

Disruptor®



Disruptor ®

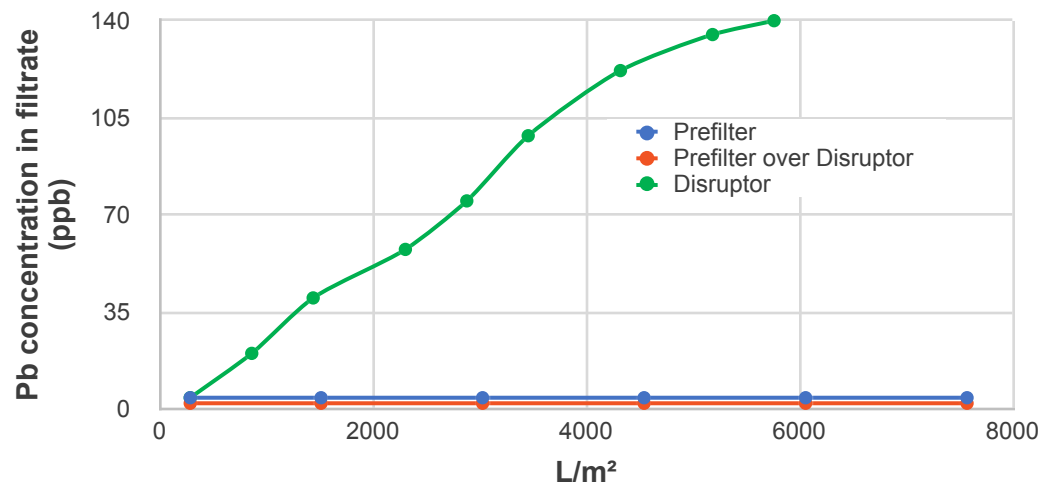
Retention Studies – Lead

Lead retention results

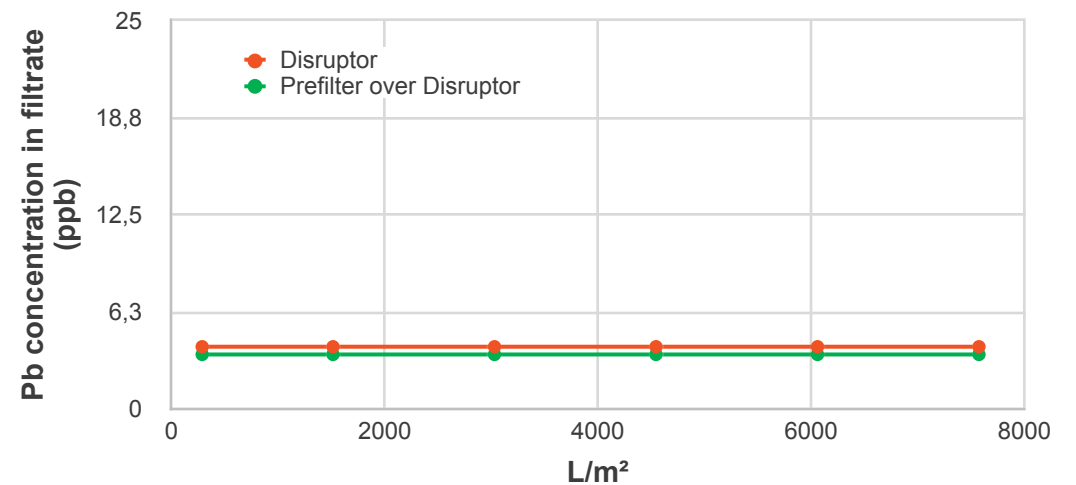
Results:

- Disruptor Lead prefilter improved significantly soluble lead reduction
- Lead concentration is under 5 ppb during the entire test for both soluble and particulate lead (NSF requirement)
- Disruptor alone clogs during particulate lead test reducing the filter life. However, no clogging issues were observed during the entire test when the prefilter is used on top of Disruptor.

Soluble Lead Retention (pH 6.5)



Particulate Lead Retention (pH 8.5)

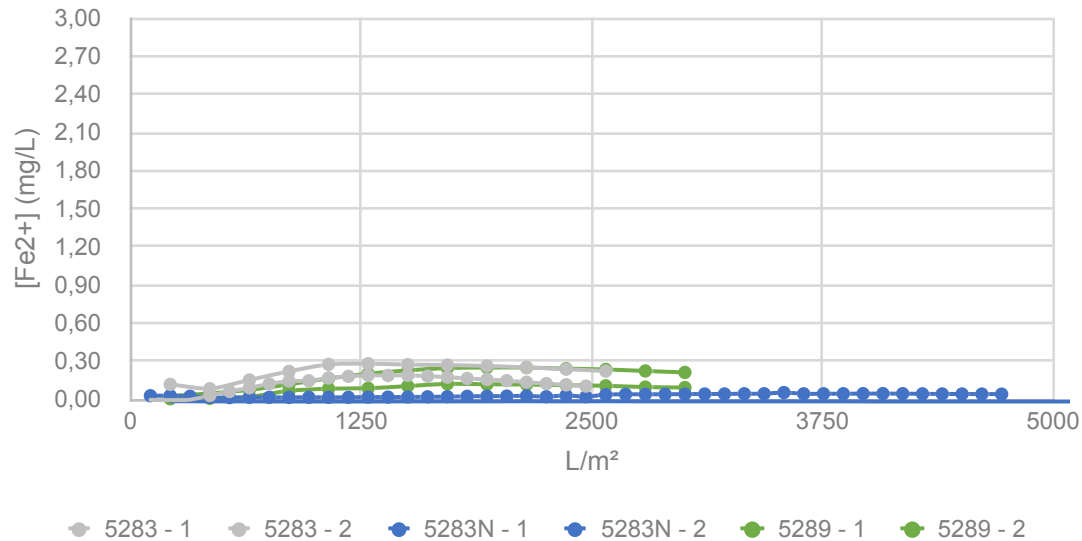


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Retention Studies – Iron

Iron II Summary

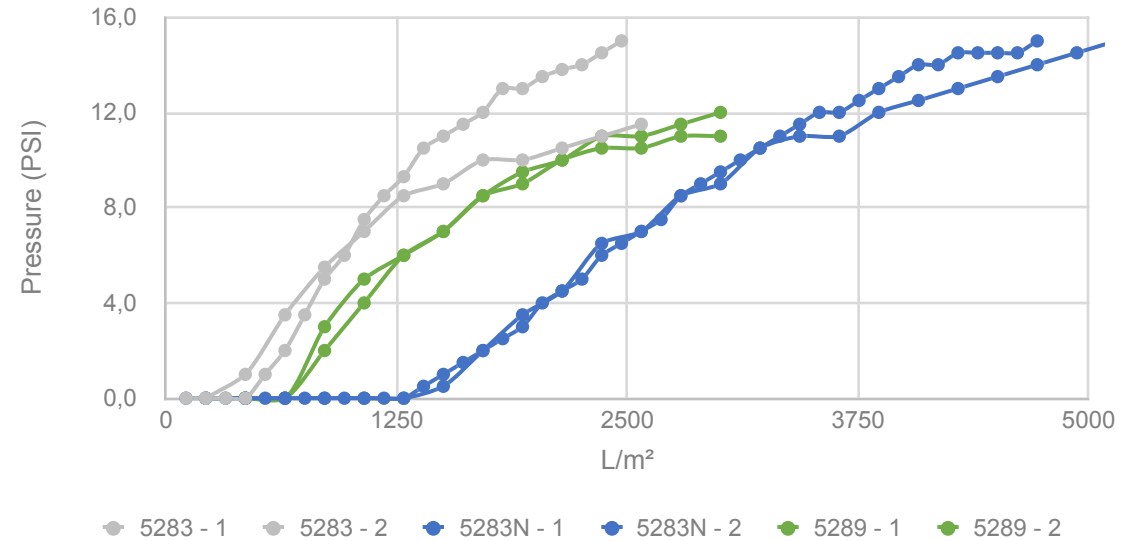
Fe²⁺ Retention - Concentration



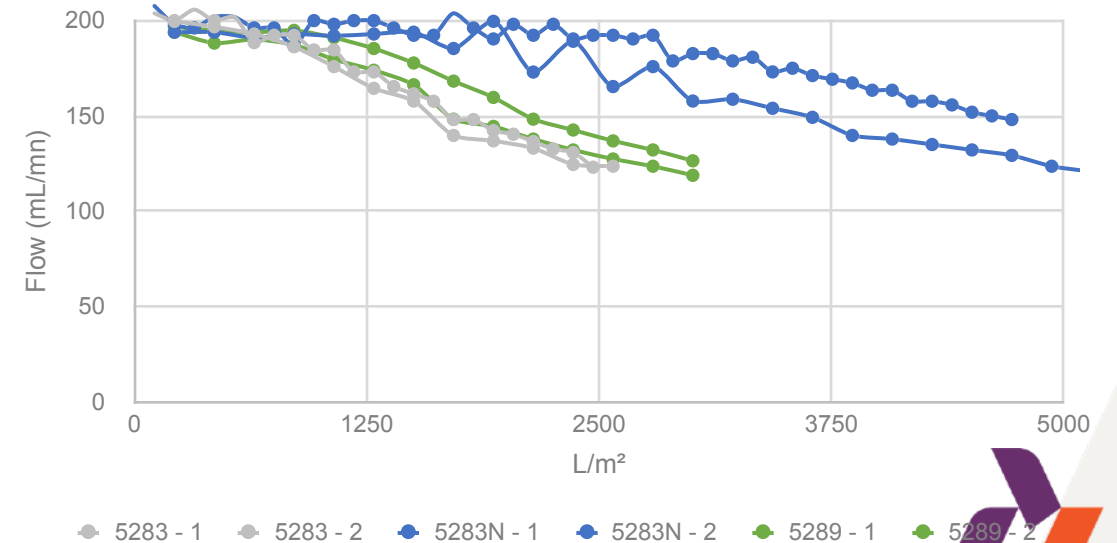
Conditions:

- Tap water from Pont Eveque-PEV
- (Conductivity 590 μ S/cm, T° 20°C, TDS 310 mg/L, 6.5 < pH < 8.5)
- Iron II concentration: 3 ppm
- Flat sheet samples, surface area: 46.6 cm²
- Flow rate: 1 gpm/ft² = 190 mL/mn
- Analysis by ICP-AES

Fe²⁺ Retention - Pressure

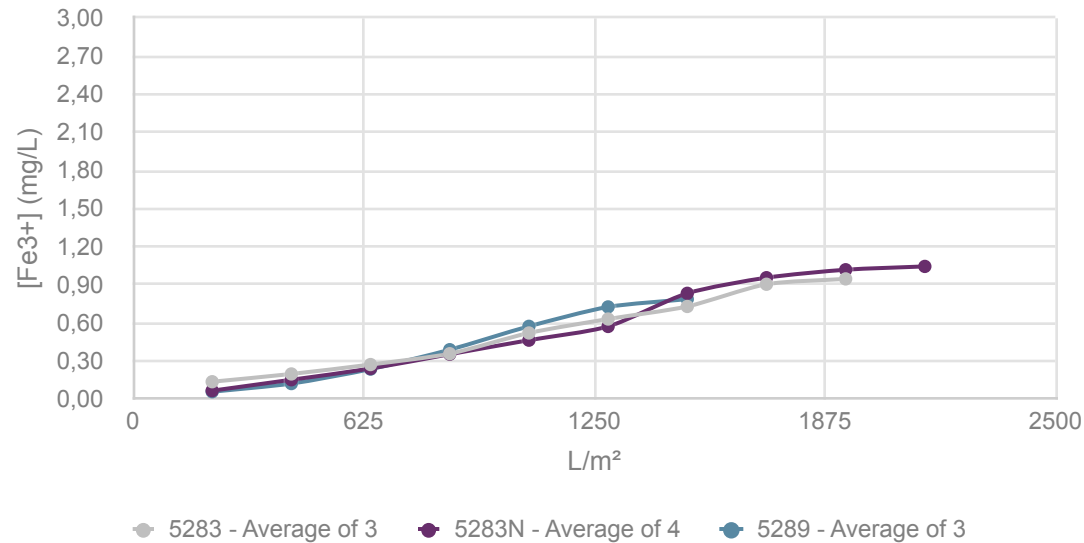


Fe²⁺ Retention - Flow

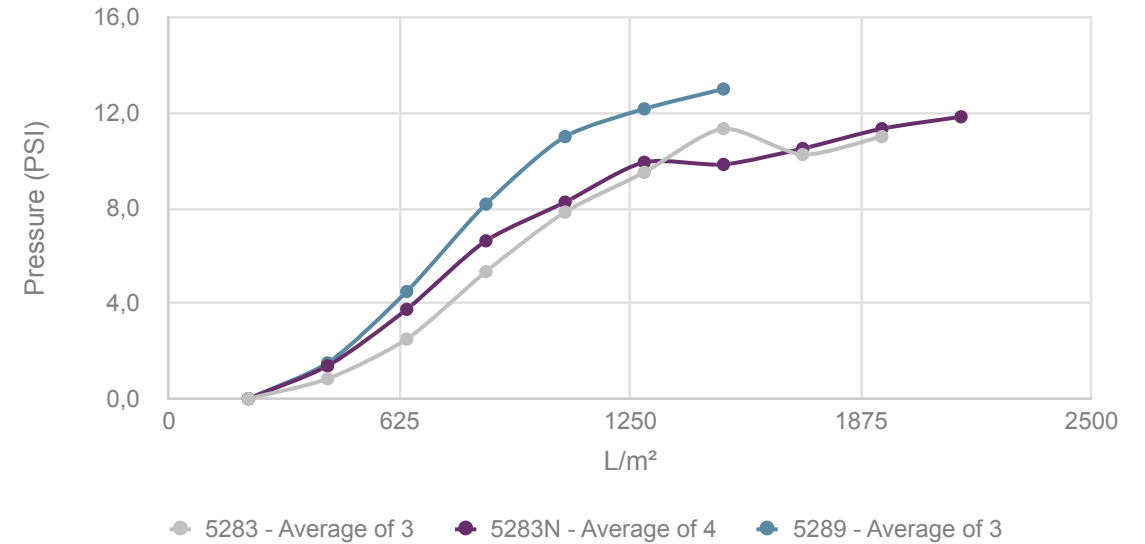


Iron III Summary

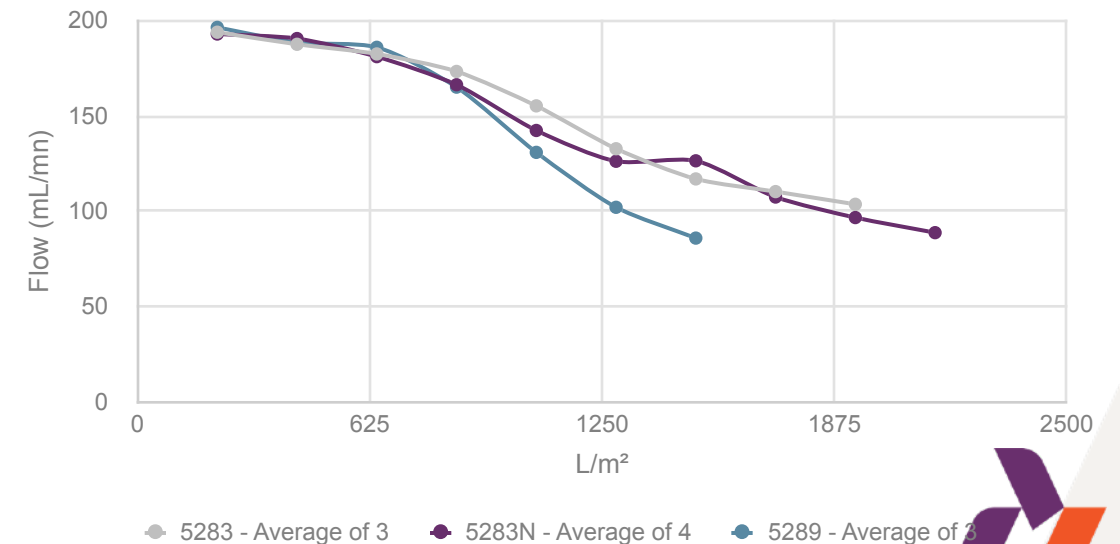
Fe3+ Retention - Concentration



Fe3+ Retention - Pressure



Fe3+ Retention - Flow



Conditions:

- Tap water from Pont Eveque-PEV
- (Conductivity 590µS/cm, T° 20°C, TDS 310 mg/L, 6.5 < pH < 8.5)
- Iron III concentration: 3 ppm
- Flat sheet samples, surface area: 46.6 cm²
- Flow rate: 1 gpm/ft² = 190 mL/mn
- Analysis by ICP-AES



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Retention Studies – Chlorine

Chlorine Retention

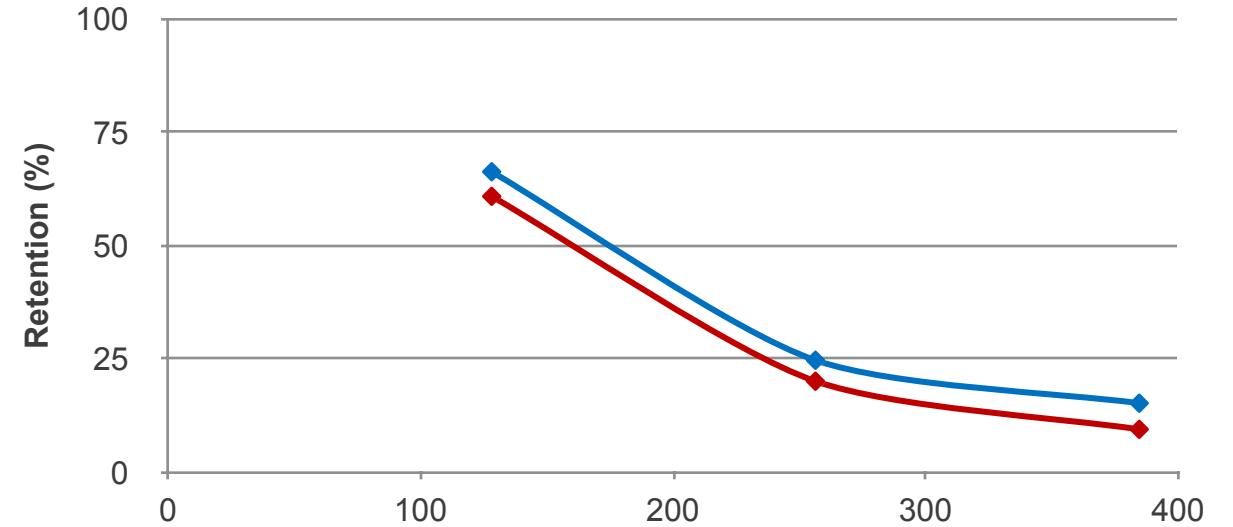
Grade 5283 and 5283N

All grades are below 50% retention after first sampling

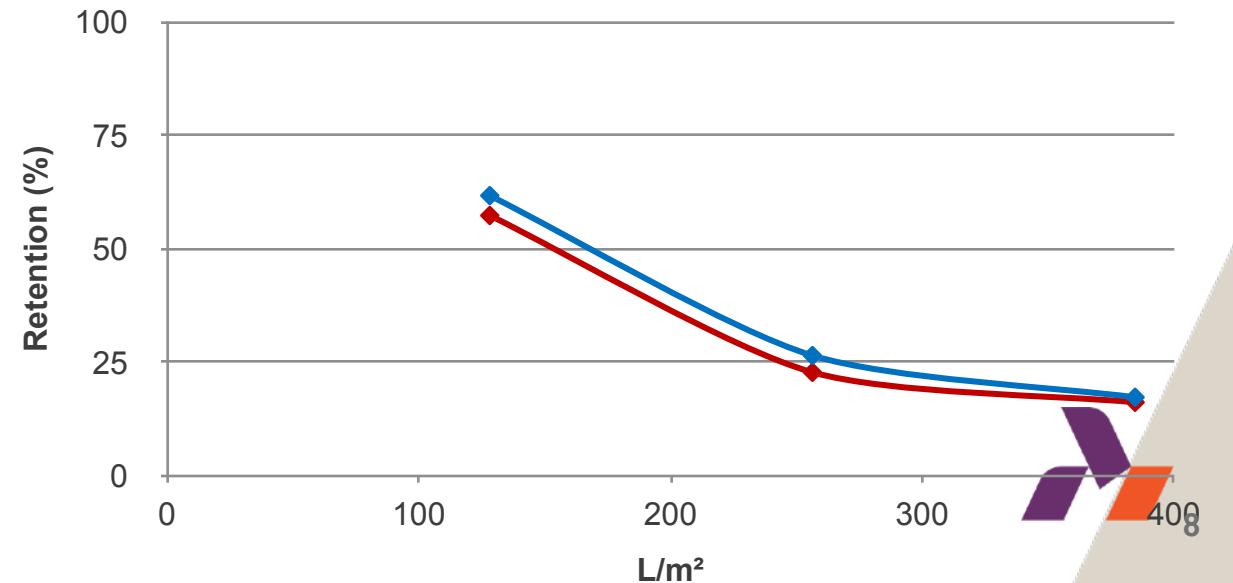
Conditions:

- Tap water from Pont Eveque-PEV
(Conductivity $590\mu\text{S}/\text{cm}$, Temperature 20°C , TDS $310\text{ mg}/\text{L}$, pH 7.4)
- Chlorine initial concentration: 2 ppm
- Flat sheet samples, surface area: 3.9 cm^2
- Flow rate: $1\text{ gpm}/\text{ft}^2 = 15.9\text{ mL}/\text{mn}$
- Analysis by spectrophotometry using kit test reagents from Hach.
- Concentration range between 0 and 2 ppm.

5283 lot 203384



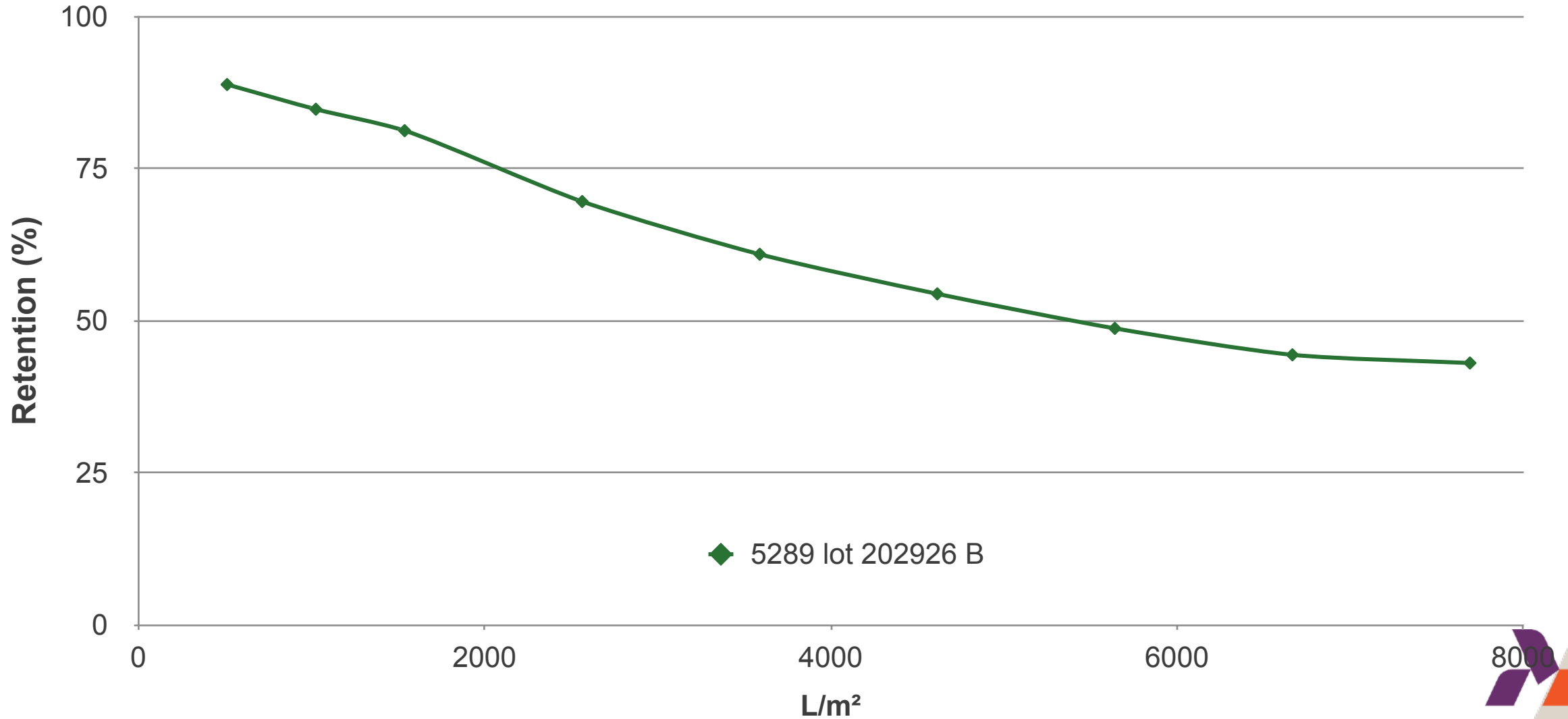
5283N lot 203230



Chlorine Retention

Carbon Grades Summary

Chlorine Retention – Carbon Grades

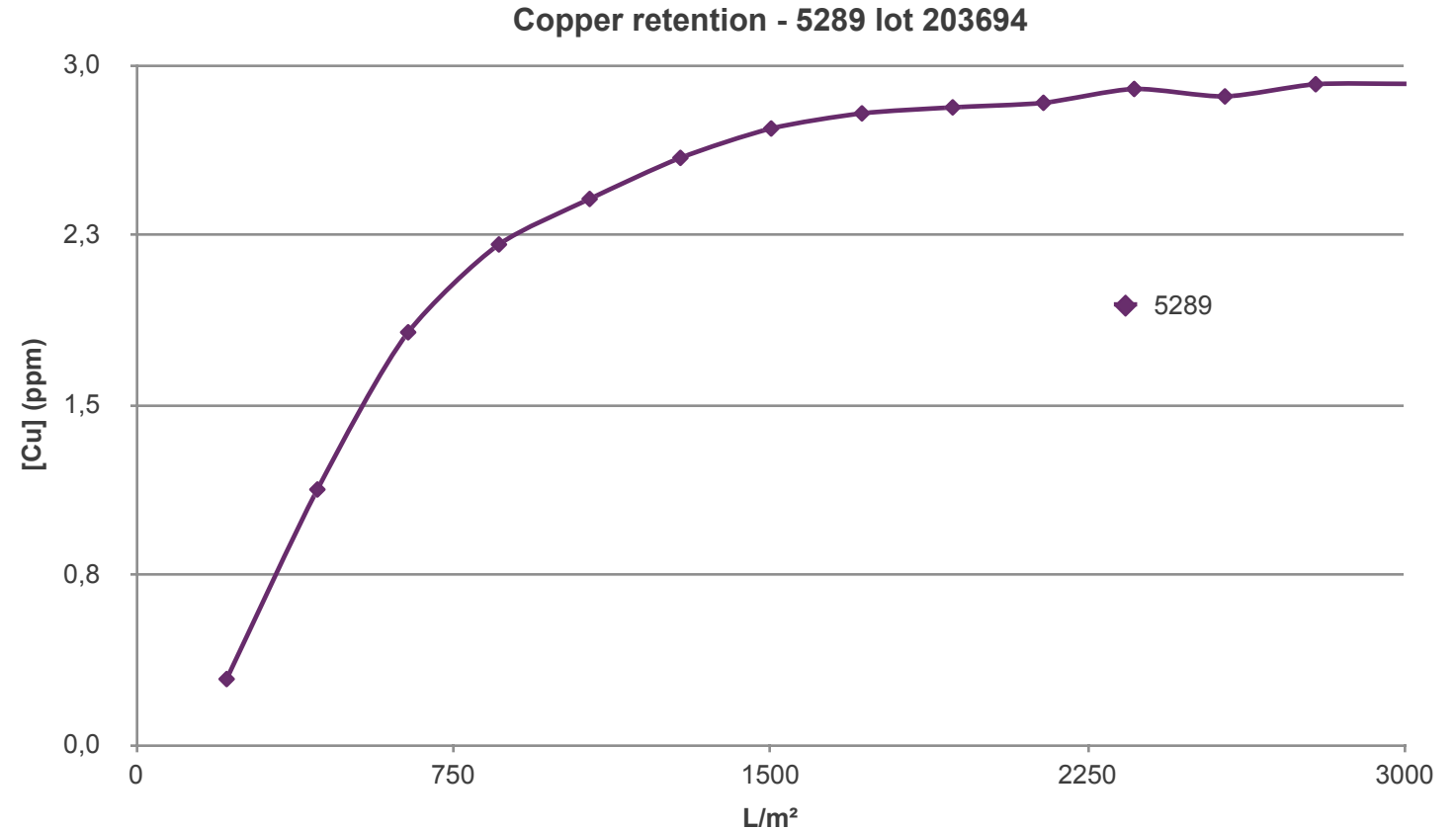


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Retention Studies – Copper

Copper Retention

5289



Conditions:

- Tap water from Pont Eveque-PEV
(Conductivity 590 μ S/cm, Temperature 20°C, TDS 310 mg/L, pH 7.4)
- Copper initial concentration: 3 ppm
- Flat sheet samples, surface area: 3.9 cm²
- Flow rate: 1 gpm/ft² = 15.9 mL/mn
- Analysis by spectrophotometry using kit test reagents from Hach.
- Concentration range between 0 and 2 ppm.



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Retention Studies –

Emerging Contaminants

Emerging Contaminants retention

Grade 5293

Prescription Drugs

- Meprobamate: a compound found in anti-anxiety drugs.
- Phenytoin: an anti-epileptic drug.
- Atenolol: a beta blocker drug.
- Carbamazepine: an anti-convulsant and mood-stabilizing drug.
- Trimethoprim: an antibiotic medication.
- Estrone: a prescription birth control drug.²

Chemical Compounds

- TCEP (Tris(2-chloroethyl)phosphate): a chemical compound used as a flame retardant, plasticizer and viscosity regulator in various types of polymers including polyurethanes, polyester resins and polyacrylates.
- TCPP (Tris(1-chloro-2-propyl) phosphate): a chemical compound used as a flame retardant.
- BPA (Bisphenol A): a chemical compound used as a plasticizer.
- Nonyl phenol: a collection of compounds often used as a precursor to commercial detergents.³

Prescription Drug Testing NSF 401					
Analyte	Sample Point				
	50%	100%	150%	180%	200%
Meprobamate	NO	NO	NO	NO	NO
Phenytoin	YES	YES	YES	YES	YES
Atenolol	YES	NO	NO	NO	NO
Carbamazepine	YES	YES	NO	NO	NO
Trimethoprim	YES	YES	YES	YES	NO
Estrone	YES	YES	YES	YES	YES

Chemical Compound Testing NSF 401					
Analyte	Sample Point				
	50%	100%	150%	180%	200%
TCEP	YES	YES	NO	NO	NO
TCPP	YES	YES	YES	YES	YES
Bisphenol A	YES	YES	YES	YES	YES
Nonyl phenol	YES	YES	YES	YES	YES

All testing based on a life estimation of 1000 liters/ft² corresponding to 100% in the tables.

Emerging Contaminants retention

Grade 5293

Over-the-Counter Medications

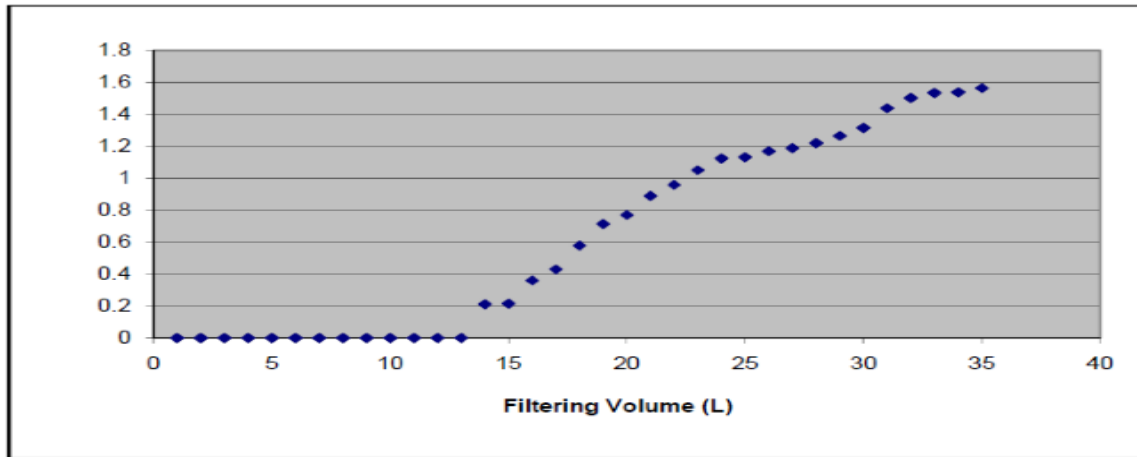
- *Ibuprofen: an over-the-counter pain reliever and anti-inflammatory medication.*
- *Naproxen: an over-the-counter pain reliever and anti-inflammatory medication.*
- *DEET (N,N-Diethyl-meta-toluamide): a pesticide and common active ingredient in insect repellents.*
- *Metolachlor: an organic compound that is widely used as an herbicide.*
- *Linuron: an herbicide often used in the control of grasses and weeds⁴.*

OTC Medication Testing NSF 401					
Analyte	Sample Point				
	50%	100%	150%	180%	200%
Ibuprofen	YES	YES	NO	NO	NO
Naproxen	YES	YES	YES	YES	YES
DEET	YES	NO	NO	NO	NO
Metolachlor	YES	YES	YES	NO	NO
Linuron	YES	YES	YES	YES	YES

Other trace pharmaceutical / micro contaminant reduction results with Disruptor®

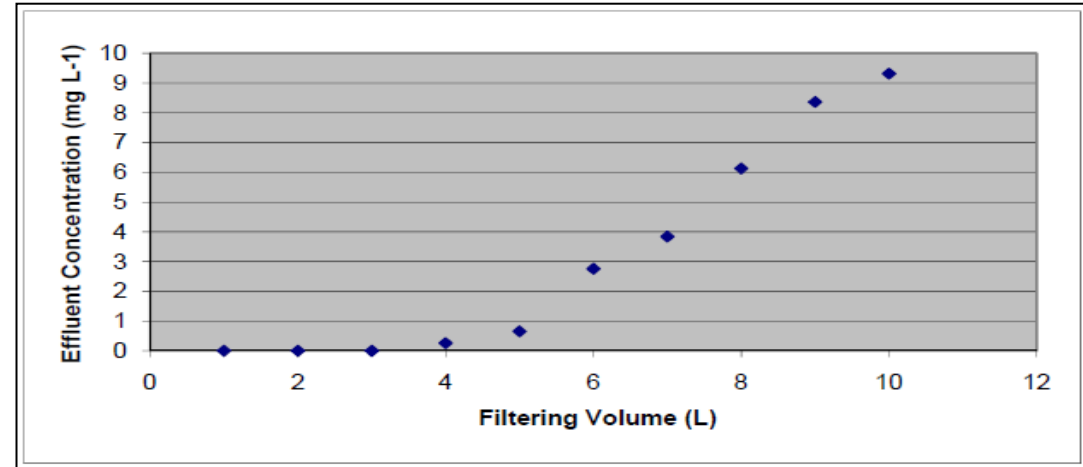
- Micro-contaminants of many types are now being detected in many waste water and in some potable water sources.
- The dangers these contaminants present to humans and the environment are not well understood
- Reduction of removal of these compounds from both waste and potable water is a concern to many health authorities and agencies

Penicillin G Removal



Penicillin G was used as a representative antibiotic. It was first studied using a challenge solution of 2 mg/l. This slide shows that the entire antibiotic was removed from 13 liters of water. At more typical concentration in the range of 2 micrograms per liter, a square foot of Disruptor® PAC could theoretically process more than 900,000 liters of water if it were free of other contaminants.

Flumequine Removal



Flumequine is a chemotherapeutic antibiotic implicated in tendon rupture, DNA damage and anaphylactic shock. It has been taken off the market but is representative of the flumequine drug class. The data shows complete removed from 3 liters of water having a concentration of 10 mg/L. At more typical concentration in the range of 2 micrograms per liter, a square foot of Disruptor® could theoretically process more than 1 million liters of water if it were free of other contaminants.

Other trace pharmaceutical / micro contaminant reduction results with Disruptor® (cont.)

PCB Removal

Congener Group	ng/L influent	5284 ng/L effluent	5283 ng/L effluent
Total monochloro biphenyls	158	2.36	0.377
Total Dichloro Biphenyls	629	0.85	nd
Total Trichloro Biphenyls	1260	nd	nd
Total Tetrachloro Biphenyls	4490	nd	nd
Total Pentachloro Biphenyls	4870	nd	nd
Total Hezachloro Biphenyls	4460	nd	nd
Total Heptachloro Biphenyls	2460	nd	nd
Total Octachloro Biphenyls	1810	nd	nd
Total Nonachloro Biphenyls	473	nd	nd
Decachloro Biphenyls	187	nd	nd
Total PCBs	20797	3.21	0.377

Polychlorinated biphenyls (PCBs) are man made organic chemicals that are known for their toxic and carcinogenic effects. Independent testing has shown Disruptor® and Disruptor® PAC to be effective in removing PCBs from water as indicated by the above chart.

Orthophosphate (fertilizer) reduction

Criteria	Median MBE Effluent Concentration	Disruptor RO-Prefilter Effluent
cBOD (mg/L)	2	
Turbidity (NTU)	0.07	
Ammonia (mg/L-N)	0.03	
Nitrate (mg/L-N)	1.33	
TKN (mg/L)	0.95	
Total Phosphorus (mg/L-P)	0.145	
Ortho-phosphate (mg/L-P) - 3/7/11	0.118	0.002
Ortho-phosphate (mg/L-P) - 3/10/11		0.023
TOC (mg/L)	7.93	8.15

Pilot trial data in tertiary waste water to evaluate orthophosphate reduction using Disruptor®