

Project undertaken with the financial support of the European Commission.
Grant Agreement Number: 686031

DISCLAIMER NOTICE

The content of this newsletter reflects the author's view. The Commission is not responsible for any use that may be made of the information it contains

COORDINATOR CONTACT

Daniela Galla
Enel Produzione SpA
Via Carlo Bini 2
50134 Firenze (FI)
ITALY
Email: daniela.galla@enel.com;
Phone: +39-055- 5234088

Visit our website:

www.matching-project.eu

Follow us on

Linked in

www.linkedin.com/groups/8533291

Upcoming Events

- **European Federation of Corrosion (EFC)- Winter School "Modelling of Corrosion", Saclay, France, January 28 - February 1, 2019** <https://efcweb.org>
- **Dead Sea Water 2019 Workshop: Nanomaterials at the Water-Energy Nexus; Israel, February 2 - 4, 2019** <https://dsw2019.net.technion.ac.il/>
- **European Coatings Show Conference 2019, Nuremberg, Germany, March 18 - 19, 2019** <https://www.european-coatings-show.com/en/conference>
- **13th World Filtration Congress, WFC13, San Diego, U.S.A., April 20 - 24, 2019** <https://wfc13.societyconference.com/v2/>
- **International Conference on Applications of Multi-Scale Approaches in Environmental Chemistry, AMARE2019, Rennes, France, April 23 - 25, 2019** <https://amare2019.sciencesconf.org/>
- **HEX XIII 2019 - Heat Exchanger Fouling and Cleaning XIII - 2019, Warsaw, Poland, June 2 - 7, 2019** www.heatexchanger-fouling.com
- **5th Edition of International Conference on Polymer Science and Technology, Berlin, Germany, June 10 - 11, 2019** <http://polymerscience.euroscicon.com>

Partners



Subscribe to our Newsletter or Join our Stakeholders' Community

Interested in MATChING progress? Subscribe to our newsletter or ask to join our stakeholders' community. Joining the stakeholder community is a non-binding complimentary and voluntary basis.

For further information contact: matching-communication-team@enel.com



ISSUE

04

November
2018SIX
MONTHLY
NEWSLETTER

MATChING

Project Updates

Here is a summary, at WP level, of the most relevant progress:

- WP3 Low-T geothermal case: lab tests with coatings for geothermal brine were completed (12 coatings for AISI 316L and 9 coatings for P265G). Six of them have been selected (2 on stainless steel and 4 on carbon steel) and will be tested at Balmatt site where they will work with the real geothermal brine. Test set-up is ready and start-up is planned during this month.
- WP4 - High T geothermal case: The hybrid (wet/dry) module was designed and supplied to Nuova San Martino plant. The module is now operating and first results are being collected;
- WP5 - Steam Condenser materials: Tests on antifouling materials and stainless steel with biocide properties completed at Pericles facility. Performance test concluded at Thyco Facility for steam side hydrophobic coatings. On site test with pilot condenser at a production site is planned for testing the most promising coatings.
- WP6 - Technologies for water treatment: all the technologies under investigation have been already tested at lab scale with promising results. Almost all pilots are operating. So far, successful results were achieved with capacitive deionization at Engie's test site and with membrane distillation at As Pontes Power Station.



In this issue

- Welcome **P.1**
- Partner update: VITO on Balmatt site **P.1**
- Membrane distillation (MD) configuration **P.2**
- Partner update: ENDESA on MD **P.2**
- Partner update: VITO on CDI **P.2**
- Workshop in Rome and WP Team Meeting **P.3**
- Geothermal Hybrid cooling towers **P.3**

Welcome to the 4th edition of MATChING Newsletter

Since our last Newsletter in May 2018, many progresses have been made in the project: this edition will summarize some of them. Partners' updates have been added by Vito for the Balmatt test description and capacitive deionization, and by Endesa for the long run test of membrane distillation. Technology focuses will describe As Pontes membrane distillation configuration by Aquastill and Geothermal hybrid cooling tower provided by SPIG. Update on past and future workshops is included.

PARTNER UPDATE: VITO

Within MATChING different coatings are developed and tested under real conditions. One of the applications for coatings tested in the project is for piping of geothermal fluids for low-temperature geothermal wells. For those application appropriate material selection is crucial as the high salinity, acid gases, elevated temperature and pressures of the geothermal fluid create very aggressive environments. Pipelines and heat exchangers in direct contact with the fluid need to be constructed of very resistant materials like titanium alloys or high alloying stainless steels. One of the aims of project is to evaluate whether cheaper materials (e.g. carbon steel) with cost-efficient coatings could be used to reduce the costs. In the project different coatings have been tested on lab scale by the research institutes DTI and Aimen and based on these tests results a selection of coatings has been made to be tested under real circumstance at Balmatt, the first deep geothermal project in Belgium with both heat and electricity production developed and owned by the research institute VITO.

At Balmatt a test set-up has been constructed where the coatings could be tested with real geothermal fluid under the right pressures and temperatures. Pipe sections with different coatings are installed in a loop that is fed with fresh geothermal fluid from the extraction well. In the loop also a corrosion sensor systems is included in order to follow up the corrosion resistance on-line. The start-up of the Balmatt installation is planned within the end of November and the testing is planned in the first half of 2019.



Coating demonstration in geothermal project Balmatt



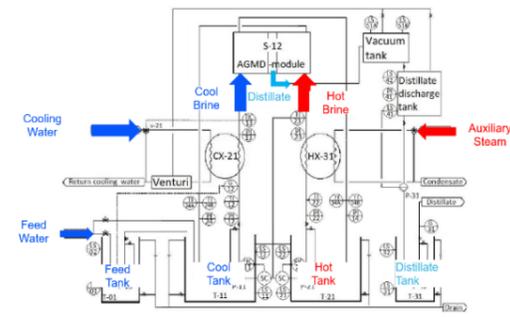
MEMBRANE DISTILLATION: AIR GAP CONFIGURATION

The process of Membrane distillation (MD) can be adapted to different types of configuration such as Direct Contact (DCMD) and Air Gap (AGMD), among others.

The most commercialized configuration is DCMD, which consists in using 2 counter current channels: one hot channel with the brine to be treated, and one cold channel with the condensate. This channels are separated by the hydrophobic membrane, and the distillate is collected together with the condensate from the cold channel.

On the other hand, in the AGMD configuration, there are 3 different channels: one hot channel, one cold channel and a thin airgap. Both the hot and cold channel contain the brine to be treated, and in the airgap is where the distillation collection takes place. This airgap can be empty or filled with material (spacer e.g.). In this configuration, the airgap is limited by the hydrophobic membrane from the hot side, and by the condensate foil from the cold side. The water evaporates from the hot brine, crosses the membrane to the airgap, and condensates on the wall of the condensate foil from the cold channel. This way, the distillate condensates in the airgap and it is separately collected. The main advantages of this configuration is that it has an higher thermal efficiency due to the air insulation between the hot and cold stream (lower conductive heat losses), any coolant can be used since it is not mixed with the distillate, which also makes it possible to purely collect the distillate produced. This type of configuration is the one being currently used in the MD pilot in As Pontes.

Membrane Distillation test rig in As Pontes



Since February 2018 a long run demonstration test on membrane distillation is being performed at ENDESA coal power plant in As Pontes (Spain).

The membrane distillation pilot facility provided by AQUASTILL is fed with water coming from the blowdown of one of the cooling towers. In this way, the blowdown can be partially recovered for other uses, for instance as make up water of the cooling system, thus leading to a reduction in the fresh water abstraction of the power plant.

The pilot facility consists of 7 Air Gap (AGMD) modules built on 5 pallets for easy transportation. The thermal energy necessary for driving the process and heating the brine is provided by auxiliary steam coming from the power plant, while the cold brine is cooled by water coming from the cooling tower blowdown (same kind than the feed water). The process is controlled by an electronic cabinet with a data acquisition system recording all operational parameters as pressures, temperatures, flows or conductivities.

The long run test will last one year. During the first part of the testing period, different trials were performed varying operational parameters as brine flow and heating temperature to compare results in terms of water recovery ratios, distillate quality and production rate and specific energy consumptions. The second part of the tests, currently ongoing, aims to continuously run the pilot facility to assess other operational and maintenance issues as well as the influence of environmental conditions. Promising results have been achieved so far.

Demonstration of Membrane Distillation

Long run tests on going at As Pontes Power Plant

Capacitive Deionization (CDI) pilot test

Engie lab and VITO successfully completed piloting capacitive deionization (CDI) in the late spring of 2018. CDI desalination technology uses carbon based electrodes to remove ions from watery streams. The main purpose of the test was to demonstrate the effect of CDI pretreatment on the water efficiency of a cooling tower. The pilot test was performed at Engie's Linkebeek test site (Belgium). A CDI pilot, capable of treating >300l/h, was coupled to

Engie lab's Merades pilot cooling tower and water from the canal Brussels-Charleroi (Belgium) was used as a feed. The cooling tower pilot consists of two circuits in parallel with semi-open cooling circuits. This allows for a direct comparison of untreated and treated feed water in both cooling towers. The demonstration ran for 3 consecutive months starting

April 2018. It was found that CDI is able to significantly reduce the hardness and salinity of the canal water, resulting in higher cycles of concentration and/or a lower consumption of chemicals (e.g. acids). A reduction of 25-75% in feed water uptake can be realized, depending on the feed water composition (e.g. pH) and at low energy consumption. Further

techno-economic calculations are currently performed to elucidate the specific area of applicability of this technology.



Water Management in the Power Sector Workshop and WP Team Meeting, Rome October 2-3, 2018



The Water Management in the Power Sector Workshop was held on October 2nd - 3rd, 2018 in Rome. The purpose of the workshop was to present the most relevant results of the first 30 months of the Project. Around 50 people attended the workshop. A panel discussion has been organized during which the expected benefits for the European Power Sector have been highlighted. In particular, taking into account the climate

change and the new global situation, the participants have illustrated how the focus on research (on water and cooling systems) has changed during the last 10 years and how the Matching project is responding to these changes. Looking at wastewater treatment and recovery, the new membrane technologies to face the challenge of water demand reduction have been described.

SPIG HYBRID COOLING TOWER

The Hybrid Cooling Tower is a combination of dry and wet cooling (the so-called hybrid technology) and is adopted for visible plume abatement and to reduce water consumption due to cooling evaporation process. The reduction of water consumption is obtained because Dry section (tube bundles) dissipate portion of the total heat duty, reducing thus the portion to be dissipated by evaporation process.

In Geothermal power plant water saved can be reinjected in the well increasing plant life time.

Due to the high fouling and corrosive behavior of the geothermal fluid nowadays the hybrid technology does not find application in geothermal power plants. Within Matching Project SPiG SpA has installed a Demo module in the cooling tower of Nuova San Martino geothermal plant where advanced filling material and innovative coating solutions of the Dry bundles are under investigation.



Cooling Tower



Dry Bundles