MemBrain®

MEMBRANE INNOVATION CENTRE

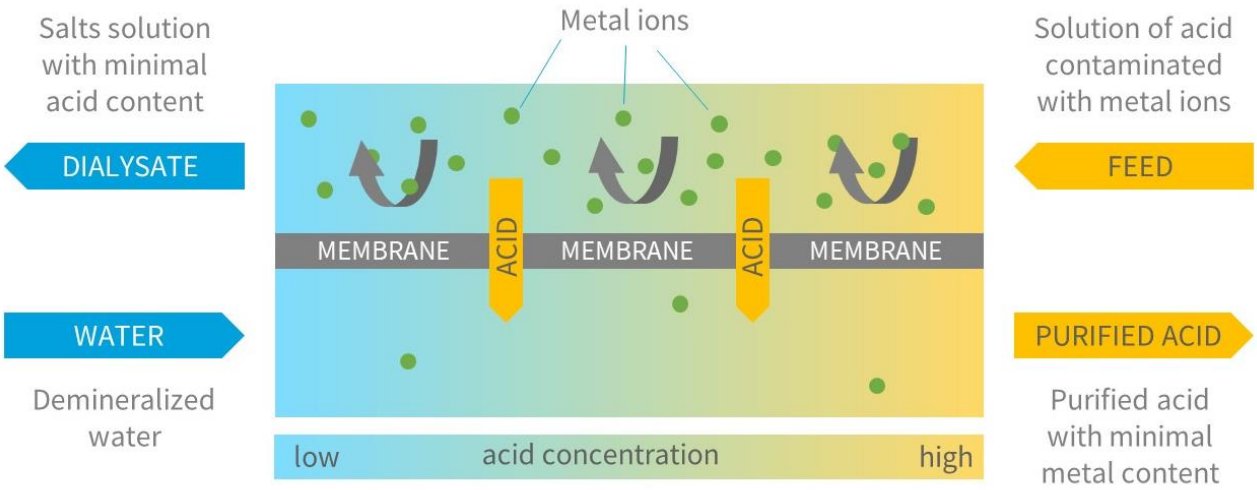
DIFFUSION DIALYSIS – PROGRESSIVE TECHNOLOGY FOR ACID RECOVERY

Technology utilization

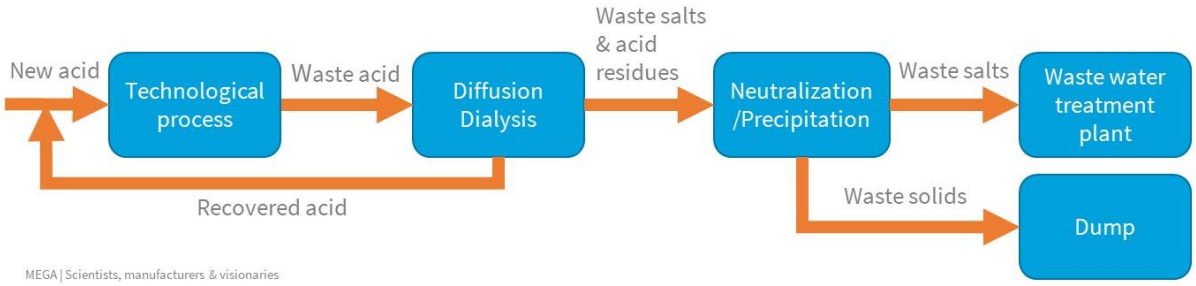
- Technology for free acid recovery and salt separation from an acid bath
- The technology can process inorganic acids contaminated with their salts, i.e. H_2SO_4 up to 30%, HCl up to 15%, HNO_3 up to 15% (more concentrated solutions or other acids should be tested), a mixture of HNO_3 (up to 20%) and HF (up to 5%)
- Problematic are organic substances (oils, surfactants, silicone oils) → pre-treatment is required

Diffusion dialysis process principles

- Two streams enter the diffusion dialysis module equipped with anion-exchange membrane:
  1. FEED = solution of acid contaminated with metal ions (e.g. waste solution after surface treatment)
  2. DEMINERALIZED WATER
- Anions (SO_4^{2-}, Cl^-, NO_3^-) are preferably transferred through the anion-exchange membrane together with H^+ ions (because of their very high mobility). Cations (Na^+, Zn^{2+}, Ca^{2+}, Cu^{2+}, Al^{3+}) are repulsed by the positively charged anion-exchange membrane and they are kept in the dialysate.
- Two streams leave the module:
  1. DIFFUSATE = purified acid with minimal metal ions content
  2. DIALYSATE = salts solution with minimal acid content



Regeneration of the acid by diffusion dialysis



Process parameters

- Free acid recovery of ca. 90%, ca. 10% of acid remains in the dialysate
- Ions rejection: ca. 95% of multivalent (e.g. Zn^{2+}, Ca^{2+}, Cu^{2+}, Al^{3+}) ions remain in waste, ca. 5% are transferred into product, ca. 80% of monovalent ions (e.g. Na^{+}) remain in waste, ca. 20% are transferred into product
- 200-400x salt concentration reduction is possible with the two-stage process

Main advantages of the technology

The technology is robust and economically and environmentally beneficial due to:

- Cost reduction of new acid and neutralization agent purchase
- Cost reduction due to lower salt emissions into the wastewater
- Reduction of the negative environmental impact of the production
- Continuous or batch feed processing possible
- No additional chemicals except water
- Very low electrical energy demands
- Simple scale-up of the technology

MEGA offers

- The first spiral wound membrane module for commercial use in the world (Company SPIRALTEC GmbH)
- Cooperation of MEGA and SPIRALTEC GmbH – MEGA has **territorial exclusiveness** for the Czech Republic, Slovakia, Hungary, Poland, Romania, Bulgaria, CIS countries, Estonia, Latvia, Lithuania
- Developed hollow fibre membrane module for HNO_3 and HF mixture
- Full service for industrial application: Laboratory tests in MemBrain, pilot tests in MemBrain or at customers facility, engineering and production, transport and installation, start-up & training, warranty and post-warranty service