



ReWaCEM Project Leaflet



What is the project about?

The ReWaCEM project aims at reducing water use, wastewater production, energy use, valuable metal resource recovery and water footprint by between 30-90% in the metal plating, galvanizing and printed circuit board industry.

In order to achieve these goals, ReWaCEM will adopt two cutting edge membrane technologies suitable for the requirements of closed material cycles approaches and recovery concepts in metal processing industry: Diffusion Dialysis (DD) and Membrane Distillation (MD) as an integrated hybrid process. This combination of existing technologies will be adapted to fit the requirements of four pilot demonstration sites in representative industrial applications of the metallurgical industry in order to evaluate the accomplishment of the ReWaCEM goals. Through the evaluation of the demonstration a highly attractive technological solution for low energy wastewater treatment will be available to be entered into the large and growing market of metal processing. This market will profit significantly from the technological outcome of the innovation action, with cost savings and environmental benefits as relevant rewards. In order to maximise impact, the project consortium was selected carefully to represent all relevant stakeholders in the quadrant of end users, scientific partners, associations and decision makers and SMEs. The consortium will establish a dissemination & exploitation board that will create a substantial network of interest groups from agencies, industry, research SMEs and research centres as well as universities. The successful exploitation of the results will lead to a post project up-scaling of the technology and a step by step market introduction.

Part of ReWaCEM will be to mobilise all relevant stakeholders into promoting innovative membrane solutions for industrial water and resources management, leading to the effective implementation of European directives and policies while creating market opportunities for European industry and SMEs.

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Diffusion Dialysis (DD) and Membrane Distillation (MD) – the technological aspects

How it works (functional principle)

Diffusion Dialysis (DD): Diffusion Dialysis is a membrane separation process, driven by a concentration difference between two solutions, separated by an anionic exchange membrane aiming for the recovery of acids.

Diffusion dialysis recovers acid using a concentration difference of solution on both sides of the ion exchange membrane.

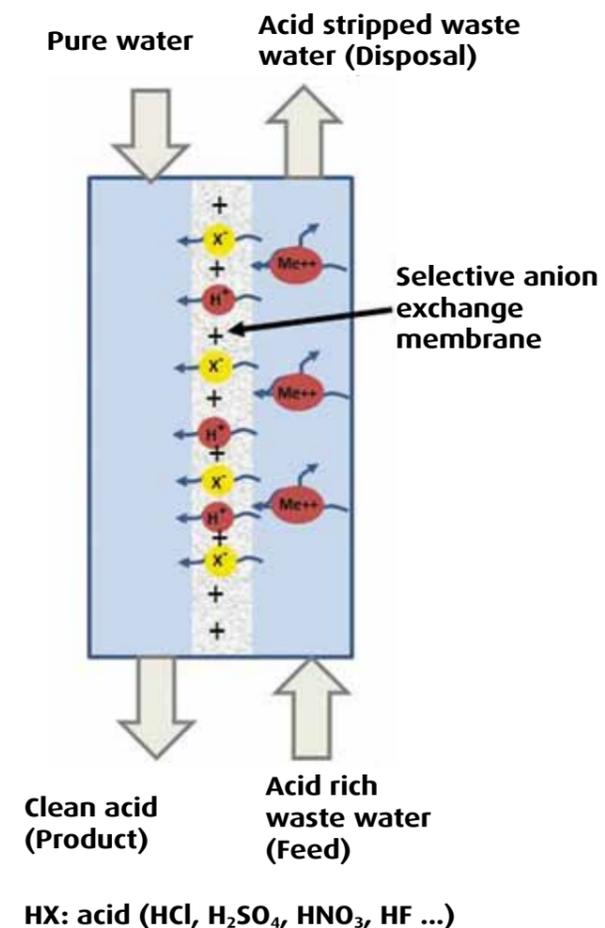
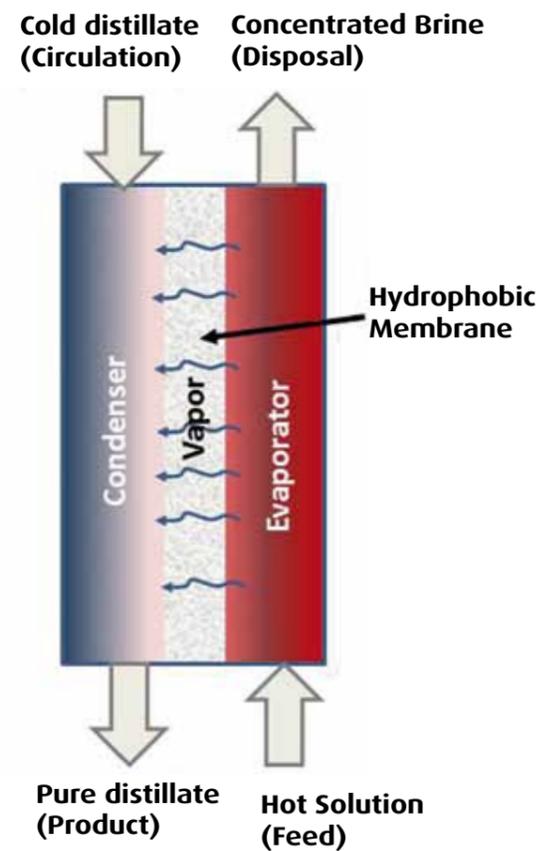


Figure 1:
Basic principle of
Diffusion Dialysis

Membrane distillation (MD) is a thermally driven membrane process in which a hydrophobic microporous membrane separates a heated feed solution and a cooled receiving phase. The temperature difference across the membrane results a water vapour pressure gradient, causing water vapour transfer through the pores from high vapour pressure side to the low one.

Figure 2:
Basic principle
of Membrane
Distillation



Advantages / disadvantages of the technology

Advantages of the DD process

- Very low energy requirement
- Drastic reduction in fresh acid requirements
- Drastic reduction in neutralization and landfill costs
- Considerable reduction in pollutant freight
- Fully automatic operation
- Very low maintenance costs
- Long membrane service life
- High economic efficiency
- Short amortization period

Disadvantages of the DD process

- Moderately high capital cost
- Impurities in the recovered acid stream in the magnitude of 5 to 50 percent depending on the type of acid and metal contaminant makes the value or reuse potential of the system output difficult to assess

Advantages of the MD process

- relatively lower energy costs as compared to distillation, reverse osmosis, and pervaporation
- a considerable rejection of dissolved, non-volatile species
- much lower membrane fouling as compared with microfiltration, ultrafiltration, and reverse osmosis
- reduced vapour space as compared to conventional distillation
- lower operating pressure than pressure-driven membrane processes
- lower operating temperature as compared with conventional evaporation

Disadvantages of the MD process

- Tensides reduce or eliminate the surface tension of the water which is needed to keep the separation property in the membrane diffusion process.
- Not too much experience with strong acids



Fields of application

Typical applications of Diffusion Dialysis

- Acid recovery of the metal pickling process
- Artificial kidney machine (medicine)

Typical applications of Membrane Distillation

- Seawater desalination
- Brackish water desalination
- Process water treatment
- Water purification
- Removal/Concentration of ammonium
- Resource concentration
- Precipitation of Gold or other valuable metals



Coupling of the DD and MD technologies for four case studies

The innovation in ReWaCEM is to combine both technologies, DD and MD, which allows the separation of metallic ions from the acid molecules AND in a concentration step the make-up of concentrated acid solution. The basic principle of the combined process is shown in Figure 3.

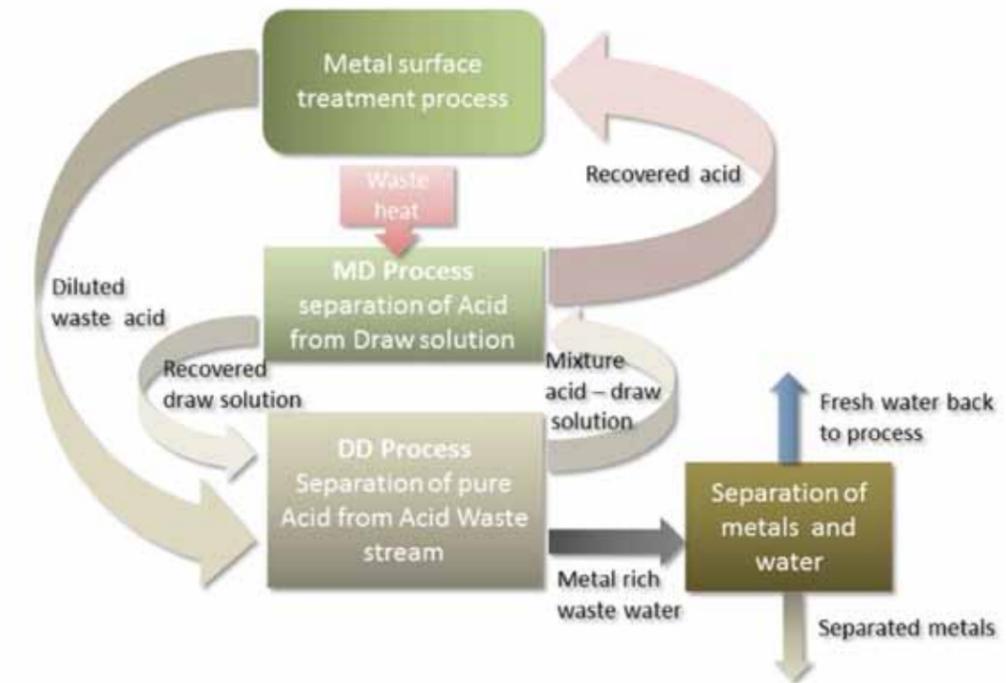


Figure 3: ReWaCEM basic scheme of coupling the two cutting edge membrane technologies, Diffusion Dialysis (DD) and Membrane Distillation (MD), as a closed material cycles approach and recovery concept in metal processing industry.

Recovery of acid in pickling solutions used in zinc plating, hot-dip galvanizing and stainless steel industry

The project is divided into two phases which are supported by overarching activities.

Phase I: Process analysis and system design

Phase II: Operation and evaluation of demonstration systems

Generic: Life Cycle Assessment (LCA) and water footprint Analysis;

Activities to disseminate the results and unlock the market.



Statement Dott. Giuseppe Prestigiacomo, CEO from Tecnozinco:

„Oggi dobbiamo smaltire circa una tonnellata al giorno di soluzioni di decapaggio esauste. Con il progetto ReWaCem contiamo di ridurre significativamente tali quantitativi con un conseguente risparmio economico ed una riduzione dell’impatto ambientale.“

“Today we have to dispose waste acid solution of about one ton per day. With the ReWaCEM project we hope to reduce this amount significantly which will save us money and be beneficial for the environment.“

Short description of Tecnozinco S.r.l. (SME, Italy):

Since 1998 Tecnozinco has provided quality galvanizing services for the trade, from the small customer to the large engineering and fabrication firm. Hot Dip Galvanizing has been used successfully in such different industries as Power Transmission, Petrochemicals, Water Treatment, Bridges and Highways. Hot-dip galvanizing is the process of surface alloying between steel and zinc, with a thin zinc layer, by passing the metal through a molten bath of zinc at a temperature of around 450°C. Galvanized steel is widely used in applications where rust resistance is needed. Tecnozinco’s main task is to host the working system prototype and monitoring the values during working test after lab test phase.



Statement of Alfredo Escandón Pérez, Director General Ales Grupo:

“Si tenemos éxito en reducir la suma de metales en las soluciones residuales y las aguas de lavado, no solo mejoraremos el rendimiento de los procesos electrolíticos, sino que haremos que todo el proceso sea más fluido y respetuoso con el medio ambiente. Además, tanto recuperar metales valiosos, como ahorrar en el consumo de agua de red, son una responsabilidad social.“

“If we succeed reducing the amount of metals in the waste solutions and rinsing waters, not only we will improve in the plating processes, but this will make the whole process smoother and more environmental-Friendly. Moreover, either recovering valuable metals or saving fresh water consumption, are a social responsibility.“

Short description of ELECTRONIQUEL SA (SME, Spain):

Electroniquel SA, is a company founded in 1923 and located in Gijón, Asturias. From 1997 to 2011 was part of SEM Group, and since 2012 belongs to ALES Group, an international focused industrial group (Luminosos ALES, Ferjovi, M.T.I., etc). The manufacturing area is 2468 m², with several production lines, such as copper bonded process; Zinc, Tin and Industrial Silver plating; Varnishing & Polishing, Zinc Phosphatising, Cleaning – Descaling (pickling) & Passivation of stainless steels. Electroniquel manufactures and trades Earthing Electrical Items and is specialized in electroplating on all kinds of metal components. Electroniquel distributes its products in the EEC, North Africa and Middle East, featuring an extensive network of dealers and distributors.

With automatic and manual process lines and its quality assurance, is given satisfaction to all kinds of protection needs to metals. The zinc plating process coats zinc without raising the temperature. The Zinc Plating process provides a finish that meets the technical requirements of zinc as a visual appearance of extraordinary brilliance, as well as cathodic protection against rust.

The electrolytic and chemical processes meet the standards DIN 50961&50941, UNE EN ISO 2081, EN ISO 4042, ASTM B633, ASTM A380, etc. Electroniquel in accordance with its commitment to the environment, as much to own a sewage plant for treatment and purification of wastewater, regularly monitored and audited.

DEUTSCHE EDELSTAHLWERKE



Statement of Mr. Jürgen Alex, CEO of DEW:

„Um unseren Unternehmensgrundsätzen (DEW) gerecht zu werden und die Produktivität unserer Anlagen zu steigern, sind wir an zukunftsorientierten Ideen und innovativen Projekten interessiert. Wenn wir es schaffen, durch das ReWaCem-Projekt, Trennung von Säure und Schmutzpartikeln durch die Membrantechnologie zu optimieren oder zu steigern, so könnten wir den Säureverbrauch beim Beizprozess von Edelstahl Drahtcoils durch Recycling minimieren und die Säureaufbereitung maximieren. Dieser optimierte Prozess durch ReWaCem würde den Medienverbrauch reduzieren und die Umwelt schonen.“

“In order to meet our corporate principles (DEW) and increase the productivity of our plants, we are interested in innovative and future-oriented ideas / projects. If we are able to optimize or increase the separation of acid and dirt particles by the membrane technology in the ReWaCem project, we could minimize the acid consumption during the pickling process of stainless steel wire coils and maximize acid treatment. This optimized process through ReWaCem would reduce media consumption and protect the environment.”

Short description DEW (Germany):

Deutsche Edelstahlwerke Specialty Steel GmbH & Co. KG (DEW) is a leading producer and processor of stainless steel long products. With a workforce of 4,200 employees, it processes a total of about one million tonnes of stainless steel per year. Its product portfolio stretches from drawn wire to 900 millimetre thick forgings and includes stainless structural steels, tool steels, as well as rust, acid and heat resistant steels. Products from DEW are used in automotive, aerospace and mechanical engineering industries and energy and plant technology. In the REWACEM project the focus of DEW will be the particle separation and acid recovery from the mixed acidic pickling line for stainless steel wire rods.



Recovery of metals in the printed circuit industry



Statement of Mr. Heinz Moitzi, COO of AT&S:

„AT&S has an excellent reputation as a high-end printed circuit board (PCB) manufacturer and we are also one of the most advanced players with social and environmental programs in the field of PCBs. In the ReWaCEM project, we want to increase the recovery rate of gold and palladium, which are used for the production of PCBs. In addition, we also expect to save a lot of rinsing water. These activities are completely in line with our company strategy, as sustainability has always been one of our guiding principles, and it is integral to our culture at all of our locations worldwide.“



AT & S Austria Technologie & Systemtechnik Aktiengesellschaft:

AT&S is the European market leader and one of the globally leading manufacturers of high-value printed circuit boards. AT&S industrialises leading-edge technologies for its core business segments Mobile Devices, Automotive, Industrial, Medical and Advanced Packaging. In 2016, AT&S produces two new, leading-edge technologies at the new site in Chongqing (China) – IC substrates and substrate-like printed circuit boards for high-end applications. As an international growth enterprise, AT&S has a global presence, with production facilities in Austria (Leoben and Fehring) and plants in India (Nanjangud), China (Shanghai, Chongqing) and Korea (Ansan, near Seoul). The company employed an average of 8,759 people in the financial year 2015/16. AT&S aims to minimize its environmental footprint by reducing the CO₂ emissions per m² PCB attributable to production processes by 5% a year and to reduce the Group's annual fresh water consumption per m² PCB by 3%.

Involved Partners:



Further Information:

www.rewacem.eu

Contact: For any questions concerning the ReWaCEM project, please contact info@rewacem.eu

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www.gestaltung-usw.de

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