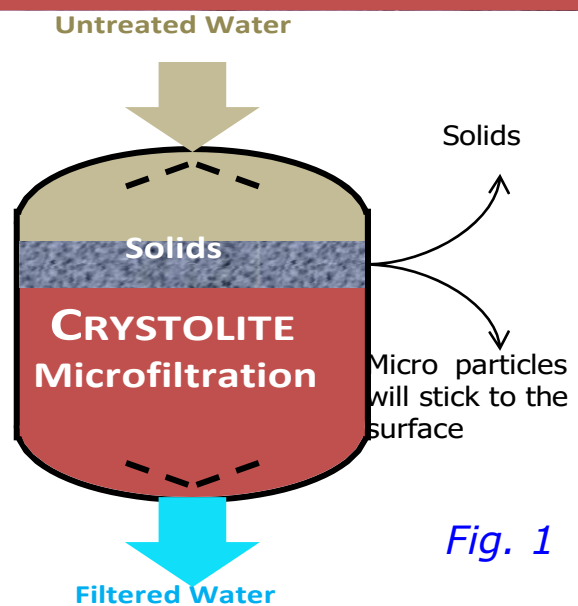
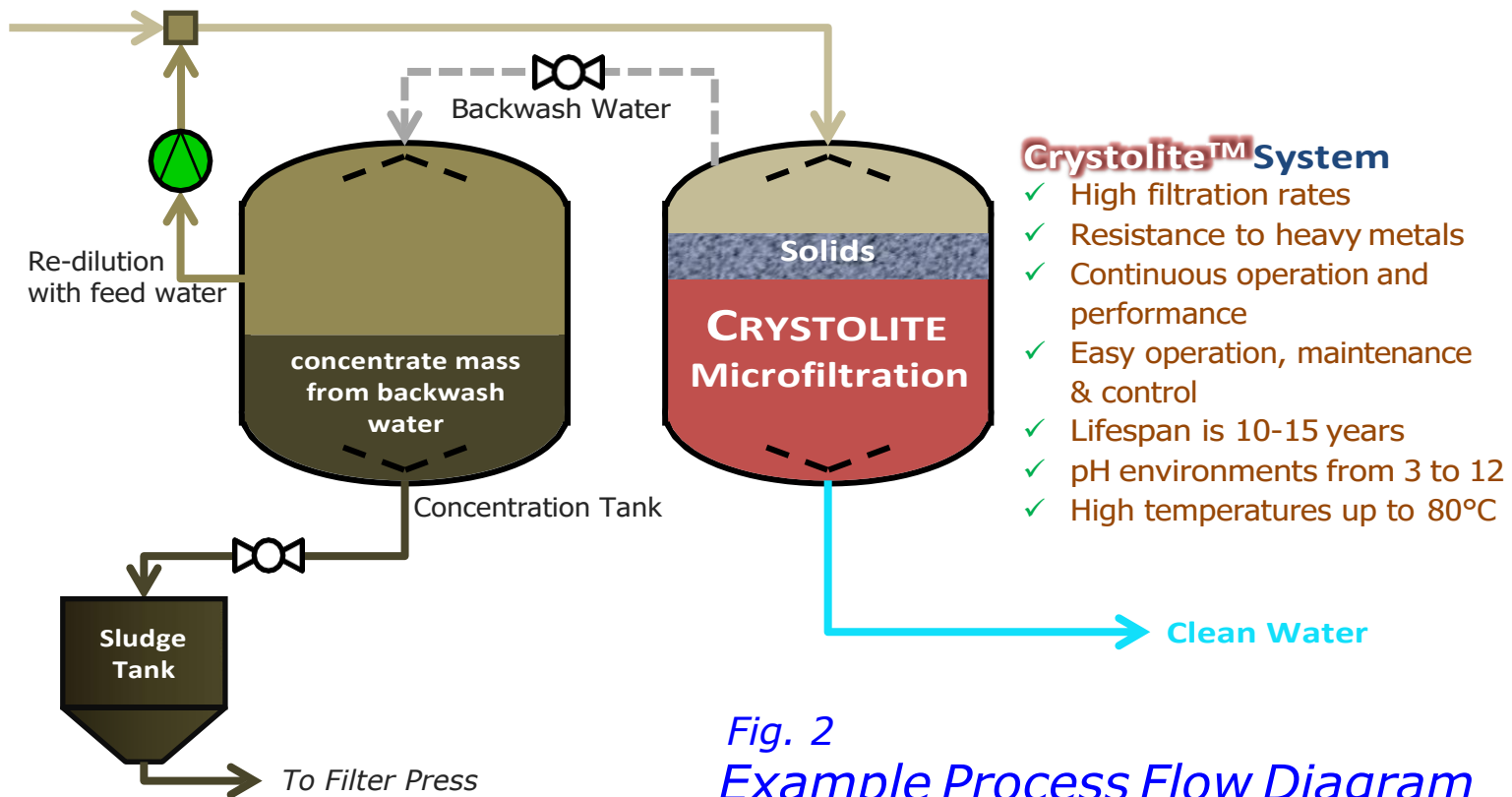


Fig. 1

For Applications

- Ammonia removal
- Trace heavy metal removal
- Pretreatment of RO & RO reclaim
- 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

NOTE: IT IS NOT SAND !



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 requires 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.

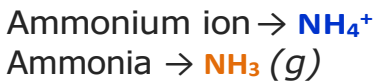
Crystolite™ filtration media (CFM) that can handle any process streams with a high solids concentration.

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

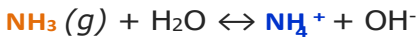
Ammonium Removal with

Introduction

Ammonium ion removal from water and wastewater is dependable on parameters such as contact time, pH and initial ammonia created by Katalox-Light as described in a following description. pH has a notable effect in **ammonium** ion removal efficiency.



Ammonium [NH_4^+] is a positive ion and is a conjugated acid of the weak base **ammonia** [$\text{NH}_3 (g)$]. When **ammonia** is dissolved in water (H_2O) it reacts with the water molecules to form **ammonium** according to the reaction:



As Katalox-Light has the unique ability to split water $\text{H}^+ + \text{OH}^-$ the pH changes into 9.5 where **ammonium** changes into **ammonia** (NH_3) gas and this occurs rapidly within the first EBCT of 4 to 5 minutes. The **ammonium** ion removal capacity of **Crystolite™** increases with the increase of pH and **ammonium** ion concentration. The optimum pH for ammonia removal is at 8.5 - 9.0.

Regeneration/Desorption

Ammonium loaded **crystolite™** can be regenerated completely by high pH solution made by oxides at pH 10 to 11. 5% of **OXYDES** solution is sufficient for direct chemical cleaning and desorption/ regeneration. 100 grams of **OXYDES** is needed for 100 liters of **Crystolite™**.

Note if Katalox-Light is not applied pH increase with NaOH is closed at the inlet of feed water. pH must be over 8.5 to achieve best results (see Fig. 4)

Katalox-Light + Crystolite

Crystolite™ Microfiltration media in **Packed Bed** column

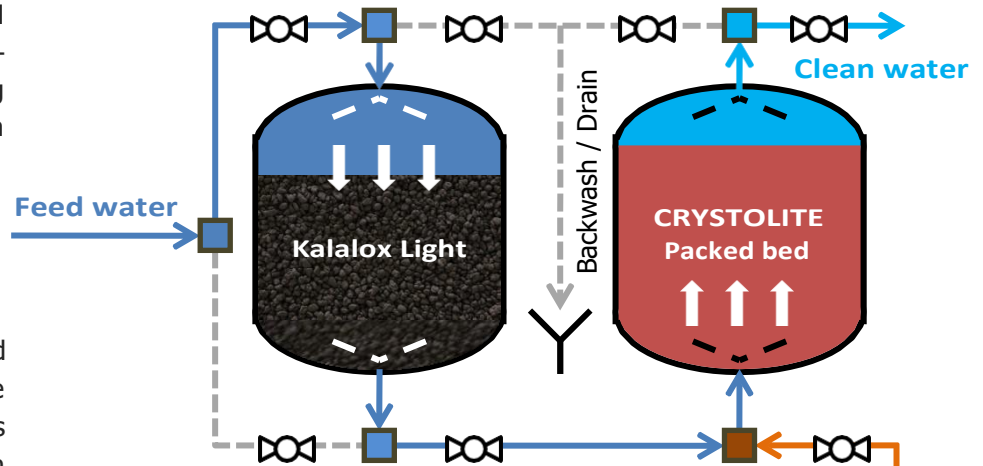


Fig. 3

The exhausted column is subjected to Desorption to regenerate the **Crystolite™** adsorbent using a **OXYDES** Solution, which is composed of 5% strength at pH 11 - 12. To regenerate the media, the regeneration solution of **OXYDES** is pumped in the up-flow direction.

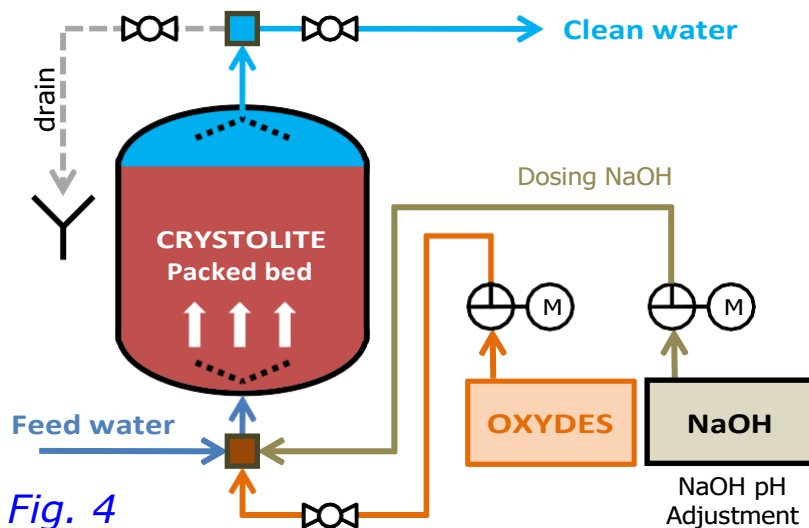
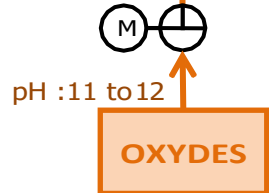


Fig. 4

Note: When pH < 7, more than 95% of the ammonium existed in ionized form (NH_4^+) when the pH approaches 9, only about 5% ammonium is left in ionized form. Fig. 4 depicts that ammonium adsorption onto **Crystolite™** Microfiltration Media is a pH-Dependent process. The total capacity is 250 mg NH_4 per liter of media at pH 8.5 - 9.5. Compared to Zeolites, the **Crystolite™** exhibits 100% higher in adsorption capacity and fast adsorption rate.

Heavy Metal Adsorption by **CRYSTOLITE™**

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 wastewaters 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 that is low cost absorbent which can be regenerated 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 Al₂O₃FeO₃CaO 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™** microfiltration media. System design as on **Fig. 4**.

Distributed by:

Wet Tech Environmental

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

Please check corresponding brochures for the media & chemicals mentioned in this literatures.

Other contaminant removal and application literatures would be available separately.

Manufactured in:

Germany for Wet Tech Environmental

