NOVEMBER 2022

EventMobi

Have you downloaded the app yet?

I encorage you to do so, and get ready to participate in the Live Polls in this and future sessions.

Here we go!

INNOVATIONS

Cartridge Filter Cleaning and Moss Point method

Piedmont GENESYS PWT™

DISTRIBUTOR SUMMIT

NOVEMBER 13-17, 2022

Sustainability

How sustainable is the single use of plastic cartridges?

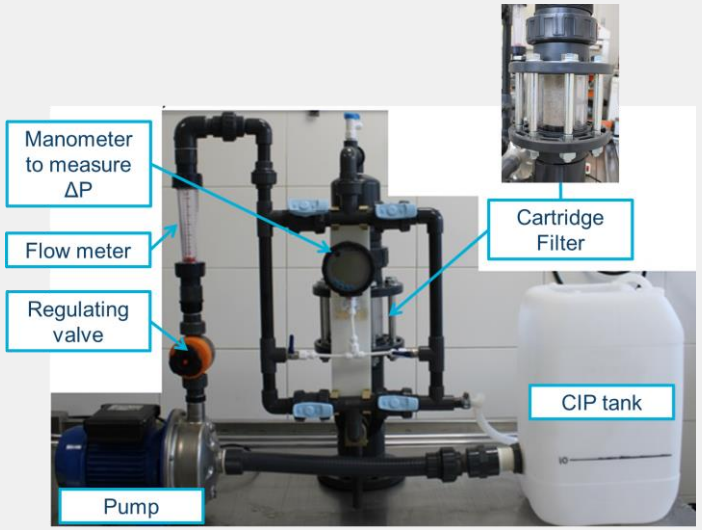
Sustainability

What if we clean and reuse them?

- A plant like Taweelah can save around 75,000 kg per year of plastic (205 kg/d).
- Reduced inventory, waste, storage space and freight.
- Reduction of operating costs (2 to 10 cleanings).
- Accommodate unexpected high filter consumption (red tide, temporary feed quality drops).
- Over 13M filters are used per year globally in RO plants.

Lab Testing

Cartridge cleaning at lab scale



What can be cleaned?

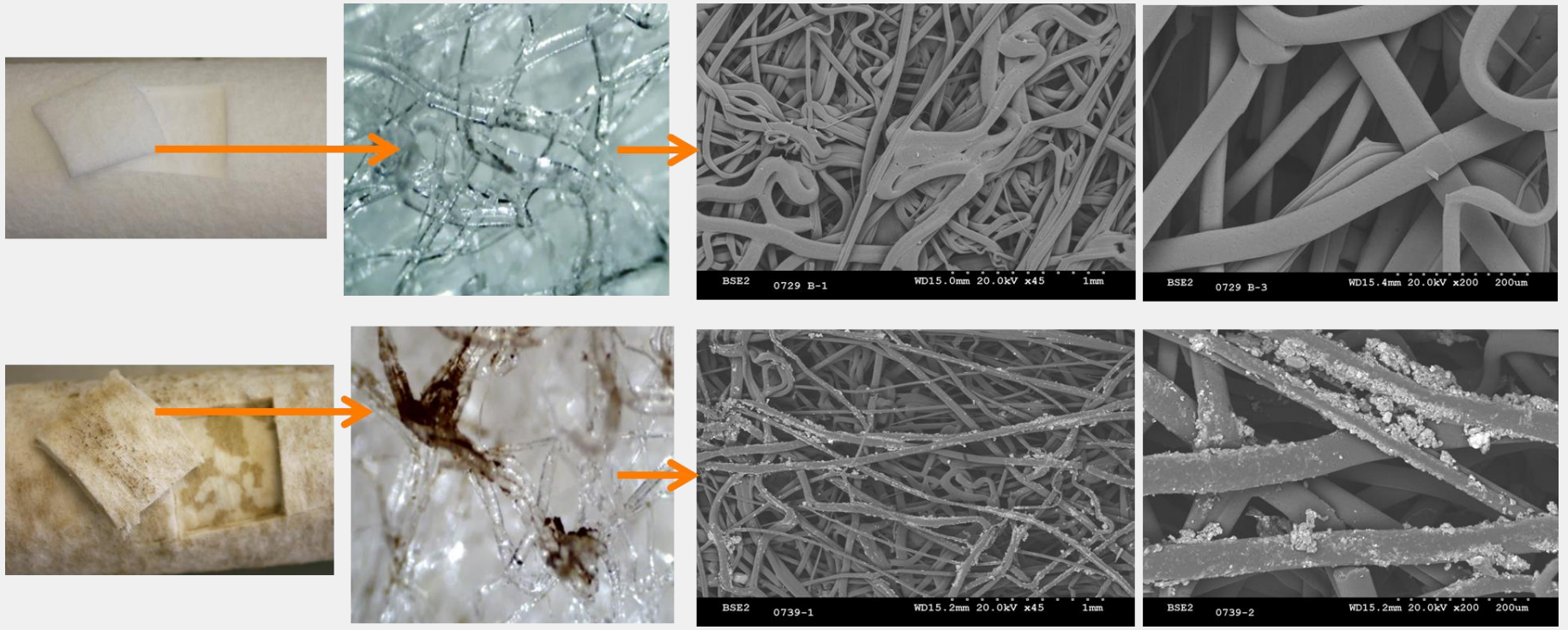
Mainly soluble solids.

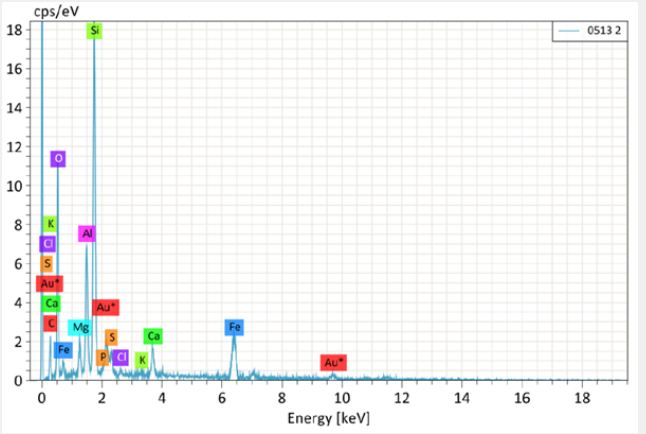
What is more difficult to remove?

Insoluble particles

First Thing's First: Cartridge Filter Autopsy

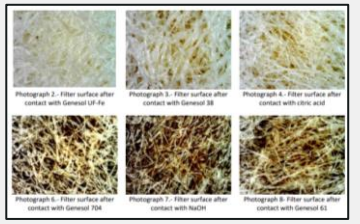
Suspended matter identification



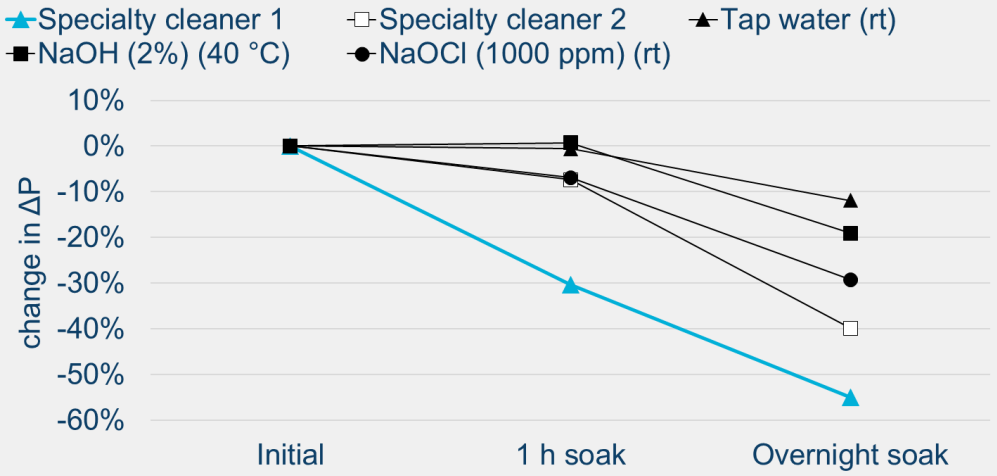


First Thing's First: Cartridge Filter Autopsy

Does one universal cleaner fitt all cases?



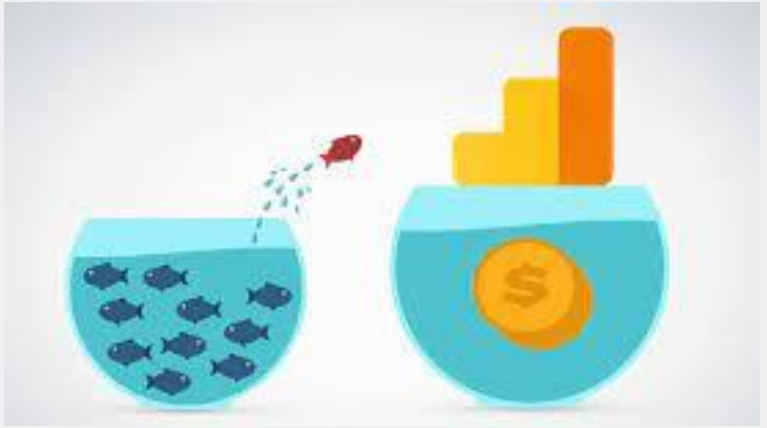
Cleaning solution	Change in ΔP	
	After 1 h soak	After overnight soak
Speciality cleaner 1	-30.0%	- 55%
Speciality cleaner 2	- 7.0%	-40%
Water (rt)	- 0.6%	-12%
NaOH (2%) (40 °C)	+ 0.7%	-19%
NaOCl (1 000 ppm) (rt)	- 7.0%	-29%



Cleaning CF with the right Specialty Cleaner does not take much to be effective

-Just soaking in the right cleaning solution overnight, and then rinsing, goes a long way.

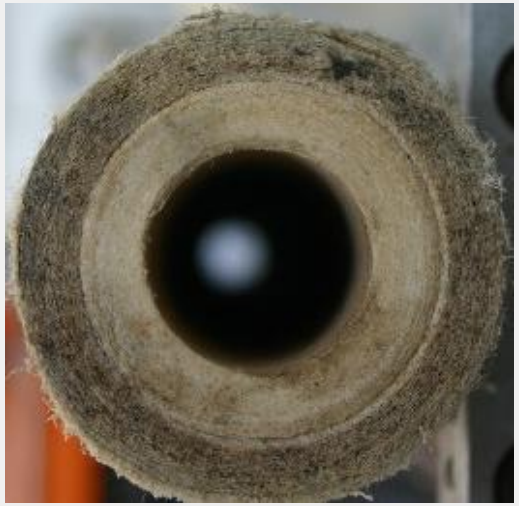
-Even if cleaning filters inside the housing was not viable. All the client really needs is the right Specialty Chemical to start saving money and plastic waste.



Do you need a specialist to know what's fouling your filter and how to clean it best?

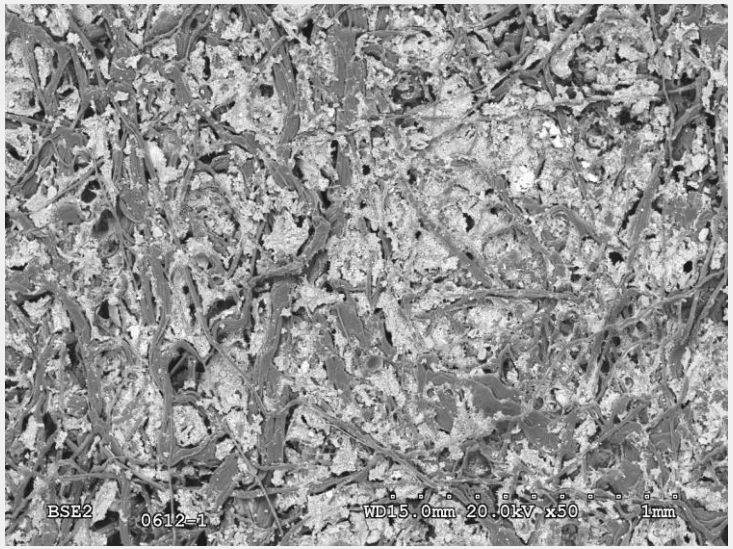
Only a deep analysis of the filter at a specialized LAB

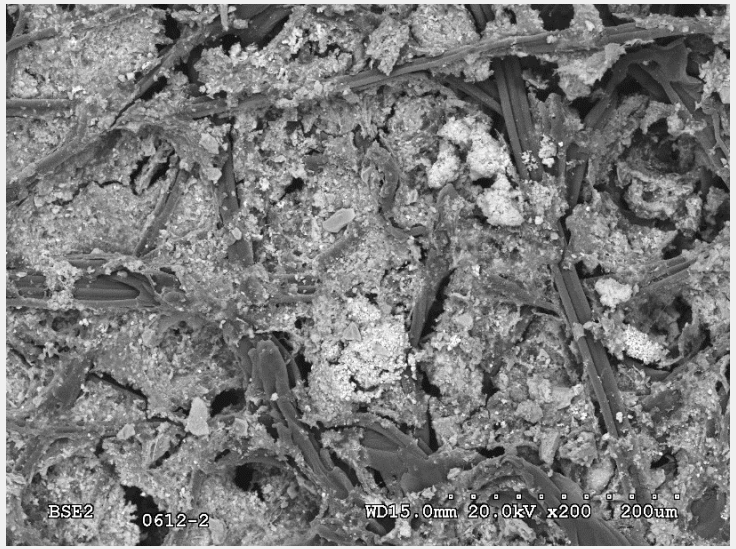
can give us the key info needed for a Good Plan.

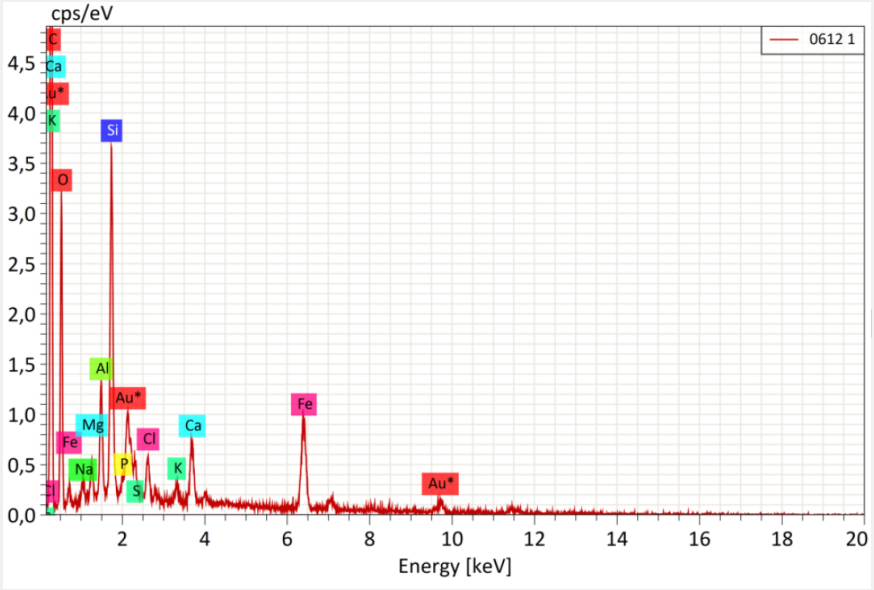


Cartridge filters foulant

Clays / aluminosilicates







Cartridge filters foulant

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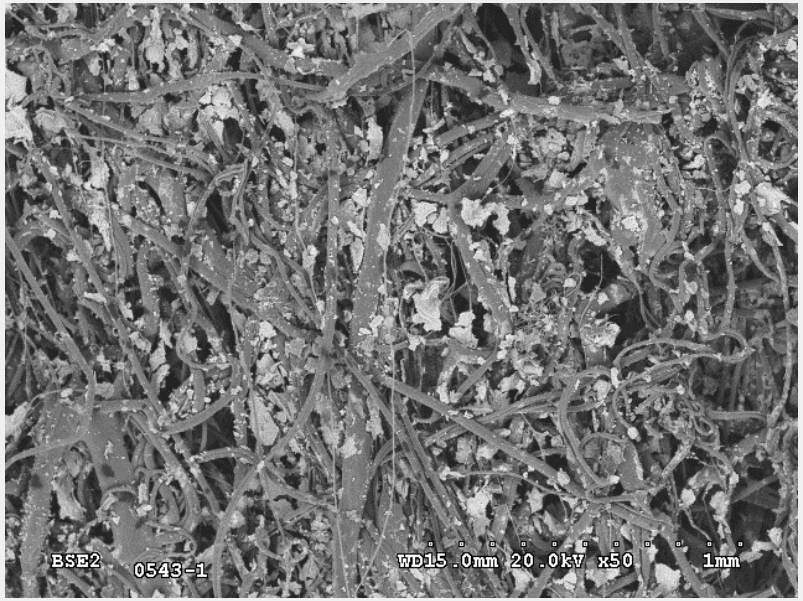
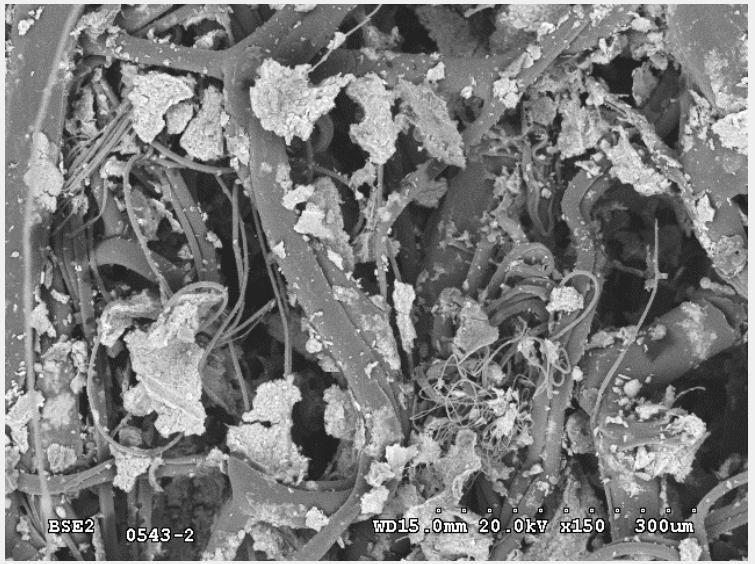
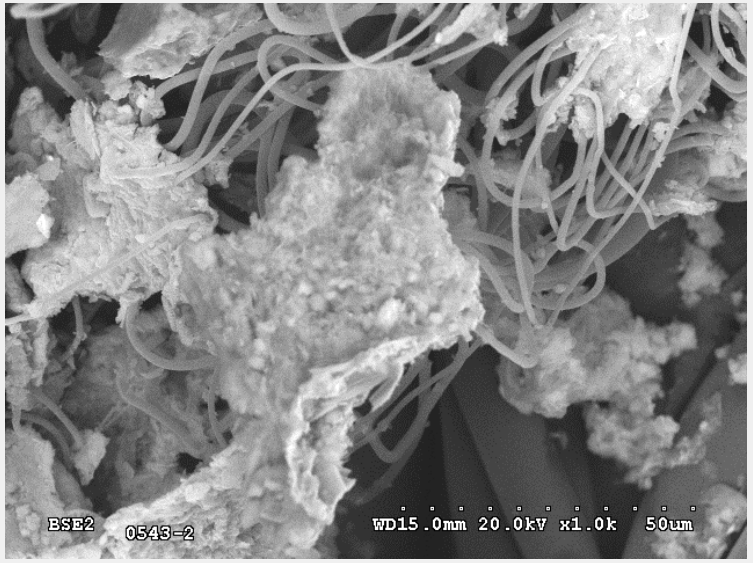
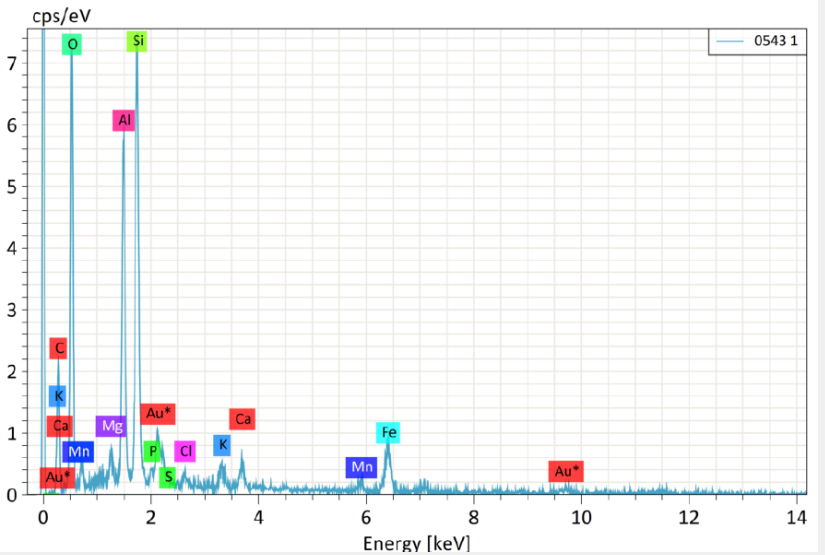


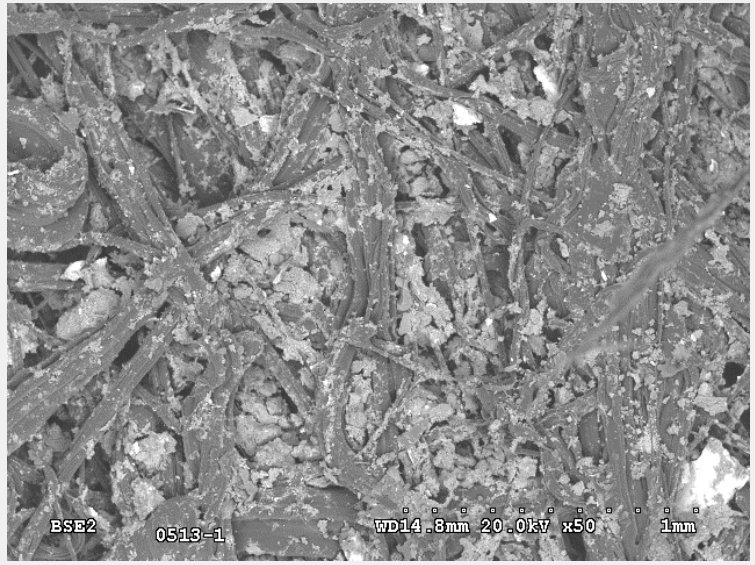


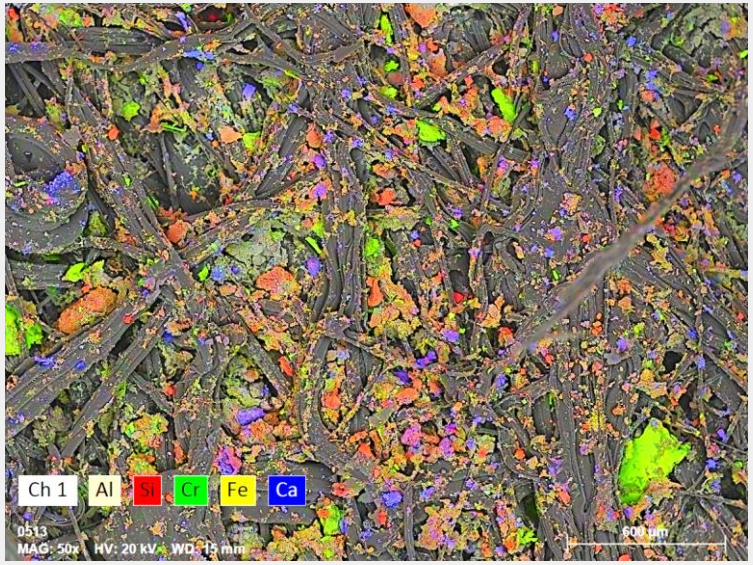




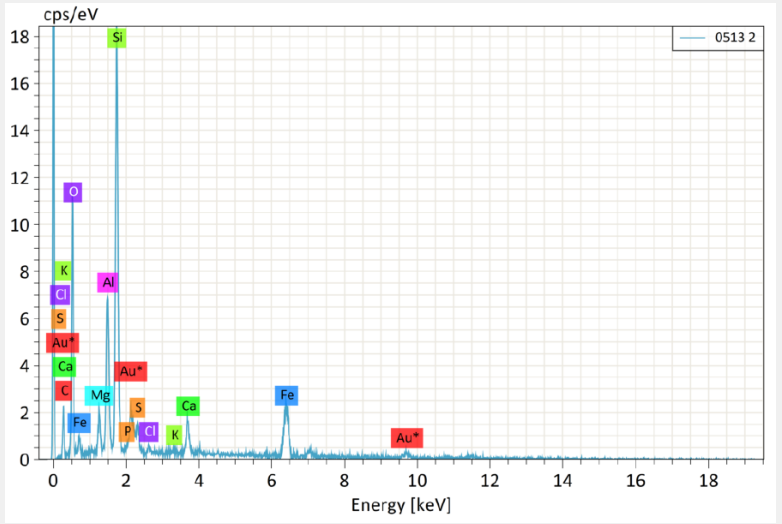
Cartridge filters foulant

Clays / aluminosilicates





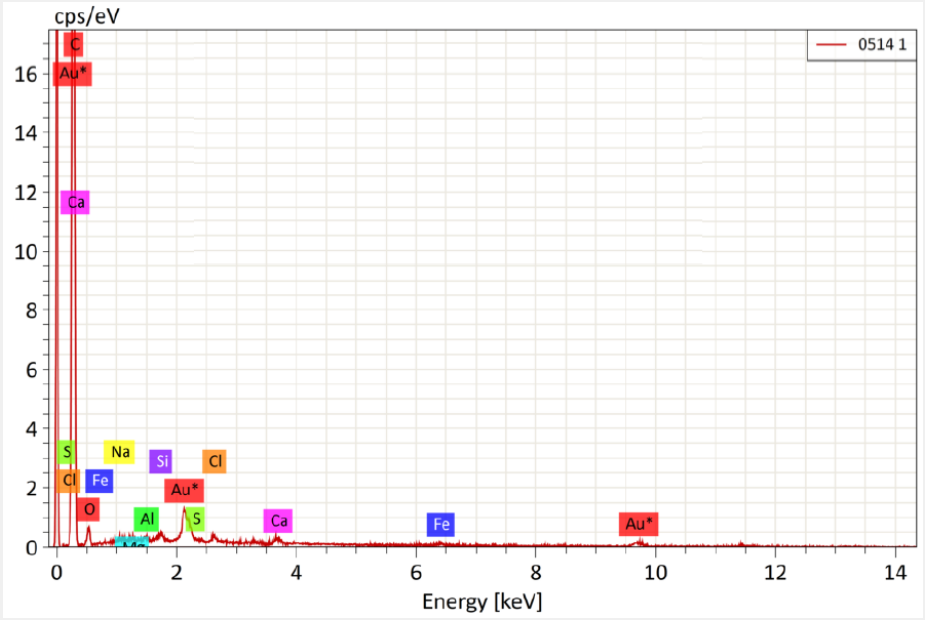
Same plant 5 µm



Cartridge filters foulant

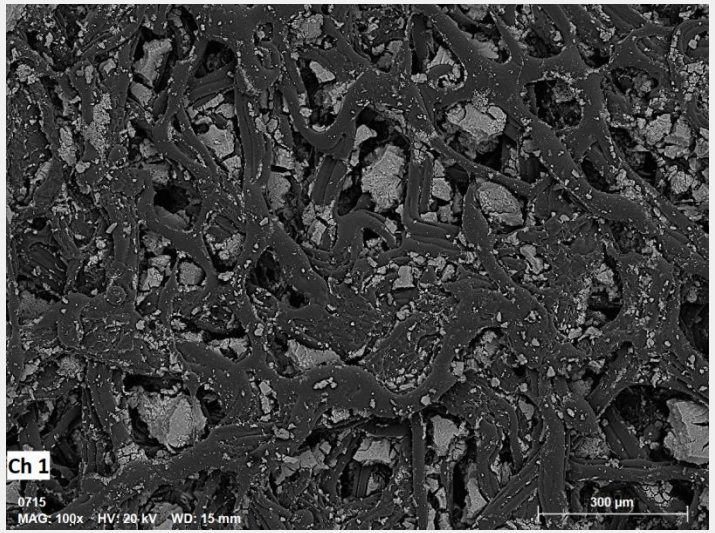
Clays / aluminosilicates

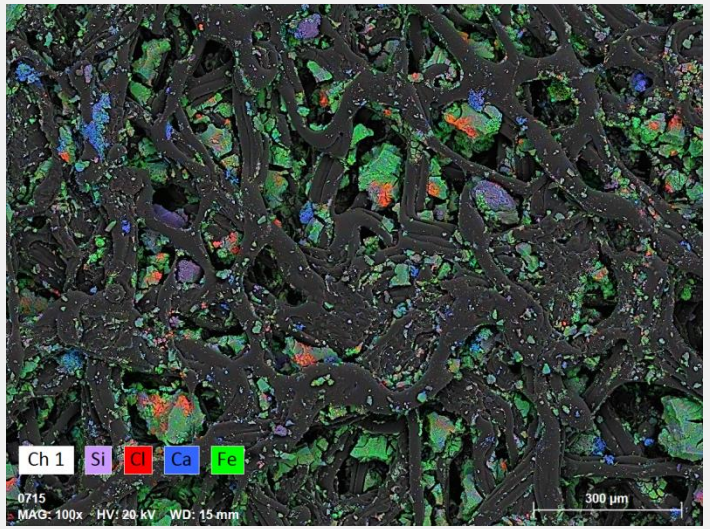
Same plant 1 µm

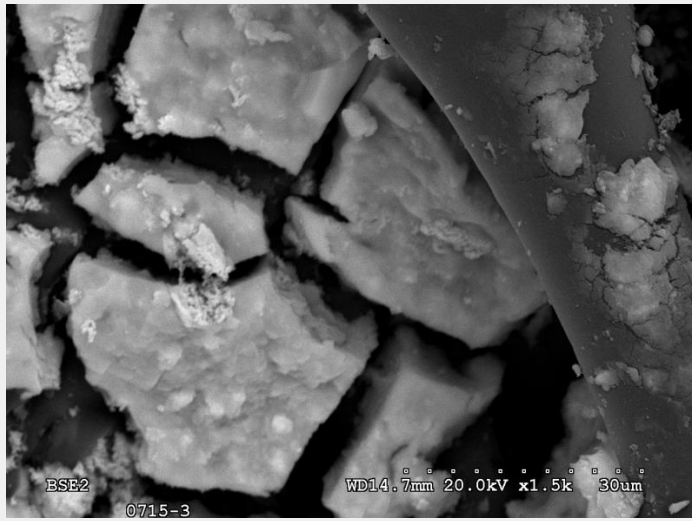


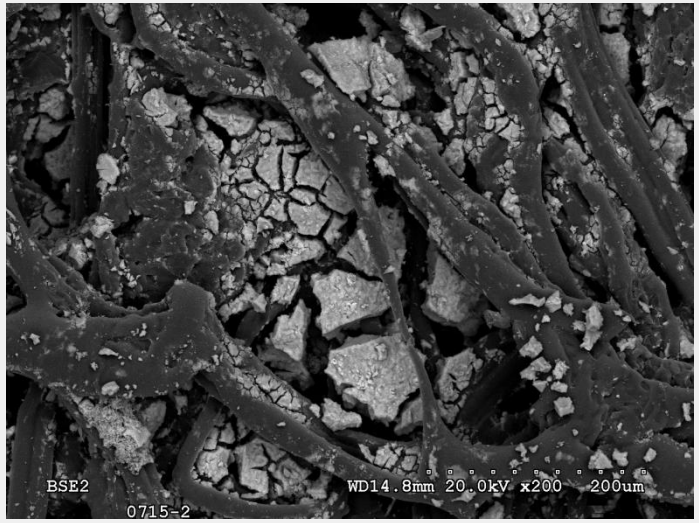
Cartridge filters foulant

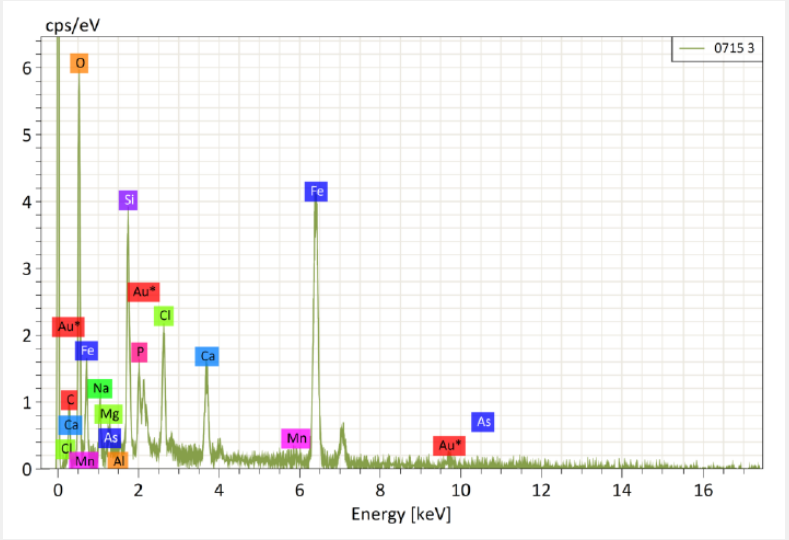
Iron



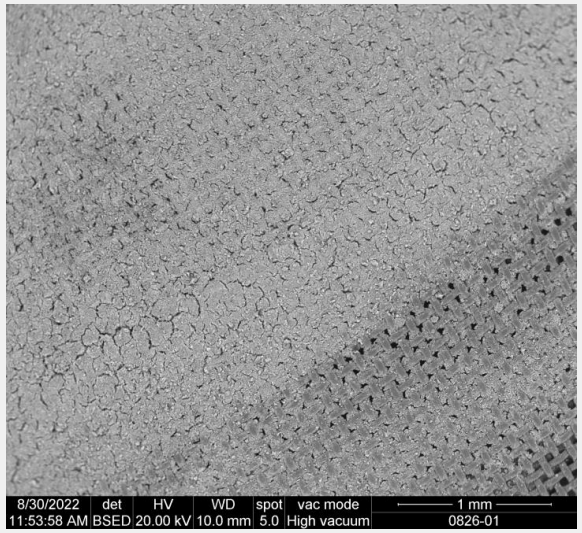


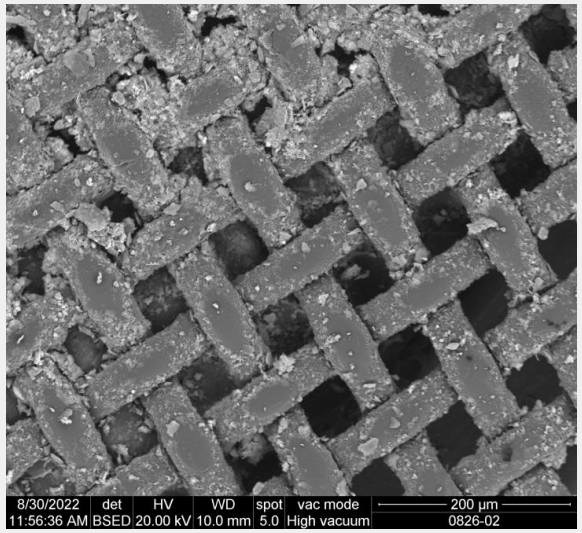


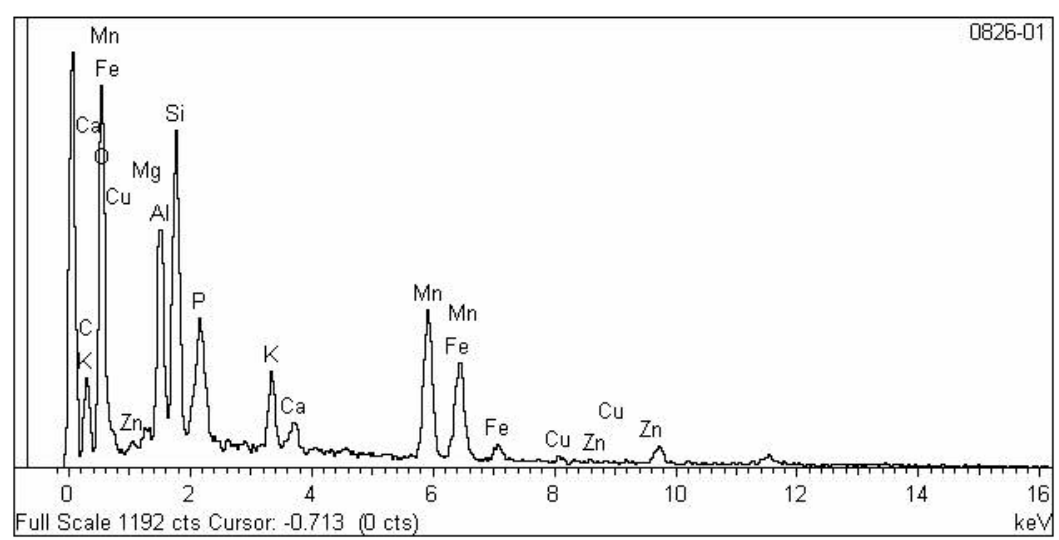




Cartridge filters foulant



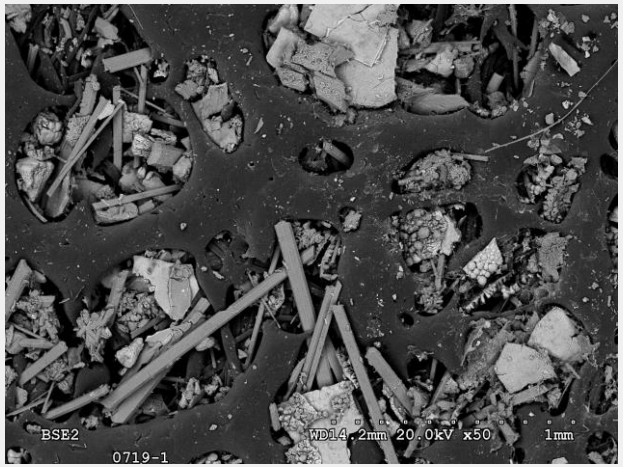


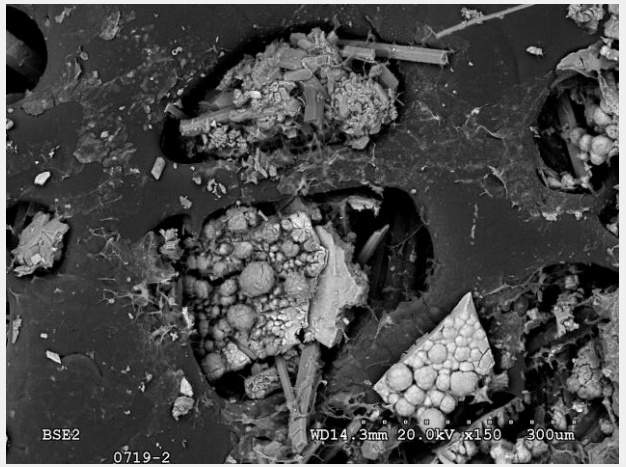


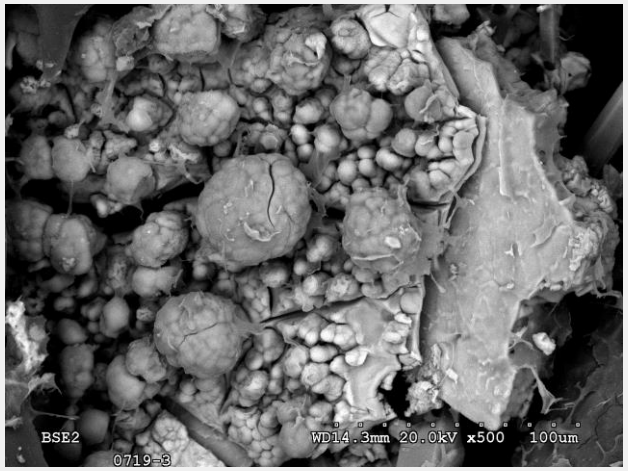
Manganese and aluminosilicates

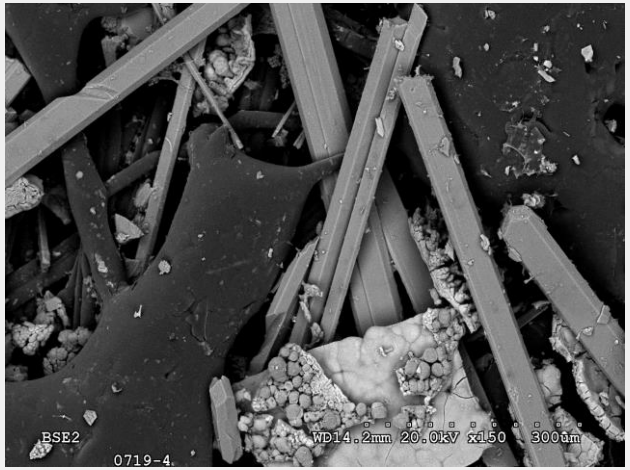
Cartridge filters foulant

Scaling





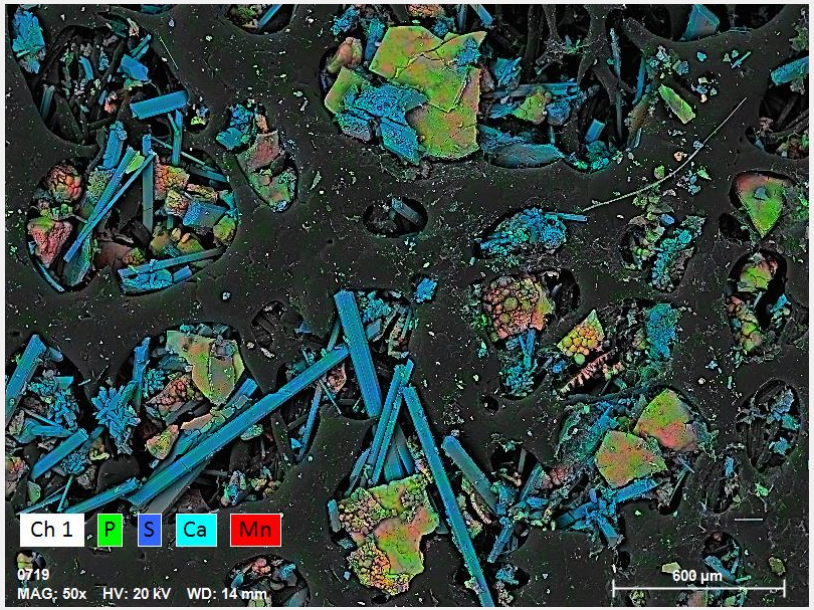


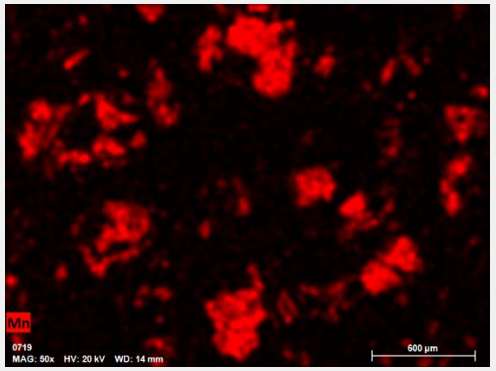


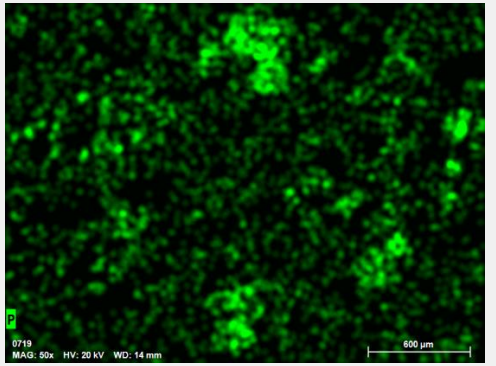
Cartridge filters foulant

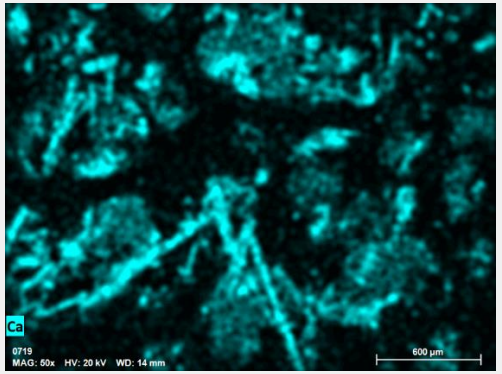
Scaling

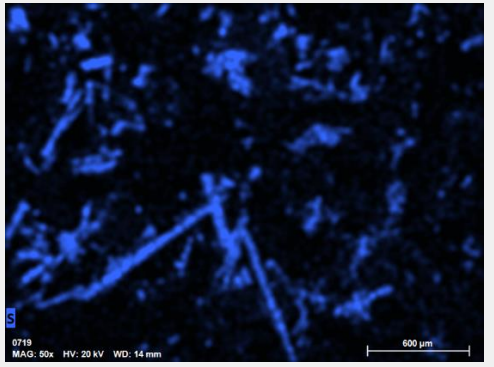
Calcium sulfate

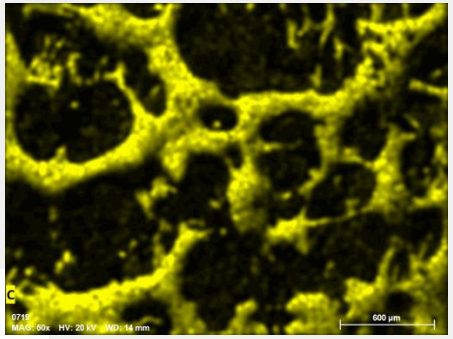












Distribution of main elements identified by EDX: general view and by elements
Relation of calcium and sulfur is clear. In this case there are also some areas where phosphorus and manganese coincide

Cartridge filters foulant

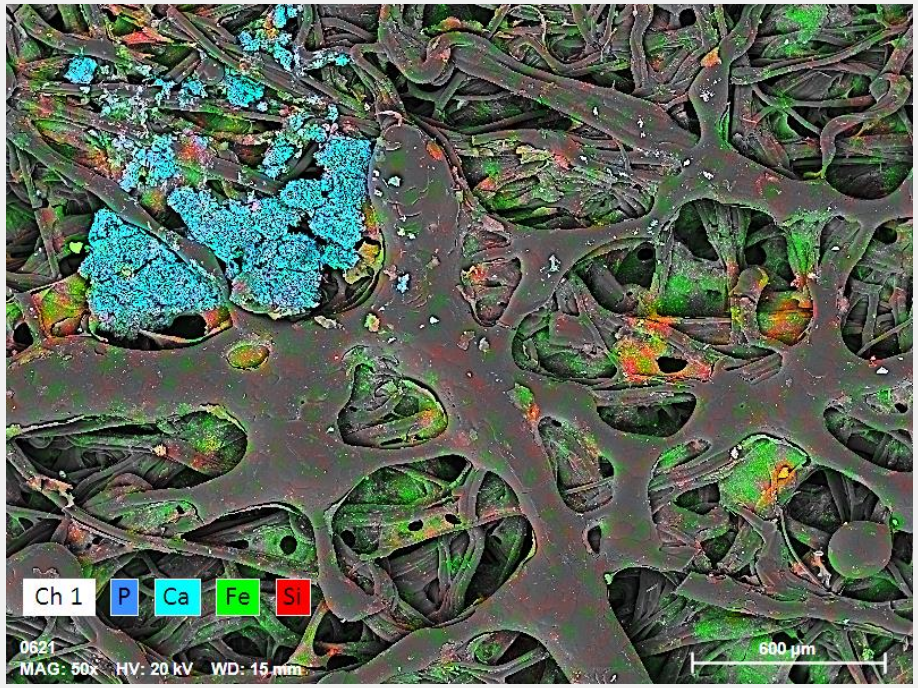
Scaling

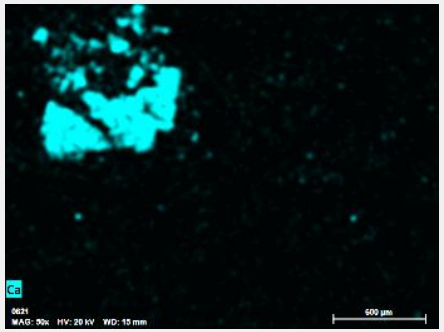
Calcium phosphate

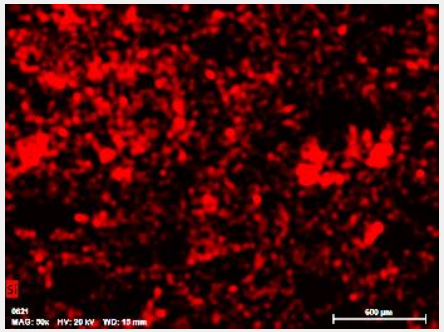
Cartridge filters foulant

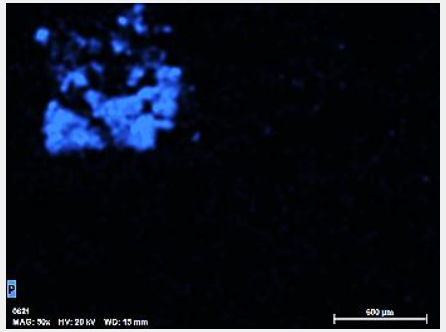
Scaling

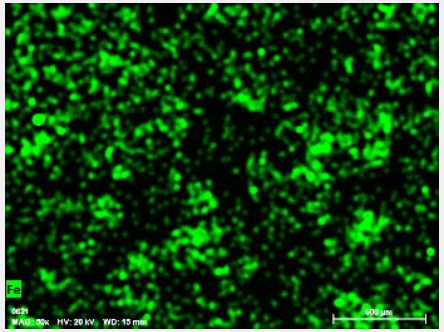
Calcium phosphate

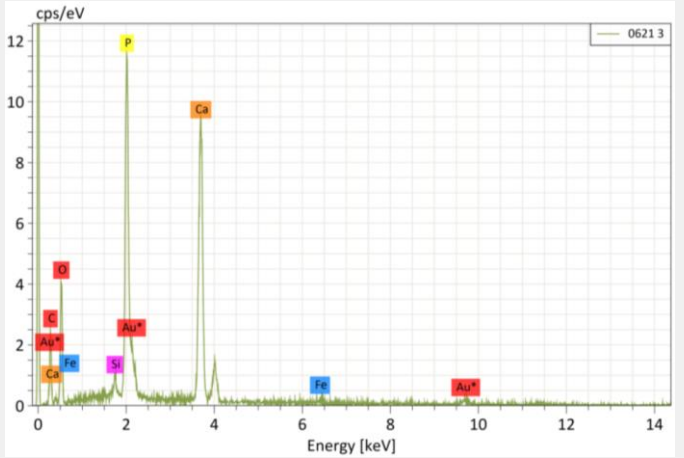






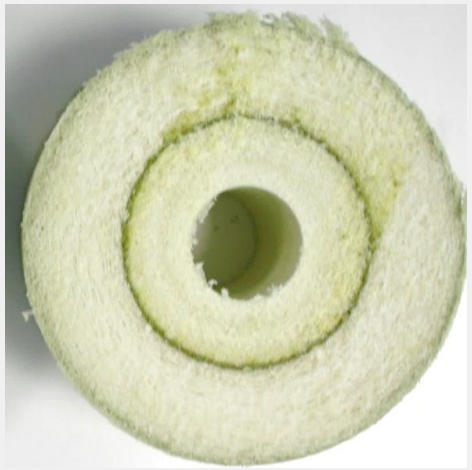


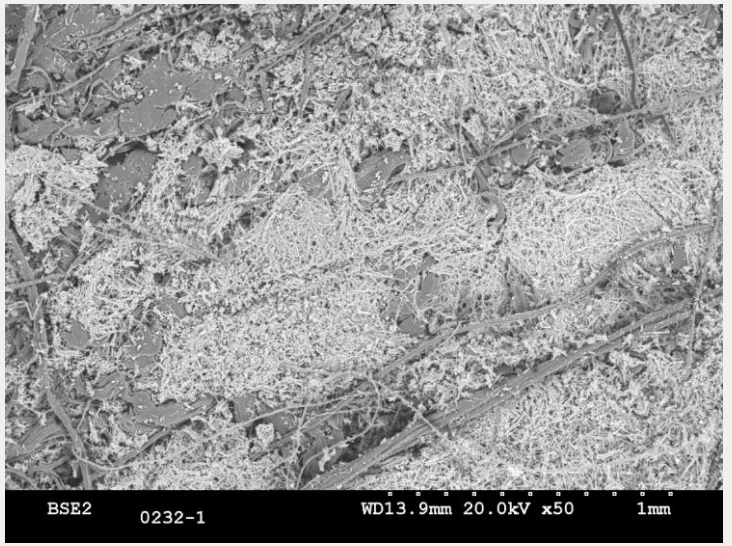


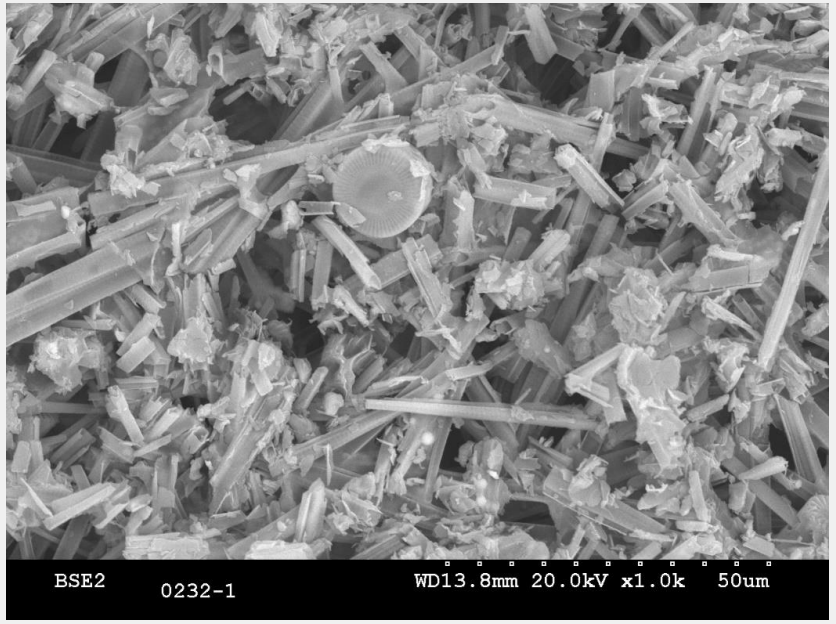


Cartridge filters foulant

Algae

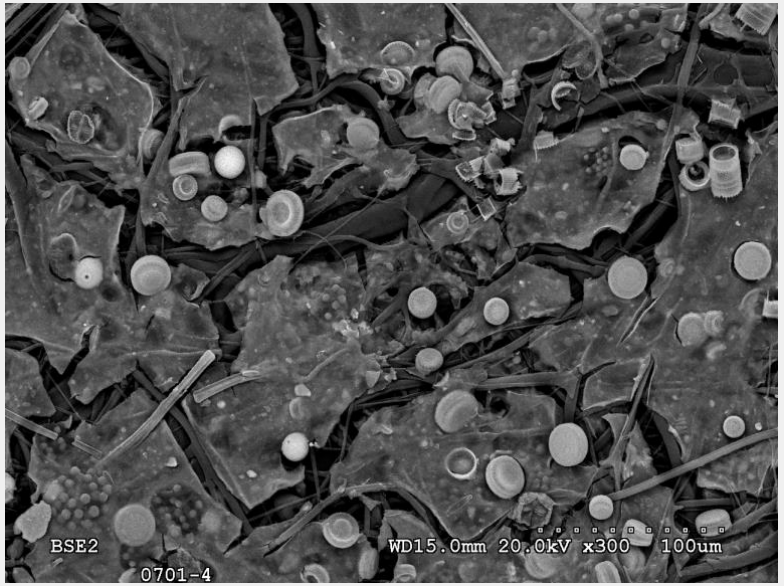


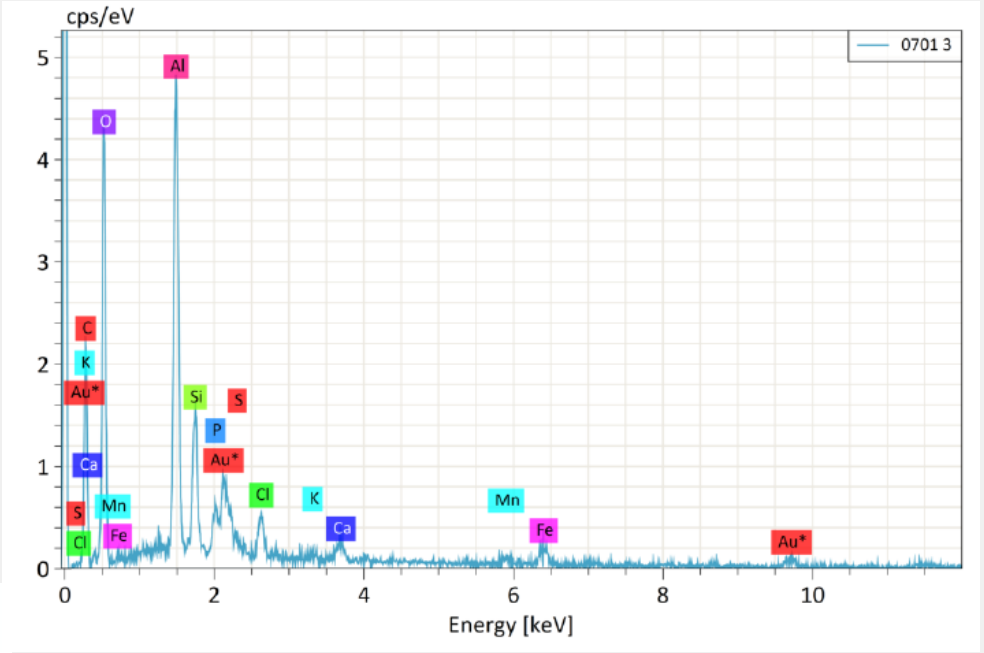


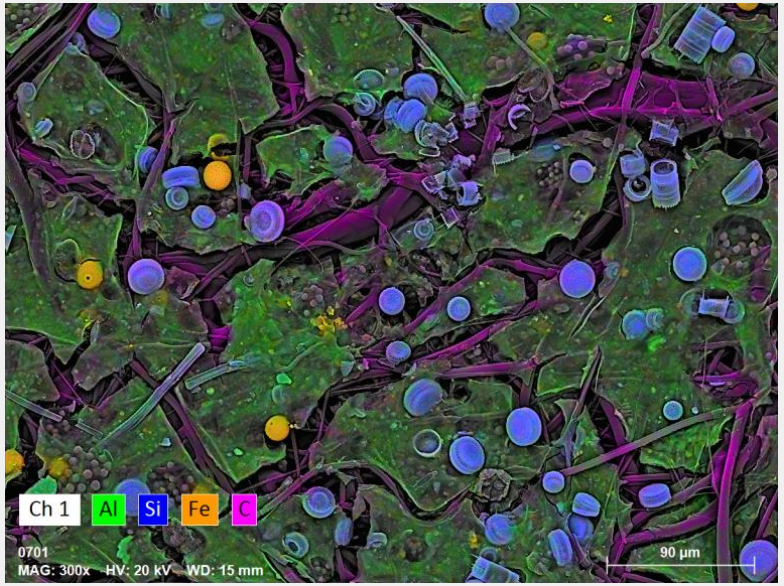


Cartridge filters foulant

Aluminium and diatoms

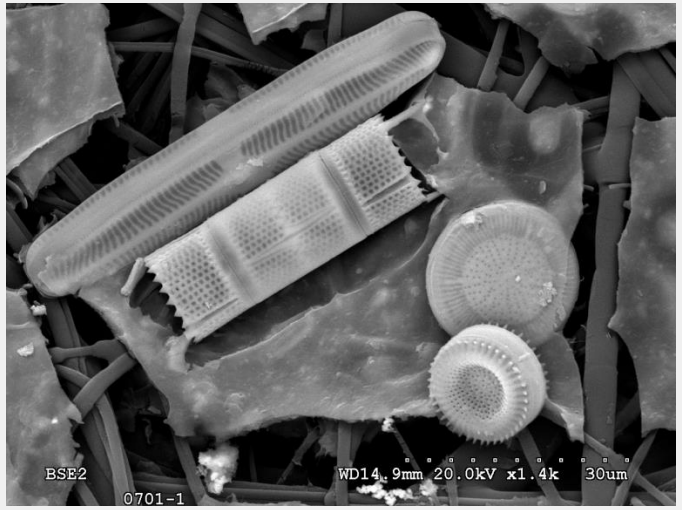


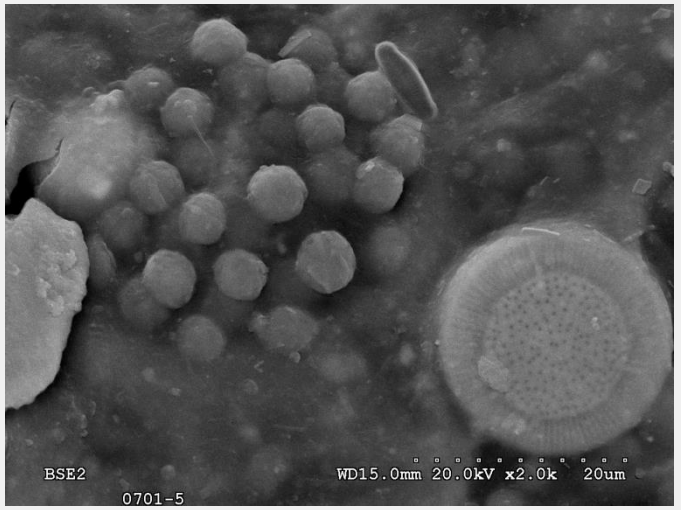


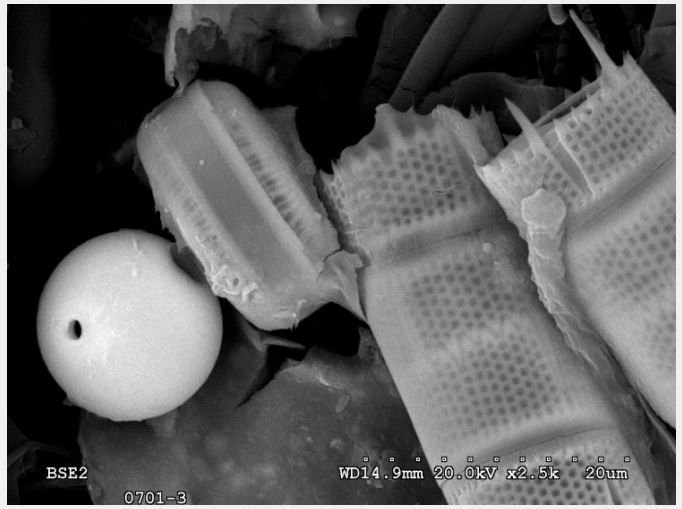


Cartridge filters foulant

Aluminium and diatoms







Can you clean filters in ANY plant?

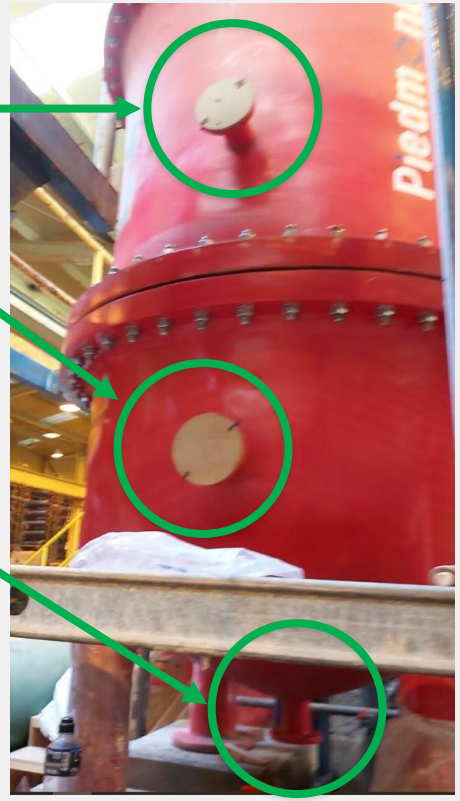
New Plants: Yes!

Just need to use a Piedmont Cartridge Filter Housing model with this option.

1- Cleaning outlet nozzle (for reverse Flow).

2- Cleaning inlet nozzle (for reverse Flow).

3- Cleaning purgue outlet nozzle.



Can you clean filters in ANY plant?

Existing Plants: In most cases, Yes.

- If inlet and outlet piping can be modified: Easy!

- If inlet and outlet piping cannot be modified: less easy

  -Cleaning outside the filter housing.

  -Cleaning in the housing, using small ancillary connections available.

Previous project at Moss Point

Previous project at Moss Point

Moss Point WTP
Cartridge cleaning pilot study

Challenging case:

The 10” inlet and outlet pipelines connected to the filter housing cannot be modified.

We need to find a way to integrate the cleaning system.

We will use the drains as our Inlet and outlet for the CIP.

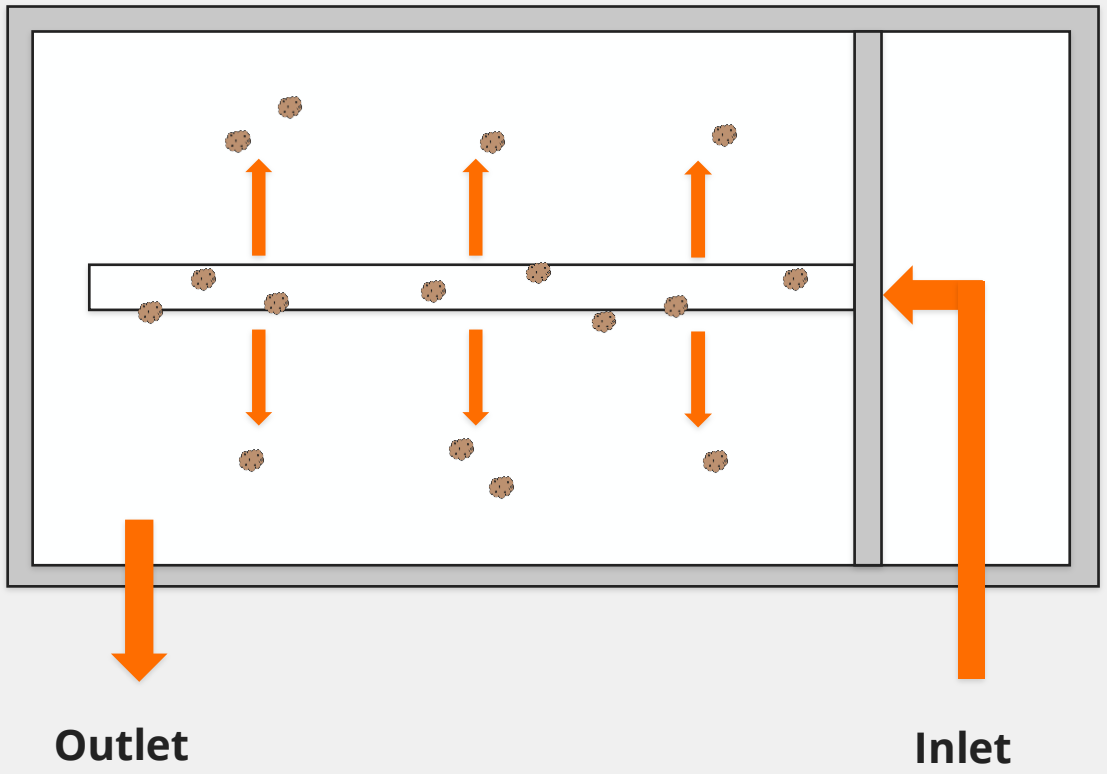
Can I ask you a Favor??

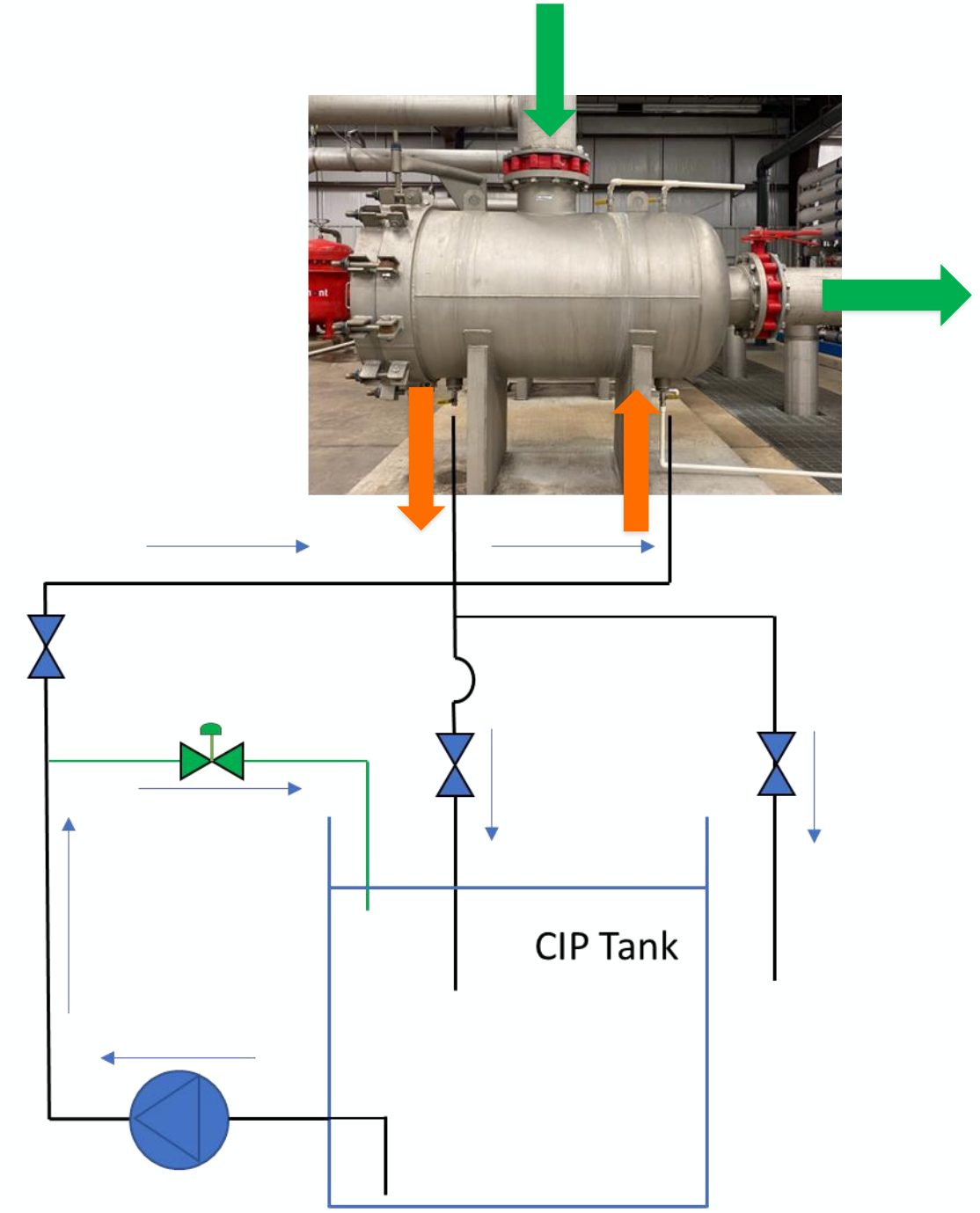
Picture time!

Cartridge Filtration at Moss Point WTP

- Brackish Water **RO** plant.
- Number of cartridge filter housings in pre-treatment: **4**
- Normal flow rate per filter housing: **250 m^3/h** (1100 gpm).
- Operating Pressure: **70 - 80 psi**.
- Filter elements per housing: **87**
- Annual consumption: **4200 filters.**

The pilot system at Moss Point
Clean in Place (CIP)





Moss Point WTP
Cartridge cleaning piloting

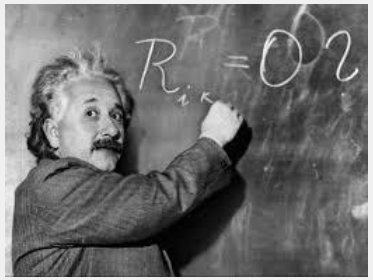
Cartridge Cleaning Considerations:

1. Target CIP flow rate: 25 m3/h (110 gpm). 10% of Opp. flow rate.
2. Target cleaning pressure: less than 25 psi.
3. Inlet for the cartridge cleaning: The filtrate chamber drain connection.
4. Outlet for the cartridge cleaning: The raw chamber drain connection.

Cartridge Cleaning Procedure:

1. Fill directly with pressurized RO permeate.
2. Top up with cleaning solution (at 2%) from CIP Tank.
3. Recirculate cleaning solution.
4. Leave to soak.
5. Disconnect CIP lines and open Feed drain and Filtrate drains, just enough to purge deposits.
6. If no deposits are present in the purge, then repeat steps 3 and 4.
7. Flush vessel and elements.
8. Consideration for cleaning solution neutralization and disposal.

Cartridge filter cleanings
Projections



COST SAVINGS IN CARTRIDGE FILTERS				
Scenario	**# of times a CF is cleaned**	**# CF saved per year**	**Cost Savings per year (USD)**	**Monthly cost in filters**
Baseline (No cleanings)	0	0	0	$ 3,500.00
Cleaning Scenario 1	1	2100	$ 21,000	$ 1,750.00
Cleaning Scenario 2	5	3500	$ 35,000	$ 595.00

Cartridge filter cleanings
Return on Investment

Scenario 1 (CF cleaned once):	
Initial Investment in CIP system	$ 8,000
Annual cost of cleaning (6 mo/year)	$ 3,000
Average monthly cleaning cost (4 CFH)	$ 250
Payback period (months)	6
Net monthly savings after payback period	$ 1,500

Scenario 5 (CF cleaned 5 times):	
Initial Investment in CIP system	$ 8,000
Annual cost of cleaning (10 mo/year)	$ 5,000
Average monthly cleaning cost (4 CFH)	$ 417
Payback period (months)	4
Net monthly savings after payback period	$ 2,500

Cartridge filter cleanings
Sustainability

PLASTIC WASTE REDUCTION			
Scenario	**# of times a CF is cleaned**	**Annual use of new CF**	**Plastic waste reduction**
Baseline (No cleanings)	0	4200	0%
Cleaning Scenario 1	1	2100	50%
Cleaning Scenario 2	5	714	83%

Moss Point WTP
Cartridge cleaning pilot study

Moss Point Cartridge filter Autopsy

This has been a fast track pilot project that just started. The first cartridge filter samples just arrived at our lab in Madrid!

Moss Point WTP
Cartridge cleaning pilot study

In the meantime at Moss Point…

Sam just finished putting together the pilot system last Friday:







Moss Point WTP
Cartridge cleaning pilot study

Last Friday: The piloting equipment was tested for the first time with a simplified and very short version of a cleaning.

Moss Point WTP
Cartridge cleaning pilot study

Last Friday: The piloting equipment was tested for the first time with a simplified and very short version of a cleaning.

Moss Point WTP
Cartridge cleaning pilot study

Short CIP equipment testing: Achieving positive results:

Differential pressure of CIP in reverse flow:

At the beginning of the cleaning: 6 psi ΔP (13 psi – 7 psi)

At the end of the cleaning: 5 psi ΔP (9 psi – 4 psi)

Differential pressure reduction: 17%

CONCLUSIONS

- A filter autopsy is key to select the best cleaner and obtain the best result.
- The cleaning needs to be well designed, and be gentle, to avoid damaging the filters.
- The pilot testing at Moss Point will help us quantify the number of times a cartridge filter can be cleaned and reused and associated savings.
- Cleaning filters can help drastically reduce the amount of plastic waste generated by desalination plants.
- Clients committed to improve sustainability and those trying to improve OPEX are perfect targets for this solution in RO plants.
- Focusing on providing the specialty chemicals for cleaning filters will help grow your sales in a product line that is more profitable and perceived as a high-value service, compared to the cartridge filter business.

Live Poll

In what cases it makes sense to clean filters in a desalination plant?

1. When cost of cleaning cartridge filters is less than savings in cartridge filter consumption.
2. When the return on CIP system investment is quick.
3. Always, as long as cleanings are effective, to prevent the cartridge filter from being “single-use plastic”.
4. All of the above.

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