System Components

Exergy's DD systems are modular, skid-mounted, and may be fully automated. The systems include high-quality, heavy duty components:

- Automated level controls for storage tanks
- Automated flow meters for feed streams
- Acid pre-filtration

Additional Options

Exergy's DD skid can be customized with optional components. Typical options include:

- Materials of construction
- Heat exchangers
- Deionization system to produce suitable water for the DD process

Model Classification

Model 320

- Capacity: up to 3 gallons per hour
- Skid size: 2.5′ x 3.4′ x 6.5′ (H)
- Semiautomatic operation

Model 1750

- Capacity: more than 3 gallons per hour
- Skid size: 8′ x 6′ x 7.5′ (H)
- Fully automatic operation
- Automated level controls
- Automated flow controls for feed streams
- Acid pre-filtration

EXERGY TECHNOLOGIES CORPORATION

Innovations in Membrane Technologies

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Revolutionize Your Production

Diffusion Dialysis Acid Recycling Technology

EXERGY TECHNOLOGIES CORPORATION

Diffusion Dialysis for Acid Recycling

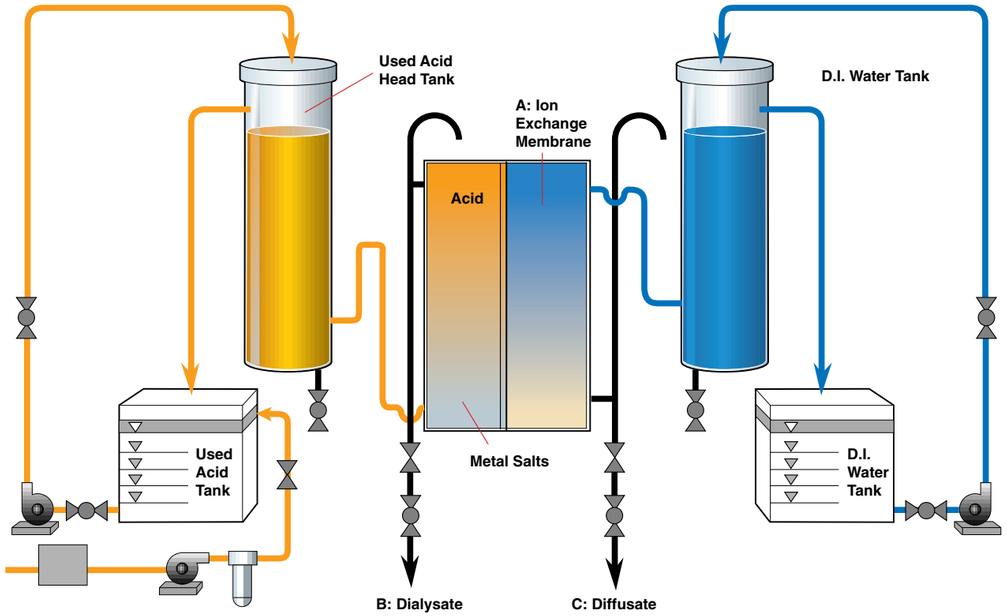
A membrane technology innovation from Exergy

Key Feature

Patent Pending "One-Piece" Spacer Technology Allows for Rapid and Efficient Mass Transfer

Use of Natural Gravity Flow to Achieve Separation of Acid and Contaminants, which will allow constant flow rates to membrane stack

Schematic of a Diffusion Dialysis System



Membrane Stack

Technology Description

Exergy's Diffusion Dialysis (DD) is a state-of-the-art technology that uses ion exchange membranes to recycle used or spent industrial acids. The membranes are installed in single or multiple stacks that are supported in a plate and frame structure. Exergy's patent pending "one-piece" membrane spacers create compartments with appropriate cell distances for optimum diffusion. Counter-current streams of spent acid and deionized water alternate through the cells. Free acid is transported from the spent acid stream into the deionized water stream. This stream (diffusate) is recovered acid for reuse in the process. The metals in the feed spent acid are rejected, and are carried as the dialysate, creating a waste stream for metal recovery or treatment.

Benefits

- Recycles 80-95% of used or spent acid
- Rejects metals up to 95%, allowing baths to be used without need for disposal
- Eliminates need for concentrated acid waste treatment and disposal
- Lowers *by half* the energy requirements in anodizing baths

Other Features

- Fully automatic and continuous operation
- Chemical resistant membranes that last up to five years for typical applications
- Acid feed filtration

Applications

Diffusion dialysis technology is used in the following industrial applications:

- Maintenance and recycling of HNO_3/HF for etching baths used in stainless steel processing
- Reclamation of H_2SO_4 and HCI in etching steel
- Reclamation of H_2SO_4 in anodizing processes
- Regeneration of battery acids
- Recovery of H_2SO_4/HNO_3 and H_2SO_4/HCI for etching non-ferrous metals

The technology is suitable to handle well disassociated acids. In some instances, due to formation of metal complexes (such as zinc chloride), the separation of acid and metal ions is not efficient. In addition, the technology is not designed to handle feed acid temperatures above 130˚F (40˚C).

The membranes require occasional replacement every three to five years, depending on the applications, and process requirements.

Exergy can provide detailed operating costs to customers who are interested in this technology, including estimates on energy savings in anodizing applications.