

ReWaCEM "Resource recovery from liquid Waste streams in metal industry by Cutting Edge Membrane technologies"

SPIRE- 01-2016 "Systematic approaches for resource efficient water management systems in process industries"



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Project Case Study

1. The EU/ SPIRE needs

About 20% of water utilization in the world is devoted to industrial use and is therefore an essential economic good. On the other hand fresh water is a scarce resource in many regions today while the disposal of waste streams comes along with destructive environmental impacts

2. The Project Solution

The ReWaCEM approach will enable the reuse of waste water and the recovery of valuable resources (acids and metals) from waste stream by means of advanced membrane technologies (Diffusion Dialysis and Membrane Distillation) in metal surface treatment and PCB industry



4. How will this happen?

The developed membrane technologies are modular, flexible and scalable in a wide range in order to be applicable to very different industries at very different sizes. 4 demonstrators will be implemented

3. Value to Customers

Customers will save:

- Production resources (Fresh water, make up acid, make up metals)
- Disposal cost (high costs are associated with transportation and disposal of hazardous substances)
- Energy costs (The applied Membrane Distillation is operated by waste heat)



What are the key expected sustainability impacts of *ReWaCEM*?

Baseline: Recovery of mixed acid pickling solutions and pure water in the stainless steel industry, Germany

Indicators according SPIRE call 01-2016	Baseline	Expected Impact
Reduction of at least 30% in waste water production compared to the current practice in the sector*	10m ³ /day waste water-acid mixture (5.5% HF/HNO ₃) disposal from each treatment bath	<ul style="list-style-type: none"> Acid recovery up to 90% = 495 l/day → saving of fresh make up acid Reduction of liquid waste streams of up to 70% by water extraction Significant Reduction of transportation risk and costs
Reduction of at least 20% in fresh water consumption compared to the current practice in the sector*	10m ³ /day waste water-acid mixture disposal from each treatment bath	Water recovery (ultra pure water due to evaporation process in MD) up to 70% = 7m ³ /day for each bath
Reduction of at least 15% of energy use compared to the current practice in the sector*	The process is not implemented yet so there is no reference with regard to energy demand	The energy demand is expected to be very low since the prime mover for DD is concentration gradient and for MD waste heat is utilized



*Core SPIRE indicator



What **outputs or learning** from ReWaCEM could have value for other SPIRE projects here?

- ReWaCEM is running for one year now, Lab investigations, system and module design for 4 demonstrators was conducted; construction of these 4 demonstrators is ongoing
- Surface treatment processes in metal industry are similar on the first sight but quite individual and complex in detail
→ only detailed process analysis (e.g. detailed mass balances) indicate clearly which treatment steps have to be applied in which order
- Material constrains and high safety measures for staff protection, transportation, handling etc. come along with acid treatment (pH ~ 0)
→ much higher effort and costs are associated compared to “common” separation processes as e.g. desalination
→ size of demonstrator must be planed carefully according to available budget (costs of resistant components are three- to fourfold of those for conventional water treatment plants)



Membranes – Utilizing skills of the nature to protect the environment



Source: Jul.s Pic.s



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