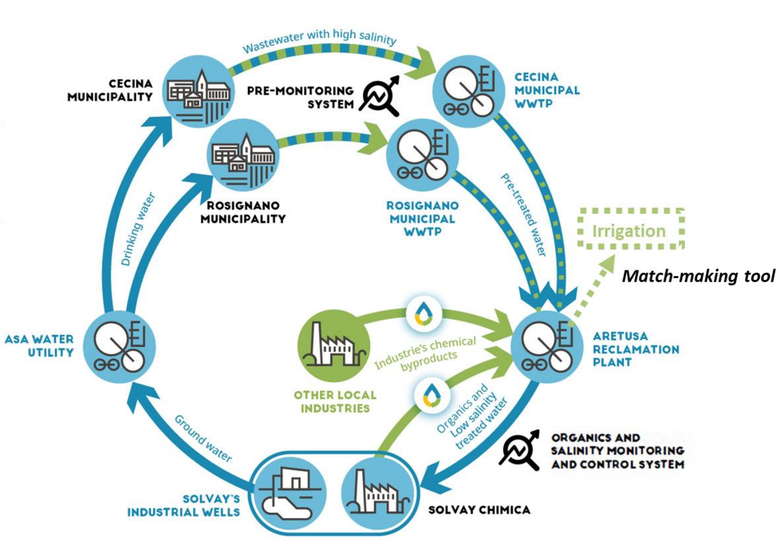
ULTIMATE

WATER SMART INDUSTRIAL SYMBIOSIS

TRANSITION FROM LINEAR TO CIRCULAR ECONOMY

in the nexus of the water sector & intensive water consuming industries.

CS3 – Use of by-products of local industries for municipal wastewater treatment in Rosignano

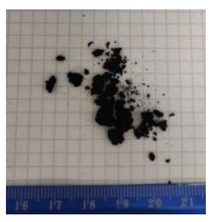


Objectives:

- Recovery of by-products as alternative softening agents/coagulants/adsorbents;
- Increase the quality of Aretusa effluent water to enhance reuse possibilities
- Decrease the territorial carbon and environmental footprint though symbiosis

HC
Hydrochar

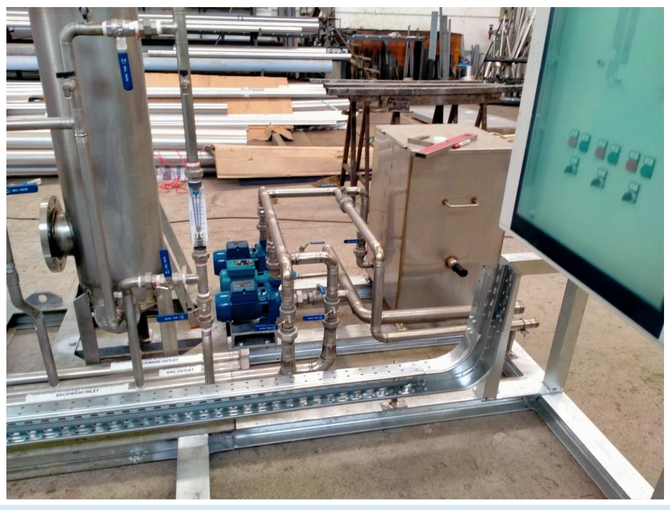
HC ATT 5-6-7
Activated HC



GAC
Activated carbon

Soda Solvay
Out of specification Na2CO3

Precotto
Granulated limestone rocks



Pilot adsorption system equipped with:

- Conductivity sensor
- pH sensor
- UV 254 nm sensor (COD monitoring)
- Fluorescence sensor (COD monitoring and charact)

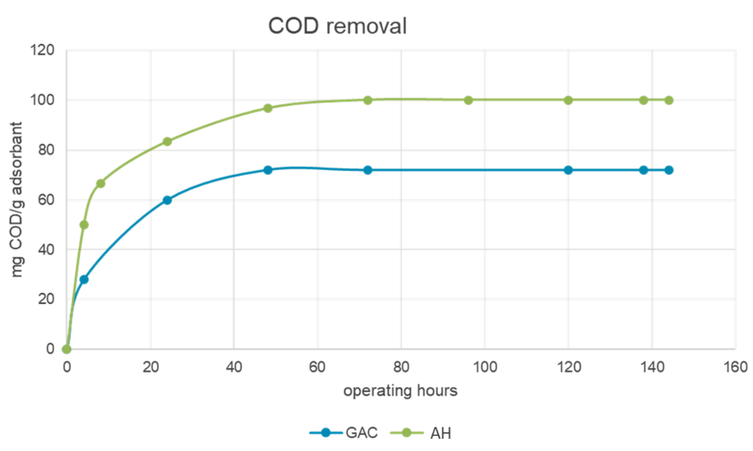
→ Possibility to test different materials and retention time
Innovative on-line process and water-quality parameters monitoring

First results – laboratory experiment testing by-products

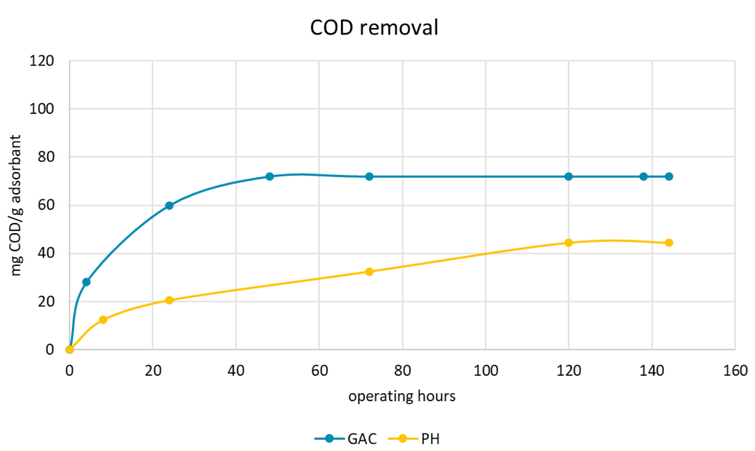
→ Hydrochar: tested as adsorbent after **Chemical Activation Process** (Activated Hydrochar - AH) and **Pyrolysis** (Pyrolyzed Hydrochar - PH)

→ **Precotto** and out of specification **Soda Solvay** used as softening agents/coagulants

Adsorption on Activated Hydrochar



Adsorption on Pyrolyzed Hydrochar



Softening on Solvay by-products

SUBSTRATE	SOFT. AGENT	pH	COD Removal (%)	Mg Removal (%)	Ca Removal (%)
Influent municipal wastewater	Commercial SODA 1M	8.5-10		0	< 53
Influent municipal wastewater	Soda Solvay	8.5-10		0	44-80
Influent municipal wastewater	Precotto	8.5-10		4-8	< 35
Influent municipal wastewater	Precotto	8-9.5	49-58	0	17-24
Effluent wastewater	Precotto	8-9.5	25-40	7-19	0
Effluent wastewater	Soda Solvay	8-9.5	< 10	0	7-45
Aretusa wastewater	Precotto	9-9.5	7-47	9-11.4	5.7-9
Aretusa wastewater	Soda Solvay	9-9.5	47-73	0-8.4	9-24
Aretusa wastewater	Precotto and Soda Solvay	9-9.5	80-87	4-6.2	10-24

Lessons learned from the experimental tests

→ High variability of performances when using by-products
→ Optimal (chemical) activation of Hydrochar at pilot/demo scale is difficult and expensive in the European scenario. Pyrolysis was tested as more feasible alternative to improve the adsorption capacities of the material, and to eliminate leaching of organic substances

What is crucial in terms of replication of the technology?

→ The reuse of by-products is influenced by local availability and variability of the production plants. Technical properties of recovered materials may still be not competitive
→ Fluorescence measurements are innovative and require specific pre-tests and calibration tests during the implementation
→ UV sensor is interesting as parameter for COD monitoring

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