



ZERO BRINE

D10.4 Report on Field Visits to Pilot Projects

May 2019



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1. Introduction

As a subtask to capacity building (Task 10.6), the coordination of site visits to the respective ZERO BRINE pilot plants is an essential part of the ZERO BRINE communication strategy to target key stakeholders – industry, media, policymakers and academia and research — further disseminating the ZERO BRINE circular economy solutions for industrial wastewater in the identified brine-intensive industries (water, coal, chemical, and textile) while sharing knowledge of the technologies, resource potential, and the circular business models employed. The field visits are an effective way to introduce the ZERO BRINE technology to industry and end-users and support the exploitation of the technology. The site visits are also a great opportunity to invite policymakers to learn about these solutions and promote the policy gaps and key recommendations that will be identified in the policy briefs, helping advance circular solutions in the field of industrial wastewater. The field visits also build connections with key stakeholders and media, encouraging their follow up of results and their exploitation. As a key pillar of capacity building, the field visits raise the overall awareness of the pilot’s objectives, contributions to circular economy, and are an interactive, educational activity that supports the development of knowledge and skills-sharing in the circular economy.

In concurrence with the field visits, pilot factsheets will be developed to provide a more in-depth overview of the respective pilots’ aims, technologies employed, and resources recovered. In the post-production of visits, promotional videos, photos, and press releases will be released along with the factsheets in the form of a media kit, to further contextualize the site visit and strengthen learning. These media kits will be hosted on the ZERO BRINE [website](#). The subsequent press releases delivered and sent to all stakeholders and specialized press will also increase the impact of the project and promote the upcoming site visits and technologies.

2. ZERO BRINE Field Visits

As part of the ZERO BRINE communication strategy, dissemination, pilot plants are targeted at academic, corporate, public partners, and their respective networks and events, as well as media. In order to optimize stakeholder engagement and attendance to the ZERO BRINE pilot site visits, organization of these visits will be strategically coordinated with other key stakeholder events.

To attract the interest of specialized press in the fields of water, water reuse, circular economy, technology and innovation and industrial processing, and to encourage the effective dissemination and exploitation of ZERO BRINE, REVOLVE has identified and formed partnerships with key print and digital media outlets. Through establishing media partnerships, coverage and quality content on ZERO BRINE is curated in exchange for covering the accommodation and travel costs for media to attend the pilot visits. The media partnerships are also a means to secure interest in project news and upcoming pilot visits, increasing the likelihood that the respective audiences and readership see the ZERO BRINE

project's aims and results unfold throughout the project's duration, increasing interest and the exploitation of the project's results.

The timeline of the ZERO BRINE field visits is dependent on the successful running of the pilots. The following schedule shows the timeline for the field visits, with forthcoming dates subject to change:

Field Visit NL-EVIDES / Plant One sites in Botlek area, Rotterdam Port

23 May 2019

Press excursion 14:00-18:00 (EVIDES site + Plant One test facility)

EU Salt excursion 16:00-18:00 (Plant One test facility)

Field Visit PL-Coal mine drainage treatment site

October 2019 (exact date TBC)

Field Visit TR: ZORLU Textile site

2020 (exact date TBC)

Field Visit ES-IQE Chemical site

Due to confidentiality concerns, this field visit has been cancelled. Video material will be provided by the local partners for the corresponding video production.

In parallel with the field visits, ZERO BRINE is developing 4 media kits per pilot that will include factsheets, infographics, interviews, photos and videos for each demonstration site.

The Field Visit Report will be delivered in M24 will be updated every six months in M30, M36 and M42.

a. Demineralized Water Plant (NL)

Based in the Botlek industrial area of Rotterdam port, the EVIDES Demineralized Water Plant (DWP) is a central facility that supplies water to 25 companies for use in industrial processing. Due to increasing quality standards, reliability expectations, and to deal with the increasing salinity of the feed water, sourced from the Brielse Meer, the pilot will use waste heat from nearby factories to eliminate brine effluent while recovering high purity calcium, magnesium, NaCl solution and sulphate salts.

i. Overview

The chloralkali sector has a high potential for the application of circular economy solutions for the recovery of salts from brine. To promote this potential and target key industry stakeholders in the salt industry, a broader collaboration was established in the context of the [EU Salt Annual Meeting and General Assembly](#), organized by the European Salt Producers' Association (22-24 May 2019) in Rotterdam. On 23 May, the conference programme 'Circularity with a pinch of salt' included a session dedicated to material reutilization, where ZERO BRINE's Innovation Manager, Dimitris Xevgenos, gave a presentation on the ZERO BRINE project and the application of circular economy approach to the chloralkali sector. To offer an example of circular processes in industrial applications, the presentation

highlighted the pilot installation at the Evides Demineralized Water Plant (DWP), also located in Rotterdam, which provided the context for the site visit scheduled for EU Salt participants (salt and industry experts) in the afternoon on the same day.

In addition to the EU salt participants, specialized press was also invited to join the ZERO BRINE pilot, located at Plant One Rotterdam, a sustainable tech and innovation test facility.



Lenntech representative, supplier of the nanofiltration unit, explains the initial trial runs.

As the Plant One test facility is conveniently located a few hundred meters away from the Evides Demineralized Water Plant's operational facility, the visit included a first stop at the Evides DWP for industry experts and press, to learn about the current technology and to contextualize the pilot plant at Plant One. At Evides, press and experts were welcomed by Jan Willem Mulder, Manager Process and Technology at Evides Industriewater. The visit included an overview of the industrial activities of the surrounding industrial cluster and an explanation of the current technology. Participants were then guided through the plant to see the technology and learn about the current purification process and had the opportunity to ask questions. Other representatives from TU Delft were also present to answer questions and supplement the presentation by Evides.

Due to agenda constraints from the EU Salt event organizers, EU Salt participants joined the press group at the pilot demonstration at Plant One, where all field visit participants were welcomed with an introduction by Roelof Moll and a representative from one of the technology partners, Lenntech. After viewing the pilot installation, participants were welcomed to a large conference room where short presentations on ZERO BRINE and the work being done at the pilot sites were presented by Dimitris Xevgenos (SEALEAU) and work package 2 (Sites 1 and II) Lead, Henri Spanjers (TU Delft), and Executive Project Coordinator Roelof Moll (TU Delft).

Following the presentations, questions were fielded from participants for the project partners. These questions focused on the problems behind releasing brine effluents into the port, the energy use for the pilots in the context of the Life Cycle Analysis, and the value of the sources being recovered from the brine and what possibilities there are for their market use.

Coordination of the site visit was conducted by TU Delft and REVOLVE.

ii. Outreach and Results

The Demineralized Water Plant pilot factsheet was developed in M24 by REVOLVE with the guidance of TU Delft and Evides, to disseminate to the attendees (see Annex). This factsheet is also included in the online [media kit](#), which was also promoted with a press release on the pilot and visit. This factsheet will be updated by M43 with the project results and will also be aligned with a dedicated press release to disseminate the final results.

As the pilot demonstration was still awaiting a final component from one of the technology partners, no professional video work was conducted during the site visit. A professional video crew will be sent when the pilot is fully operational, tentatively scheduled for M26 (TBC) and post-production will be finalized by M28, before the ZERO BRINE General Assembly in M31.

During the visit, REVOLVE took photos, short video clips, and promoted the activities on social media to the ZERO BRINE followers, tagging the relevant media and attending partner companies. The top tweet during the visit made a total of >1700 impressions and had 34 engagements, 12 of which were from other media.



The top tweet from ZERO BRINE during the site visit.

The photos that were taken are also integrated into the online [media kit](#) and in the ZERO BRINE [photo galleries](#) on the project website.

As follow-up to the site visit, a dedicated press release was sent to all identified stakeholders in the ZERO BRINE mailing lists, with a link to the uploaded online media kit. This press release was also sent to all REVOLVE's project media contacts, including other media partners and press that were invited to the visit but could not attend. This press release has already been picked up by outlets, including Water Online, whose coverage of the press release had a reach of >32,500 (Meltwater analytics).

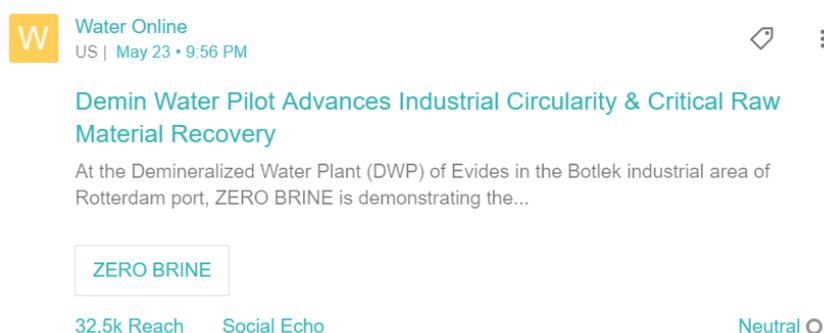


Image from the Meltwater report on the Water Online coverage of the press release (29/05/19).

REVOLVE managed all follow-up with the attending media to ensure curated content and forthcoming articles, as specified in the media partnerships. REVOLVE is in close contact with the media to help coordinate follow-up interviews and direct questions on the pilot and ZERO BRINE concepts to the rightful project partners.

The attending media included technology and water-focused, Dutch-speaking print and digital media (De Ingenieur / WaterForum), digital, European water outlets (Water News Europe), and international, water-focused print and digital media (Global Water Intelligence / World Water).

The breakdown of the audience and subscribers of the attending media:

- [De Ingenieur](#)
 - >4,770 Twitter followers
 - Online: 56,000 monthly users
 - Print/Digital Subscribers: 22,000
 - Online Newsletter: 25,000
 - Audience: Educated following, interested in engineering

TECHNIEK MAAKT JE WERELD
DE INGENIEUR

- [WaterForum](#)

- >4,020 Twitter followers
- Online: 12,000 monthly users
- Online Newsletter: 9,000
- Audience: Drinking, waste water management, knowledge centers, universities, national/local governments, industrial/sewage treatment, water tech/engineering companies.



- [Water News Europe](#)

- >1,200 Twitter followers
- Online: 1,500 monthly users
- Online Newsletter: >300
- Audience: Water professionals, policy makers and water companies



- [Global Water Intelligence](#)

- >15,200 Twitter followers
- Online: 187,000 annual users in over 200 countries, 938,000 page views/year
- Publication: Over 10,000 subscribers
- Audience: EPC contractors, utilities, equipment/tech suppliers, engineers, and researchers



- [World Water \(Water Environment Federation\)](#)

- >27,600 Twitter followers (WEF)
- Online: 13,000 users/month, 116,000 page views/month (WEF)
- Print Publication: 4,967 subscribers
- Digital Publication: 21,649 subscribers
- Audience: Engineers, government/municipal offices, consultants, contractors, planners, executives in water industry



A total of 45 participants took part in the field visit to the Plant One test facility, with the majority of participants comprising the salt and industry experts.

b. Coal Mine (PL)

The pilot plant, demonstrating the application of circular economy principles in coal mining industry, will be located at “Bolesław Śmiały” Coal Mine in Łaziska Górne, Poland. The aim is to decrease the energy consumption by 50% compared to the energy consumption of a reverse osmosis-vapour compression system which represents current best practice. The aim of plant is to demonstrate that coal mine water, considered to be a waste by the coal mining industry, can be the source of valuable raw materials, such as concentrated brine, magnesium hydroxide, and high-quality RO permeate.

i. Overview

The field visit will be organised during operation of the pilot plant and is planned for M29. To optimise the dissemination and outreach the stakeholder groups, the aim is to organise the site visit in correlation with a partner conference in this field. Due to coordination with potential partner conference the exact date will be confirmed by M26. During the visit the ZERO BRINE application for the coal mine will be demonstrated.

ii. Outreach and Results

The aim of this field visit is to demonstrate the ZERO BRINE case study at the “Bolesław Śmiały” coal mine recovering resources and reducing energy consumption to stakeholders such as industry, academia, policy makers and media. First connections to local and international policy makers with an interest in energy and environment are established and they will be invited to the field visit. Furthermore, the aim is to include international and local media covering energy, water, circular economy topics in the field visit such as media partners and other media outlets to maximise the dissemination and communication of the results of this case study to a broad range of stakeholders.

To support the outreach of the results, a media kit including fact sheets, press release, photo essay, video will be developed. The factsheets and press release will be produced by M29 to share along with the field visit and potentially updated with the final results expected by M31. In M29 photo and video material will be produced to develop the promo video and photo essay by M31.

c. Textile Factory (TR)

The pilot study undertaken by TUBITAK in the ZORLU textile factory in Büyükkarıştıran Kasabası, Lüleburgaz – Kırklareli, Turkey focuses on the development of the innovative brine treatment system for textile industry. Along these lines, recovery of concentrated salt solution for using in textile dyeing process baths is aimed. Alternatively, salt recovery for other sectors i.e. leather salting process is also considered throughout the study. The expected results from textile industry brine recovery system was pre-assessed to be 50 kt/year reduction water consumption due to achievement of additional water reuse, recovery of 400 tons of NaCl/year for production processes, reduction of 200 t/year CO₂ emissions also due to NaCl recovery and attainment of waste heat recovery from the enterprise.

i. Overview

The field visit will take place during the operation of the pilot between M33 and M43. The date and context will be defined between M28 and M33.

ii. Outreach and Results

The objective of the field visit is to demonstrate the circular economy approach to stakeholders such as industry, corporates, academia and research, policy makers and media to ensure the communication and dissemination of the results. To support the communication and dissemination a media kit including factsheet, press release, interview, photo essay, video will be developed.

The factsheet and infographics for the demonstration site of the textile factory in Turkey will be developed between M33 and M43 based on the results of the demonstration.

The interview with an expert by TUBITAK will be conducted M33-M43.

First photos are available on the project website ([see here](#)). More photos of the demonstration site as well as the video will be produced during the field visit M33-M43.

d. Silica Plant (ES)

The pilot plant implemented at IQE in Zaragoza, Spain demonstrates the technical and economic feasibility of implementing a circular economy scheme in the silica industry to recover water, sodium sulphate, waste heat, acids and alkalis. Nanofiltration and crystallization and Electrodialysis with bipolar membranes (EDBP) will be evaluated. Heat waste recovery strategies will be evaluated from a theoretical point of view. After pilot plant operation, the environmental impact of the technology will be evaluated and a business plan will be developed.

i. Overview

Due to confidentiality reasons external people (including project partners) are not permitted to the site. Therefore, the field visit is not possible. To share insights into the operation of the ZERO BRINE technology within the silica factory, a media kit including video will be developed. IQE will provide video material for the development of a video undertaken by REVOLVE demonstrating the process.

ii. Outreach and Results

For optimal communication and dissemination of the results of the ZERO BRINE technology in the chemical industry/silica factory, REVOLVE will produce a media kit including a fact sheet, press release, video and photos to share with targeted stakeholders.

The factsheet, press release, infographics and interview with an expert by CTM about the demonstration site of the silica factory in Spain will be developed between M25 and M36 based on the results of the demonstration plant.

First photos are available on the project website (see [here](#)). More photos of the demonstration site as well as the video will be produced throughout M24 and M28.

ANNEX

a. MEDIA KITS

i. Demineralized Water Plant (NL) Media Kit



ZERO BRINE PILOT DEMONSTRATION DEMINERALIZED WATER PLANT (DWP) OF EVIDES IN BOTLEK, ROTTERDAM, THE NETHERLANDS

Context

ZERO BRINE advances circular economy business model solutions to reduce industrial saline wastewater streams by recovering and reusing the minerals and water from the brine. Demineralized water is an essential commodity in the Botlek area, the industrial district of the port of Rotterdam, because it is required for many production processes. Reverse osmosis (RO) has become one of the main processes for producing demineralized water, but reverse osmosis alone is not enough to produce water of the required purity from the available water (fresh surface water), and several pre- and post-treatment processes are used. At the Evides DWP, one of the largest demineralized water production facilities in Europe, wastewater is treated by reverse osmosis combined with ion-exchange softening, among other technologies (see Graph 1).

Objective

At the Demi Water Plant (DWP) of Evides in the Botlek industrial area, ZERO BRINE demonstrates the circular economy approach to treat industrial wastewater through redesigning the current brine treatment process from linear to a circular model recovering all the resources (see graph 1). A large-scale demonstration plant is tested at PlantOne, a test facility focused on sustainable technology and innovation in the Energy Port and Petrochemical cluster of Rotterdam Port, by using the waste heat from one of the factories in the port. The objective is to recover Ca- and Mg-salts as well as demineralized water from the discharges of the water-softening unit. The quality of the recovered products will be aimed to meet local market specifications.

Technology

The demonstration plant comprises two sites combining residual heat and wastewater streams with the aim to eliminate brine effluent (zero brine discharge). At Evides (Site 1) the aim is to treat the regeneration solution of the ion exchange (IEX) unit (spent regenerant) and to recover valuable minerals and salts as well as water from this flow. This is done by nanofiltration, crystallization and evaporation of IEX (see Graph 2). Site 2 is an innovative design that aims to treat the reverse osmosis concentrate of DWP. Additionally, nyex is used to remove the anions and charged organic matter (see Graph 3).

Business opportunities

Industrial saline impaired effluents (brines) are an environmental challenge and an economic opportunity. The following materials with potential commercial value are recovered on the two sites that will be used in the same factory by Evides or in the industrial area Botlek.

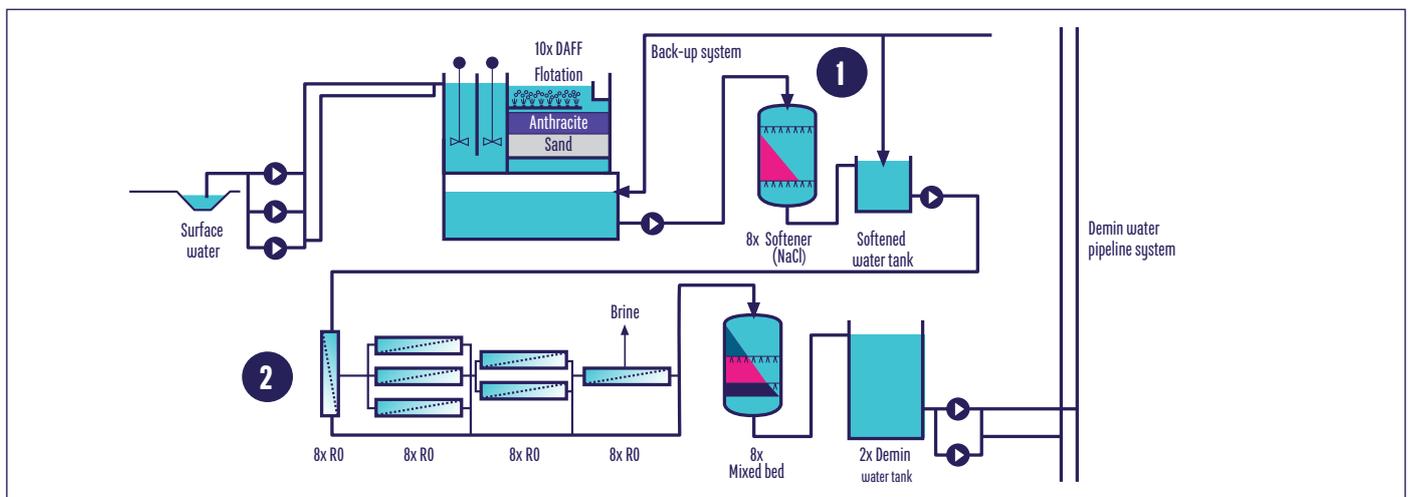
Site 1

- High purity magnesium & calcium
- Clean Water
- NaCl regeneration solution

Site 2

- Sulphate salts
- NaHCO₃
- Clean Water
- NaCl regeneration solution

Graph 1: Schematic view of the current processes at the DWP plant at Botlek



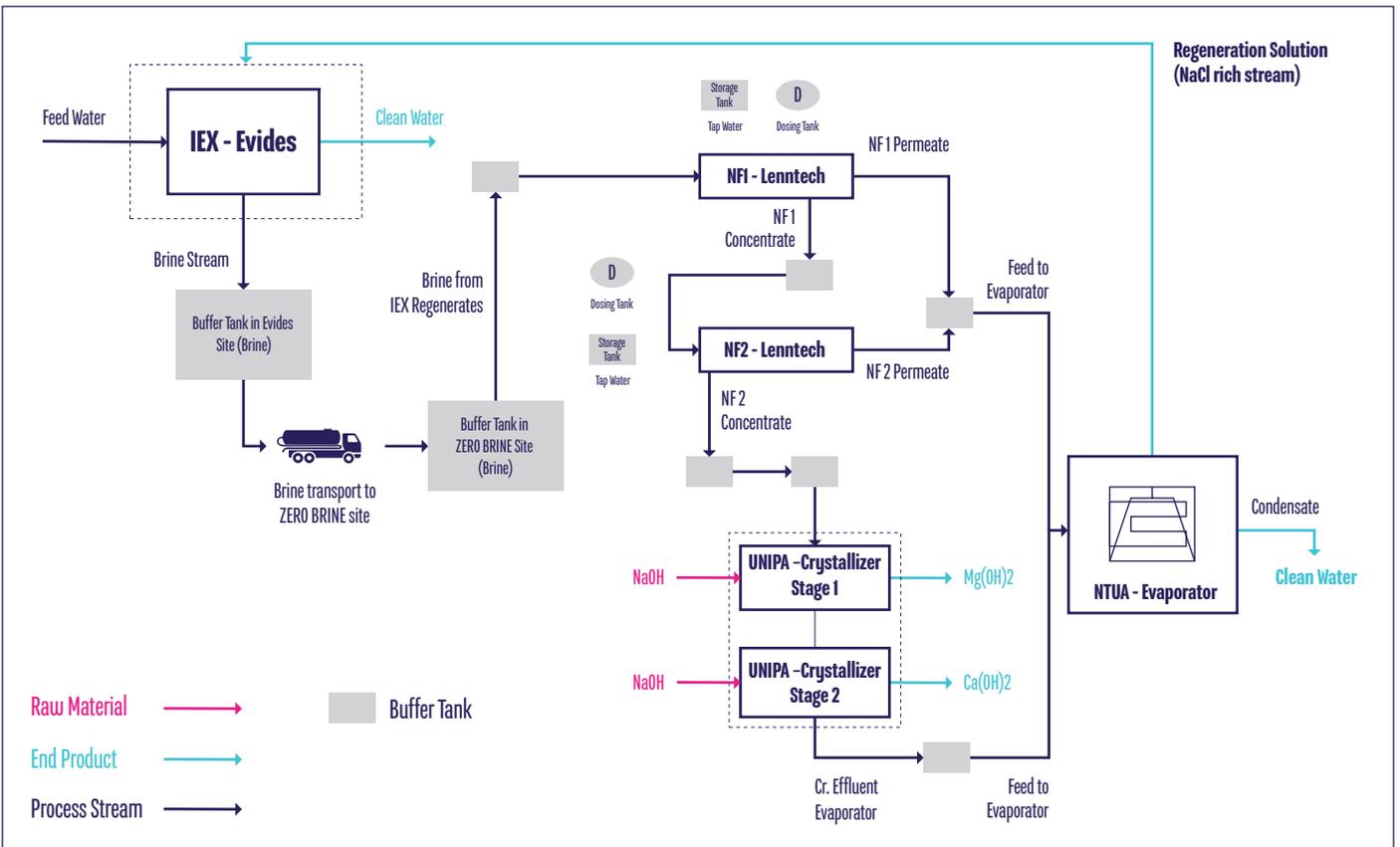
1 Site 1: Technologies

Demonstration of Nanofiltration (NF) - Crystallizer (MF-PFR)
Evaporation for treatment of Ion Exchange (IEX) Regenerates

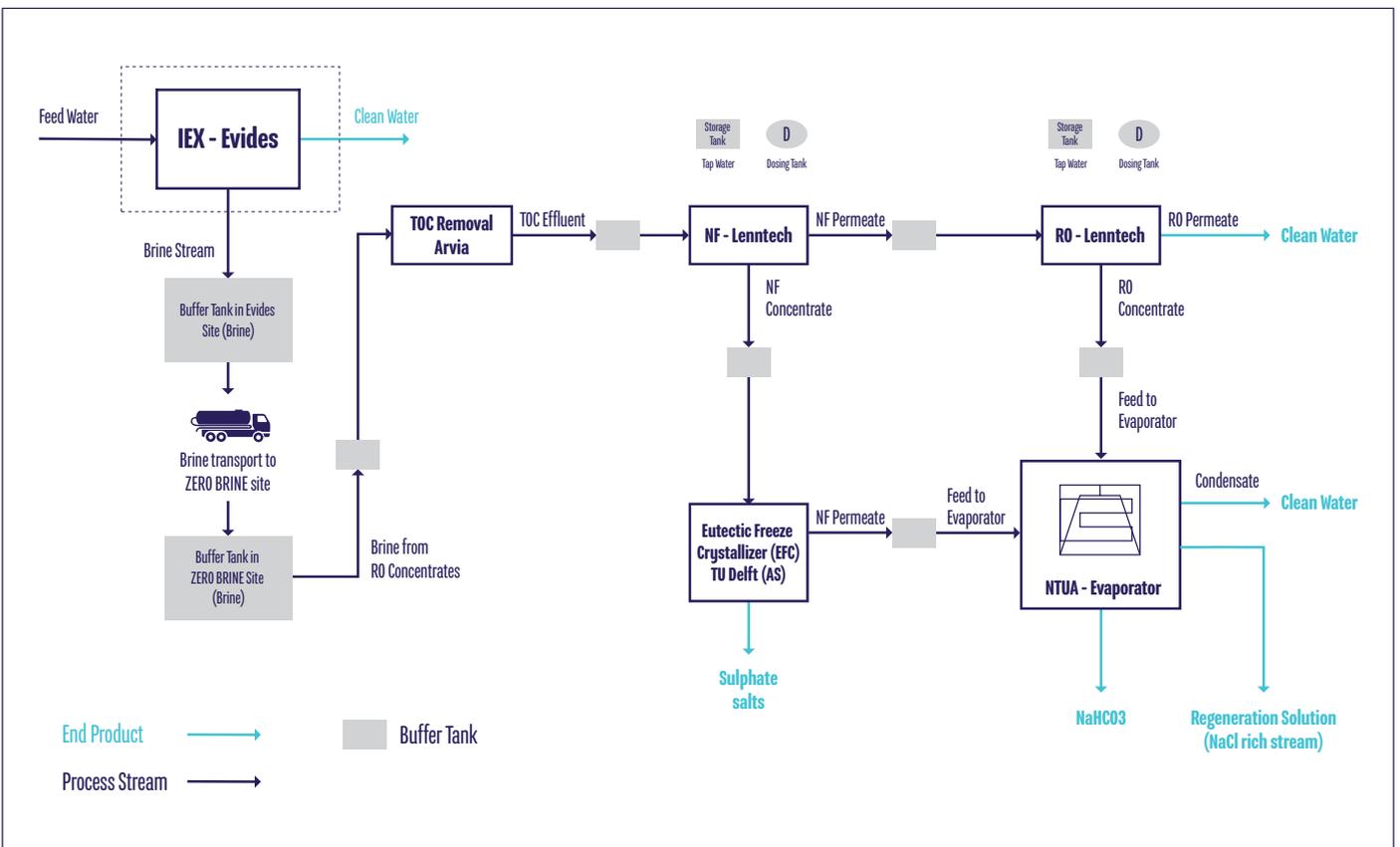
2 Site 2: Technologies

Nyex (TOC Removal) - Nanofiltration - Reverse Osmosis (RO) - Evaporation
Eutectic Freeze Crystallization (EFC) for treatment of RO Concentrates

Graph 2: Site 1



Graph 3: Site 2



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PRESS RELEASE

Brussels/Rotterdam, 28/05/2019



Demin Water Pilot Advances Industrial Circularity & Critical Raw Material Recovery

Brussels/Rotterdam, 28 May 2019 — At the Demineralized Water Plant (DWP) of Evides in the Botlek industrial area of Rotterdam port, ZERO BRINE is demonstrating the innovative circular economy concept to treat industrial wastewater through redesigning the current brine treatment process from linear to a circular model recovering all the resources. Business stakeholders of the salt industry and specialized press were present on 23 May 2019, during the first trials of Evides Industriewater's large-demonstration at Plant One Rotterdam – a sustainable tech and innovation test facility.

The Port of Rotterdam is one of the largest petrochemical clusters in Europe where demineralized water, supplied by Evides, is an essential commodity required for the many industrial processing facilities. The pilot aims to cope with increasing salinity of the feed water, supplied by the Brielse Meer, and will use waste heat from nearby factories to eliminate brine effluent while recovering high purity calcium, magnesium, NaCl solution and sulphate salts to recycle the streams back into the site.

"In addition to the environmental impacts, operating the demineralized water plant takes a lot of energy and investment to extract the water, purify it and remove all organics—so why should it be disposed of when the wastewater can be reused? Resource recovery and reuse is an option that should be considered."

– Amir Haidari, Senior Researcher, TU Delft

Circular processes in industry is essential to develop a sustainable, low carbon, resource efficient, and competitive economy in the EU. Recovering all resources from wastewater enhances preserving resources and security of supply. Magnesium is identified by the European Union (EU) as one of 27 critical raw materials, of which it is currently 100% import-reliant, with China accounting for 94% of all magnesium supplied to the EU.

The quality of the recovered resources will aim to meet local market specifications, providing immense opportunity for the recovery of second-generation resources, including critical raw materials, that

ZERO BRINE – Industrial Wastewater – Resource Recovery – Circular Economy



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PRESS RELEASE

Brussels/Rotterdam, 28/05/2019



minimize the environmental impacts of industrial operations with economic promise for circular business models.

"Evides Industriewater started the programme 'Water Without Waste' to develop further in the field of sustainability and offer their clients sustainable water solutions. The ZERO BRINE project will help us in our efforts towards a circular and sustainable economy."

– Jan Robert Huisman, Director Industriewater, Evides

The pilot is developed in the context of the ZERO BRINE project, which aims to facilitate the implementation of the [EU Circular Economy package](#) and the [Sustainable Process Industry through Resource and Energy Efficiency \(SPIRE\) Roadmap](#) in various process industries by developing necessary concepts, technological solutions and business models to redesign the value and supply chains of minerals and water while dealing with present organic compounds in a way that allows their subsequent recovery.

Three additional large-scale pilot plants will be developed in other process industries including a coal plant in Poland, a silica plant in Spain, and a textile factory in Turkey, providing the potential for immediate replication and uptake of the project results after its successful completion. In this way, ZERO BRINE encourages industrial circularity for a new generation of innovative, resource-efficient European businesses.

*** ENDS ***

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ZERO BRINE – Industrial Wastewater – Resource Recovery – Circular Economy



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