Horizon 2020
European Union Funding
for Research & Innovation

SPOTVIEW TECHNOLOGY LEAFLETS

VALMET - Ultrafiltration for Tissue Mill

BFI - Capacitive Deionization (CDI)

CERTH – Anaerobic / Aerobic Membrane Bioreactor

XERCHEM – BioControl Unit

QPINCH – Chemical Heat Pump

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No 723577

TECHNOLOGY OFFER:
VALMET ULTRAFILTRATION FOR TISSUE MILL

Valmet

OVERVIEW

Category: Technology ☑, Process ☑, Service ☑, Method ☐, R&D knowledge ☑, Other ☐

Benefit summary: Ultrapure water is produced with the new designed Valmet's Cross Rotational Ultrafilter. Permeate water is used to replace fresh water and decrease the water and energy consumption at the tissue paper production. Also, process cleanliness is maintained or improved.

Development status: First prototype has been designed and demonstrated in Essity Nokia mill at a permeate flow of 6 – 10 m^3/hr, reducing fresh water consumption by 1-2 m^3/t produced paper.

NOVELTY

- **Technology benefit description**: Valmet Ultrafiltration Tissue process produces high quality ultrapure water (Permeate) for the paper machine's wire section high-pressure showers to decrease the fresh water consumption. Permeate can also be used for paper machine's other showers on wire and press sections as well as for the dilution of chemical additives.

  The Permeate produced with Valmet Ultrafiltration technology is:
  - Free from solid substances
  - Free from colloidal material
  - Free from turbidity
  - Free from bacteria
  - Free from secondary and micro sticky
  - 50-70 % less anionic trash

  When the Permeate is used for replacing the warm fresh water there are also savings in the energy used for heating the water and the PM processes. Removing trash material from process water also help maintaining good paper making performance and efficiency.

  The feed water is normally paper machine white water, e.g. clear filtrate from fiber recovery disc filter.

  The benefit of Valmet CR (cross rotational) ultrafilter is the low operating pressure difference and thus no clogging of the membrane. This results in high and stable capacity as well as long membrane life time.

- **Technology uniqueness and comparison vs state-of-the-art**: Valmet Ultrafiltration Tissue is the first new designed cross rotational ultrafiltration system for Tissue mills white water recycling and purification. State of the art nowadays is the warm fresh water for the critical consumption points.

DEVELOPMENT

- **Technology Readiness Level**: TRL 1 ☐; 2 ☐; 3 ☐; 4 ☐; 5 ☐; 6 ☐; 7 ☑; 8 ☐; 9 ☐
- **Development status**: First prototype unit has been designed and demonstrated at a paper mill site. Recovered permeate water has been reused in the wire section high-pressure showers of the paper machine.

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TECHNOLOGY PROVIDER

- **Technology provided by**: Valmet Technologies Inc., Keilasatama 5 / PO Box 11, FI-02150 Espoo, Finland, https://www.valmet.com

TECHNICAL DETAILS

- **Description**:

  Valmet Ultrafiltration Tissue process is a factory built and IO-tested fully automated modular system. The heart of the process is the new CR1010/30 ultrafilter. The membrane area is 42 m² with 30 filter cassettes and its dimensions are 2.3 m x 2.1 m x 1.4 m (height x width x length). The modular system can easily be extended by adding filter units to increase the membrane area.

  With the typical tissue machine (100-300 t/d) the Ultrafiltration process including one or two CR ultrafilters can reach the fresh water reduction of 1-2 m³/t of produced paper.

  The process is designed to be service friendly and with exchange filter cassettes the membrane change is fast, easy and economical.

  Valmet Ultrafiltration process is also feasible to other application within Pulp & Paper industry and outside of it.

EXPLOITATION/LICENSING

Valmet Ultrafiltration Tissue process will be part of Valmet Water Management portfolio and thus available through on Sales activities.

CONTACT DETAILS

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Sustainable Processes and Optimized Technologies for Industrially Efficient Water Usage

Horizon 2020 European Union Funding for Research & Innovation

Grant Agreement Nº: 723577 / H2020-SPIRE-2016

TECHNOLOGY OFFER:
CAPACITIVE DEIONIZATION (CDI)

OVERVIEW

Category: Technology ☐, Process ☐, Service ☑, Method ☐, R&D knowledge ☐, Other ☐

Benefit summary: Capacitive deionization (CDI) is a new ionization method for the removal of ions from water by electrostatic adsorption on two opposed charged electrodes by a low-voltage electromagnetic field. Advantage of the CDI include low energy demand and the chemical free operation.

Development status: Demonstration unit operated in steel factory

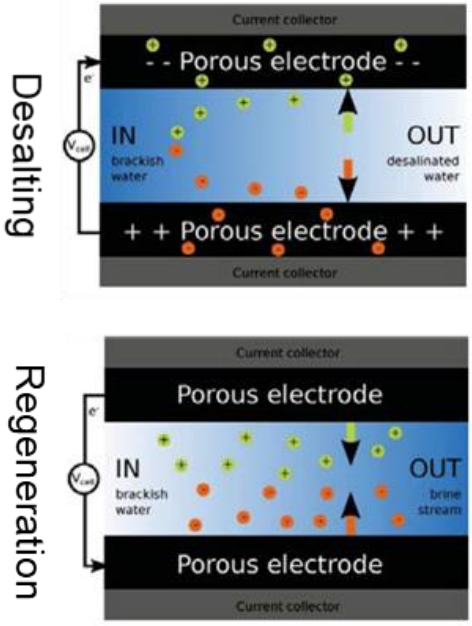
IP status: Technology patented by developer (Voltea)

NOVELTY

- **Technology benefit description**: 1. Avoidance of water losses (1 -5% of the circulation flow rate) by discharge of cooling water as a result of salts, hardness forming components causing corrosion, scaling caused by evaporation losses, and concentration. 2. Reuse of blow-down water from cooling water circuits. 3. Adaptation to complex / varying water composition. 4. Low energy and chemical use.
- **Technology uniqueness and comparison vs state-of-the-art**: Advantage of the CDI is the low operational pressure (3- 4 bar) and thus energy saving compared to RO (15- 30 bar), the low energy demand compared to electro dialysis, and the chemical free operation compared to ion exchange (acidic and alkaline resining waters from regeneration).

DEVELOPMENT

- **Technology Readiness Level**: TRL 1 ☐; 2 ☐; 3 ☐; 4 ☐; 5 ☐; 6 ☐; 7 ☑; 8 ☐; 9 ☐
- **Development status**: Demonstration unit operated at Arcelor Mittal plant in Spain



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INTELLECTUAL PROPERTY

Patent / application N°	Title	Countries	Status	Priority date
EP2373587 / US2010065438	Method of Operating A Capacitive Deionization Cell Using Gentle Charge	US/EU/…	Granted	15-09-2008
EP2344421 / US2010065511	Method of Regenerating A Capacitive Deionization Cell	US/EU/…	Granted	15-09-2008

TECHNOLOGY PROVIDER

- **Technology provided by**: VDEh-Betriebsforschungsinstitut GmbH (BFI), http://www.bfi.de
- **Related expertise**: Energy efficiency, process optimization, measuring and instrumentation technology

TECHNICAL DETAILS

- **Description**: New deionization method by electrostatic adsorption (desalting) using parallel cells with two opposed charged electrodes at low-voltage electro-magnetic field. Regeneration is done by reversing the polarity and discharging the ions in a concentrated stream. The module is cleaned with 10% HCl once a month (< 20 l) and once a week with air source as recommended by the manufacture. CDI is applied for water desalination and treatment of waste water and process streams.

EXPLOITATION/LICENSING

- **Collaboration type sought**: BFI is adapting the CDI technology to requirements in Iron and Steel industry as pretreatment of disturbing components, and operational parameters of CDI.

CONTACT DETAILS

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TECHNOLOGY OFFER:
ANAEROBIC / AEROBIC MEMBRANE BIOREACTOR

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

OVERVIEW

Category: Technology ☑, Process ☐, Service ☐, Method ☐, R&D knowledge ☑, Other ☐

Benefit summary: Novel anaerobic/aerobic membrane bioreactor (aaMBR) enables advanced wastewater treatment performance and water reclamation through integration of membrane technology with biological wastewater treatment. Main advantages of aaMBR include: Complete separation of the activated sludge, higher concentration of active biomass, process intensification, and overall higher effluent quality.

Development status: Pilot unit

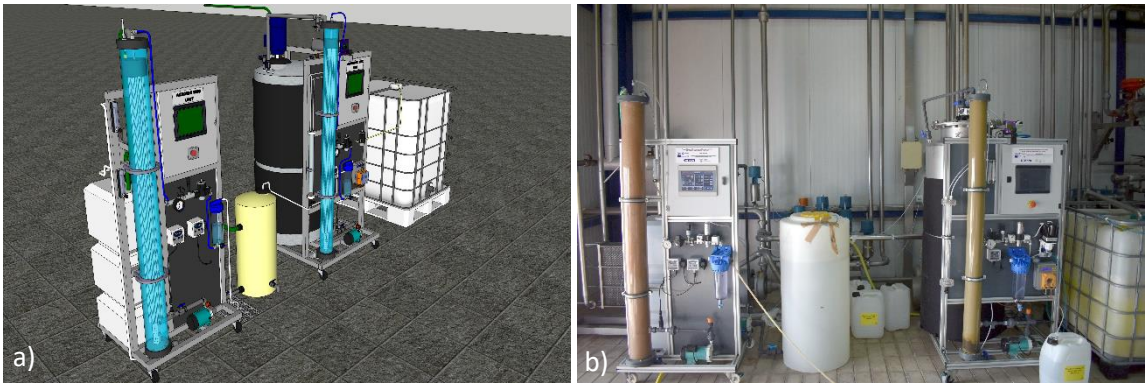
IP status: Patent pending

NOVELTY

- **Technology benefit description**: Intensified waste water treatment through integration of membrane technology with anaerobic and aerobic waste water treatment: Higher effluent quality, generally suited for recycling; renewable energy (biogas) from wastewater treatment; complete separation of activated sludge; higher concentration of active biomass; reduced amount of sludge.
- **Technology uniqueness and comparison vs state-of-the-art**: Maturity of individual technologies, high quality effluent with no suspended solids, simultaneous renewable energy production.

DEVELOPMENT

- **Technology Readiness Level**: TRL 1 ☐; 2 ☐; 3 ☐; 4 ☐; 5 ☐; 6 ☑; 7 ☐; 8 ☐; 9 ☐
- **Development status**: Pilot unit (capacity ca. 20 L/hr, 4 m^2 membrane area)



The aaMBR pilot plant: a) A 3-D view of pilot design. b) Front view of operating pilot; the anaerobic MBR unit at the right-hand side.

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TECHNOLOGY PROVIDER

- **Technology provided by**: CERTH-NRRE Lab, Thermi -Thessaloniki, Greece
- **Related expertise**: Research and technology development

TECHNICAL DETAILS

- **Description**: The aaMBR technology is based on the combination of the continuous activated sludge process (CASP) and membrane filtration as a single process for wastewater treatment. The biological process is similar to conventional systems. However, activated sludge retention is not achieved through sedimentation in a secondary clarifier, but replaced by membrane filtration utilizing ultrafiltration membranes, which also separate the treated effluent continuously. Total organic content (TOC) reduction: >99.6%; biogas production: 1-2 Nm^3/m^3 dairy wastewater, >70% CH_4 in biogas

EXPLOITATION/LICENSING

- **Collaboration type sought**: Partner and funding for installation and operation of the first full scale unit.

CONTACT DETAILS

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TECHNOLOGY OFFER:
XERCHEM - BIOCONTROL UNIT

OVERVIEW

Category: Technology ☑, Process ☐, Service ☑, Method ☐, R&D knowledge ☐, Other ☐

Benefit summary: Biocontrol (of micro-bacterial activity) by biocide production at-site directly from the salt substances in the process by utilizing electrolysis. Reduced cost, handling and transportation of hazardous chemicals resulting in an increase in occupational safety.

Development status: Demonstration unit running

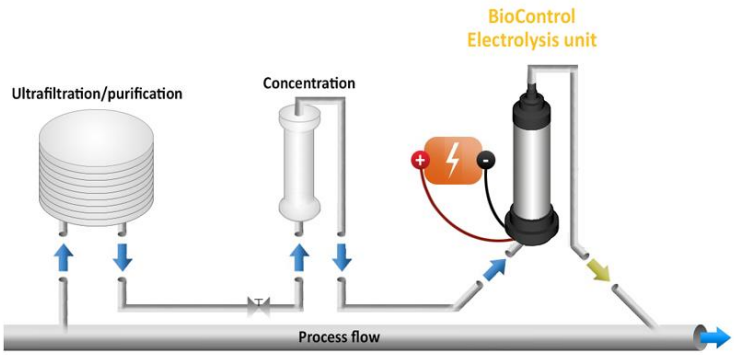
IP status: -

NOVELTY

- **Technology benefit description**: XerChem's new BioControl unit combining membrane technology and electrolysis is made for in-situ biocide production. Unit is based on the BioControl concept developed by VTT. Existing in-situ units use saturated brine solution, while BioControl unit uses existing chlorides from process water, which means that transport or storage of hazardous substances is not needed. In situ biocide production also helps to minimize the amount of chemicals introduced in the water circuits and limit the risk of detrimental impact on the waste water treatment plant.
- **Technology uniqueness and comparison vs state-of-the-art**: Reduces handling and transportation of hazardous chemicals and increases occupational safety.

DEVELOPMENT

- **Technology Readiness Level**: TRL 1 ☐; 2 ☐; 3 ☐; 4 ☐; 5 ☐; 6 ☐; 7 ☑; 8 ☐; 9 ☐
- **Development status**: BioControl unit has been piloted at a Finnish paper mill since February, 2019 and also at Finnish steel mill since August, 2019.



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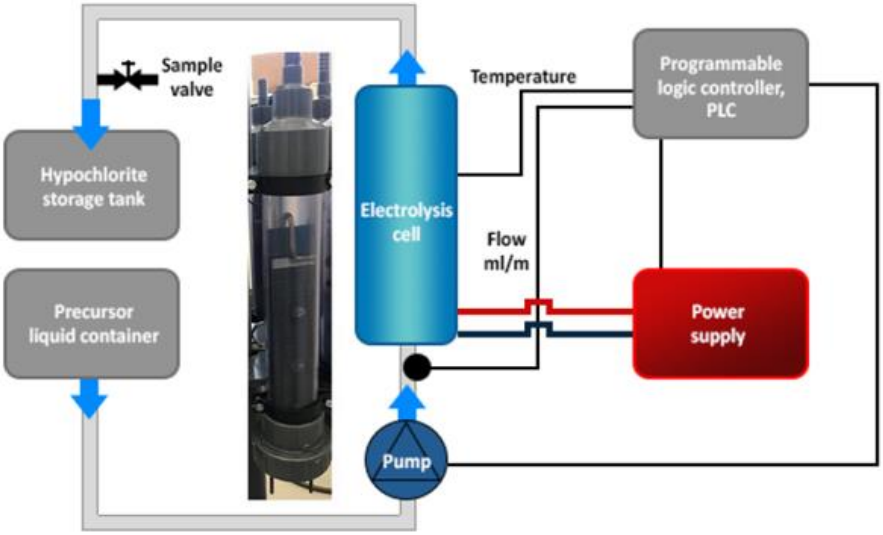
TECHNOLOGY PROVIDER

- **Technology provided by**: XerChem Oy, Peuraniitty 5 A 18, 02750 Espoo, Finland, http://www.xerchem.fi/
- **Related expertise**: XerChem imports the OxiAcWa technology. The OxiAcWa produces a mixture of oxidants, which is used as a very efficient biocide. The services of XerChem include for example: Sales, Maintenance, Operation, Training, Water analysis, Applicability studies.

TECHNICAL DETAILS

- **Description**: Biocide is produced in-situ from chlorides present in process waters by combination of membrane technology and electrolysis. The following elements of the technology have been piloted in an industrial environment (paper, steel): Chloride concentration with nanofiltration membranes, Electrolysis trials with increasing chloride solution flow rates, evaluation of biocide performance in different process conditions.



EXPLOITATION/LICENSING

- **Collaboration type sought**: Customers with a need for control of the micro-bacterial activity
- **Support provided**: Direct sales of equipment and services (including consulting and training)

CONTACT DETAILS

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Sustainable Processes and Optimized Technologies for Industrially Efficient Water Usage

Grant Agreement Nº: 723577 / H2020-SPIRE-2016

TECHNOLOGY OFFER:
QPINCH - CHEMICAL HEAT PUMP

QPINCH

OVERVIEW

Category: Technology ☑, Process ☐, Service ☐, Method ☐, R&D knowledge ☐, Other ☐

Benefit summary: The Chemical Heat Pump (CHP) transforms industrial low-temperature waste heat to a substantial higher and useful temperature. Unique selling points are the high temperature lift (40-60°C), low electricity use (only 2-4%) and high reliability (8300 running hours/y).

Development status:

A **first-generation** unit is under execution at Borealis Antwerp and expected on stream in 2020 (see picture). This installation will save up to 2200 tons of CO_2 per year.2 other units are in execution phase to be on stream by the end of 2020.

A **second-generation** demonstration unit on 100 kW scale for SPOTVIEW low temperatures (35-80°C) is in operation at Qpinch's Antwerp Pilot facilities.

IP status: Qpinch has the full Freedom To Operate (FTO).

NOVELTY

- **Technology benefit description**: The heat pump is based on chemical reactions of liquid phosphates and water. It transforms industrial low-temperature waste heat to a substantially higher and useful temperature. Waste heat sources are omnipresent in industry but are often of too low temperature (40-60°C) for upgrading to useful higher temperatures. Unlike conventional heat pumps the chemical heat pump enables a high temperature lift up, thereby creating an attractive economic business case, while improving the carbon footprint at the same time.
- **Technology uniqueness and comparison vs state-of-the-art**: Compared with conventional heat pumps the unique selling points of the Chemical Heat Pump are the higher temperature lift (40-60°C) and lower electricity use (only 2-4%), combined with a high reliability (8300 running hours/y)

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DEVELOPMENT

- **Technology Readiness Level (2nd generation)**: TRL 1 ☐; 2 ☐; 3 ☐; 4 ☐; 5 ☐; 6 ☐; 7 ☑; 8 ☐; 9 ☐
- **Development status**: Demonstration scale (100 kW)

INTELLECTUAL PROPERTY

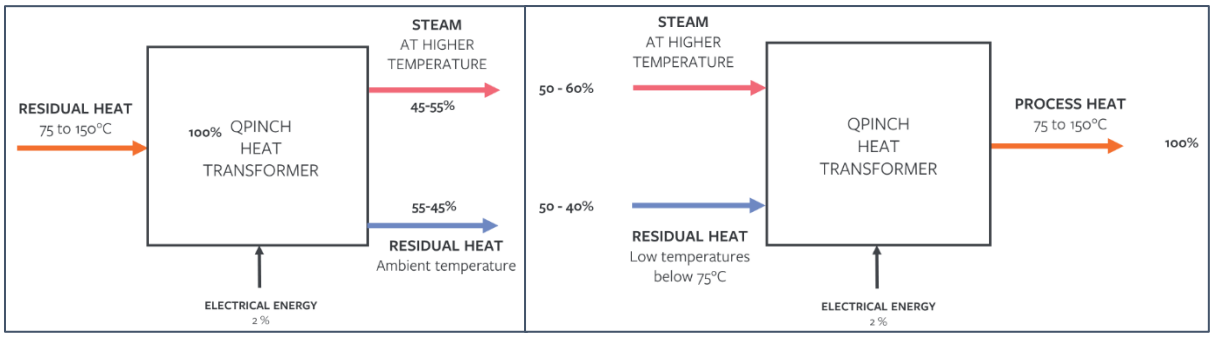
Patent / application N°	Title	Countries	Status	Priority date
WO2012101110	METHODS AND COMPONENTS FOR THERMAL ENERGY STORAGE	Worldwide	FILED	26.01.2011
WO2014016405	MEMBRANES, AZEOTROPIC & CATALYTIC COMPONENTS	Worldwide	FILED	26.07.2012

TECHNOLOGY PROVIDER

- **Technology provided by**: Qpinch, Rijnkaai 37, 2000 Antwerp, Belgium, https://www.qpinch.com/
- **Related expertise**:
  - Exploration of Business Case Identification (technology implementation, initial financial assessment, potential CO_2 savings)
  - Conceptual Design Package (technical and economic feasibility)
  - Basic Engineering (FEED)
  - Assistance to Engineering Procurement & Construction (EPC)
  - Operator training and startup

TECHNICAL DETAILS

- **Description**: The Qpinch technology pumps wasted heat over the pinch point of industrial assets, realizing temperature lifts of up to 100 °C. The standard way of operation is a heat transformer (left figure below), which creates 2 heat levels, one higher (useful heat output) and one lower than waste heat. Alternatively, steam of higher temperature can be applied as driving force (right figure below).



EXPLOITATION/LICENSING

- **Collaboration type sought**: Any market or customer with waste heat and a need for heat at elevated temperature. Sales of first installations & licenses.
- **Support provided**: Direct sales of services: Design of installations (PDP & Feed Packs); Design of proprietary equipment & control software; Startup services; Asset reliability services; Performance based licenses; Direct Sales of Hardware; Proprietary equipment.

CONTACT DETAILS

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