Valuable resources are being recuperated from brine!

Based on circular economy business models, ZERO BRINE provides water solutions that recover and reuse minerals, water and metals from that sludgy ultra-salty wastewater called brine.

Where is the ZERO BRINE project being tested around Europe and why were these industries highlighted?

We have four large-scale demonstrations for the project: 1) in the Netherlands, we are working with the Technical University of Delft at the site of the Demineralized Water Plant (Evides Industriewater) in the industrial cluster Botlek area of Rotterdam Port; 2) in Zaragoza, Spain, we are working with CTM at the site of IQE (a chemical industry) to assess the technical and economic feasibility of implementing a circular economy scheme in the silica industry to recover water, sodium sulphate, waste heat and alkalis; 3) at a coal mine in Poland we are working with the Silesian University of Technology to demonstrate circular economy principles to decrease energy consumption by 50% and recover valuable raw materials such as concentrated brine; and 4) in Turkey, an innovative brine treatment system is being developed for the textile industry with TÜBITAK MARMARA Research Centre to recover concentrated salt solutions for reuse in the textile dyeing process baths.

INTERVIEW WITH DIMITRIS XEVGENOS, INNOVATION MANAGER OF ZERO BRINE AND MANAGING DIRECTOR OF SEALEAU

We identified the sectors within the process industries that produce a lot of brine, selecting the most representative examples of these sectors which include the textile, mining and chemical industries. In the Netherlands, the industrial cluster involves many industries so that we have an implementation towards industrial symbiosis. The objective here is to address the large issue of wastewater and to establish collaboration between different industries that could recuperate waste heat from a neighboring factory to drive the process and thus make it more cost effective, environmentally friendly and sustainable.

Why is systemic innovation so pivotal to the transition towards a more circular economy?

To achieve circular economy solutions, we need to bring different stakeholders together – from economic, industrial and research organizations, to public authorities and civil society. We need all stakeholders working together to co-design and implement circular economy solutions, which is why it is important to bring together different disciplines to produce projects such as ZERO BRINE.

The circular economy is a rather new field, and while there has been a lot of progress in recycling, for example, it was only in 2015 when the European Union adopted its Circular Economy package to set up many initiatives like ZERO BRINE that are now in progress today.

How does ZERO BRINE contribute to implementing the circular economy?

With ZERO BRINE we aim to showcase real examples of circular economy solutions from process industries. We have identified specific industrial sectors for our case studies and have involved stakeholders throughout the relevant value and supply chains, either as project partners or as advisory board members. We are working with a wide range of partners to design and implement solutions for them

A CIRCULAR ECONOMY APPROACH TO RECOVER RESOURCES FROM BRINE GENERATED BY PROCESS INDUSTRIES

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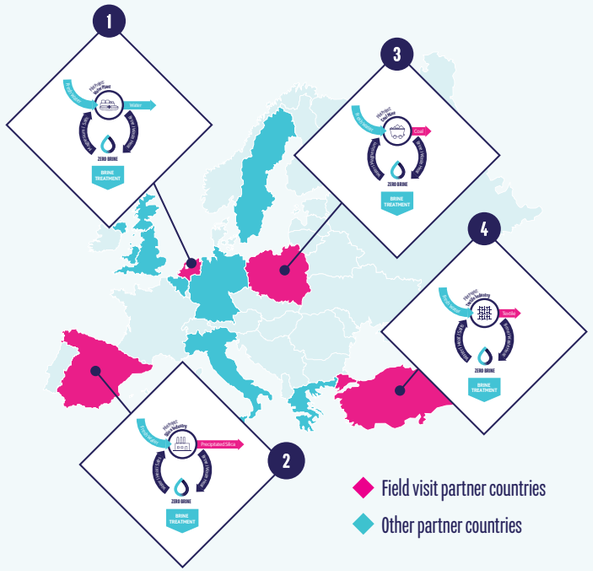
ZERO BRINE

THE ZERO BRINE CONCEPT

INDUSTRIAL WASTEWATER ⇨ RESOURCE RECOVERY ⇨ CIRCULAR ECONOMY



PILOT PROJECTS

1 WATER PLANT (NETHERLANDS)

The Demonstration Water Plant in the Botlek area uses ion exchange, membrane technology, nanofiltration, evaporation and crystallization to recover magnesium, NaCl solution and sulphate salts.

2 SILICA FACTORY (SPAIN)

Recovering water, sodium sulphate, waste heat and alkalis by using nanofiltration, eutectic freeze crystallization and forward feed evaporation technologies.

3 COAL MINE (POLAND)

Coal mine water in Laziska Górne will be treated using nanofiltration, reverse osmosis and electrodialysis to recuperate highly valuable raw materials like magnesium.

4 TEXTILE FACTORY (TURKEY)

Recovering concentrated salt solutions to be used in the textile dyeing process using nanofiltration, oxidation and ion exchange technologies.

CONSORTIUM PARTNERS

The ZERO BRINE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730390.

ZERO BRINE aims to prove that with different technologies the wastewater sludge from textiles, mining, and chemicals can be recuperated and reused, thus contributing to the circular economy.

and that will help advance the project towards commercialization. This is one of the main objectives of ZERO BRINE: to effectively demonstrate technologies at our pilot project sites in order to bring the innovations to the market.

4. What are the major hurdles to deploying the technology in other industries?

The main obstacle is the same for all circular economy applications: the mind-set. We have tested the linear economy model for many years now, so the management of companies is used to this. Apart from the mindset, the fact that companies have invested a lot of money into these linear systems means they really need to be convinced that switching to a circular economy is first technically feasible, and that it makes sense for them to move from the current status quo to the circular economy model. This is a big obstacle that needs to be addressed from the financial sector and from an investment point of view as well.

The second obstacle concerns regulation: there are some hurdles, such as the EU Waste Framework Directive, where the recovery of materials from waste and wastewater streams need to be characterized through end-of-waste criteria – not as waste, but as products. This is a process that is ongoing around Europe, and as such, is not very clear yet since work still needs to be done at the policy-making level. I also believe that legislation is coming that will put pressure on the industrial operators, meaning they will be charged for brine discharge, for example. This is something that helps circular economy business models.

5. Are policies moving in the right direction to advance circular economy solutions?

Policies are moving in the right direction. Take for example the most recent budget for circular economy projects in the final work programme for Horizon 2020, from 2018-2020; for the circular economy alone, they have foreseen almost €1 billion. This is a substantial amount to drive this research forward and bring it to the market. Apart from that I would say the European Commission, DG Research, DG ENV and others are working hard to establish collaborations outside of Europe. For example, there is a Memorandum of Understanding on Circular Economy between the EU and China, and a successful mission to Japan took place in October 2018. I was one of 69 representatives from 14 Member States who went to promote circular economy projects. So yes, it is clearly a main topic on the policy-makers' agenda.

6. How great is the potential to replicate this technology around the world?

ZERO BRINE focuses on the manufacturing sector. According to Eurostat, this sector includes a vast array of economic activities performed by 2.1 million enterprises in Europe. Although they perform different activities, they all have something in common: every industry uses water in its operations, and this is transformed into wastewater. In many cases this is brine effluent, meaning salty wastewater. In 2016, according to the European Database (2016) a total of 578 facilities released around 16 million tons of chloride in Europe. So, we have a lot of work to do.

We are also excited to bring the thinking and processes behind ZERO BRINE to a wider global audience. We are speaking with different stakeholders in South Africa from the coal mining sector, as well as China. In China many chemical plants have had to close because they are producing too much brine and they need help to address the wastewater issue. The New Environmental Law, which came into force in January 2015 in China, has put significant pressure on many industrial plants, due to the much heavier penalties. So, the problem is here and needs solutions all over the world, not only in Europe. ●

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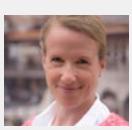

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