

Acid Management System

For Aluminum Finishing



Aluminum Finishing

Eco-Tec understands aluminum processes and the problems finishers face. With over 37 years of experience, Eco-Tec assists Aluminum Finishers in balancing the control of operating costs while maintaining high product quality.

Eco-Tec's products enable aluminum finishers to continuously recycle etching, anodizing and brightening solutions. As a result of continuous, online bath purification, hundreds of companies have:

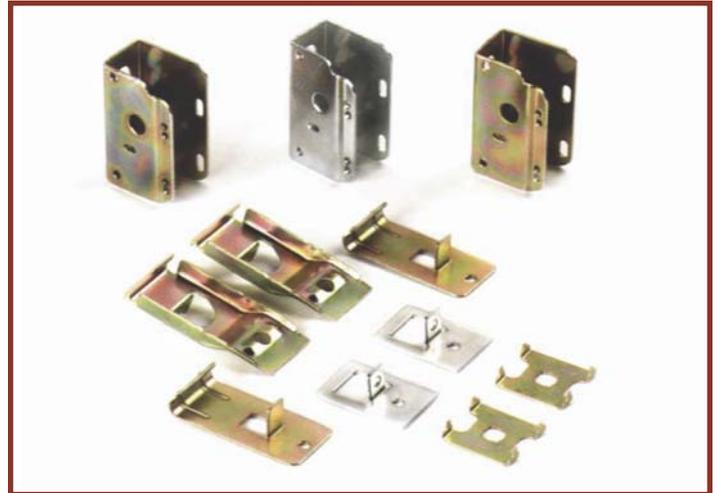
- reduced acid purchases
- reduced neutralization costs
- eliminated bath dumping, clean-out and reformulation labor
- improved product quality and consistency

Quality Control

Consistency and control of finishing chemistry is essential to ensure product quality and uniformity. Dissolved aluminum quickly contaminates most finishing solutions and must be removed to ensure high quality finishes.

Cost Control

Aluminum finishing process cost can easily escalate if not managed. Contamination build-up leads to regular discarding of solutions, loss of productivity, and high chemical and treatment expense. Continuous recovery and purification of solutions is needed to ensure effective cost management.



Eco-Tec's APU® system has become a standard in several metal processing industries including the aluminum anodizing industry. Hundreds of Eco-Tec APU® systems are installed in over forty different countries around the world. The APU® highly is efficient and fully automated to purify and recover inorganic acids.

Why Use an APU®?

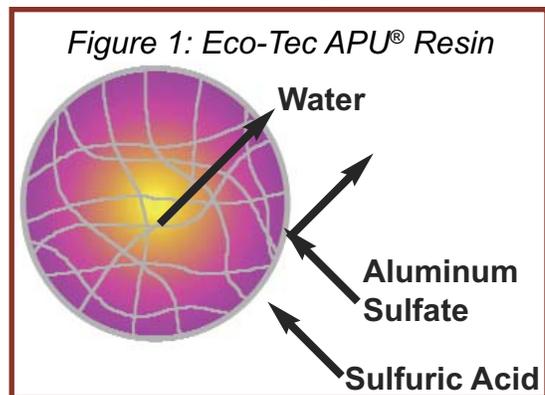
Large amounts of mineral acids - including sulfuric, hydrochloric, nitric, phosphoric and hydrofluoric - are used in both the primary extraction of metals as well as their subsequent finishing and treatment processes. Industries such as aluminum anodizing and etching use such processes. Eventually these acid baths become spent due to high metal content and need to be replaced even though there is still an appreciable quantity of free acid that can be used.

The APU® addresses this issue by continuously purifying these acid solutions of the metal contaminants. The result is a reduction in acid purchases, neutralization costs, bath dumping and reformulation. The benefit is a consistent and predictable bath operation at all times.



How Does the APU® Work?

The APU® employs an ion exchange technique known as Recoflo® (reciprocating flow ion exchange) that incorporates



specific resins that have the ability to sorb acids from solutions, while excluding metallic salts of those acids. The process is reversible in that the acid can be readily desorbed from the resin with water.



APU® Partial User's List

Customer	Location
Alcan	NEW ZEALAND
Alcoa	Mississippi, USA
Olympus	JAPAN
Lorin Industries	Michigan, USA
Pioneer Metal Finishing	Wisconsin, USA

What is an AnoPur™?

The AnoPur™ System is a small, skid mounted device that connects directly to an anodizing tank, continuously removing aluminum as it is dissolved. The AnoPur™ unit has the flexibility to be connected to one tank or several tanks. It employs a simple PLC (programmable logic controller) in a control panel that uses a graphical display to indicate what the unit is doing at any given time.

The heart of the AnoPur™ unit is a column of ion exchange resin that can absorb acid while rejecting metal salts to waste. The acid is recovered from the resin using a simple water wash.

Why use an AnoPur™?

When aluminum is anodized, a portion of the metal dissolves into the sulfuric acid solution used in the anodizing tank. The aluminum gradually accumulates in the tank and, eventually, the solution must be dumped and replaced with fresh acid. An alternative solution is continuous purification. There are a number of benefits that can be realized by continuous purification:

- reduction in sulfuric acid purchases
- fewer line shutdowns
- reduced treatment and disposal costs
- lower discharge of dissolved salt
- improved anodize finish consistency
- simplified coloring
- reduced electrical and cooling requirements.



AnoPur™ Partial User's List

Customer	Location
Meyer Industries Ltd	Sriracha, THAILAND
Surf-Tech Industries	British Columbia, CANADA
Walgren Company <small>Multiple Units</small>	Michigan, USA
Olympus <small>Multiple Units</small>	Nagano, JAPAN
Technova Imaging Systems	Maharashtra, INDIA

Acid Etchant Purification

Companies manufacturing lithographic printing plates or capacitor foils use acids to etch the surface of the aluminum. For litho-plate manufacturers, this allows a photosensitive emulsion to bond to the surface of the aluminum. Aluminum capacitor foils use acid etching to increase the porosity of the foil and alter its dielectric potential. In both cases, control of the etching process is critical to ensure product quality.

A key factor in the etching process is the dissolved aluminum which needs to be kept at very low levels. Extremely high acid and waste neutralization costs occur when the etching tank is decanted at a rate high enough to control aluminum buildup. Also, there is a loss of the organic additives that are present in many etchants.

By separating the dissolved aluminum from the acid, the acid can be recycled and reused in the process. This has the following benefits:

- **Reduction in acid purchases**
- **Reduced costs for waste acid neutralization**
- **Reduction in waste sludges - in some cases, the waste aluminum can be converted to a by-product having commercial value**
- **Reduction in waste salt concentration (e.g. lower nitrate, phosphate)**



Acid Purification Partial User's List

Customer	Location
Agfa Graphics Limited Multiple Systems	Leeds, UNITED KINGDOM
CMC	Washington, USA
Kodak	Colorado, USA
Nippon Chemicon Corporation Multiple Systems	JAPAN
Samyoung	Kyundki-Do, KOREA
SPA Process Technology	Alsama, SAUDI ARABIA

Bright Dip Recovery

Bright Dip Recovery

Phosphoric brightening provides a highly reflective finish to aluminum for items like automotive and appliance trim, picture frames, lighting fixtures, bathtub enclosures and shower doors. However, the high loss of phosphoric acid during rinsing leads to substantial operating costs.

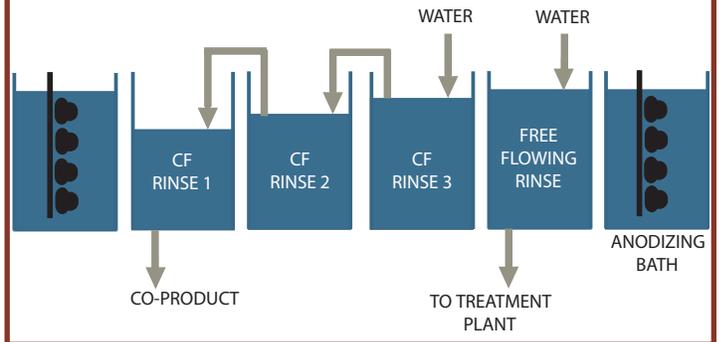
Bright dip rinse formulation is as follows:

- 65-80% phosphoric acid
- 0-10% sulfuric acid
- 2-4% nitric acid
- 35-45 g/l aluminum
- Fume suppressant

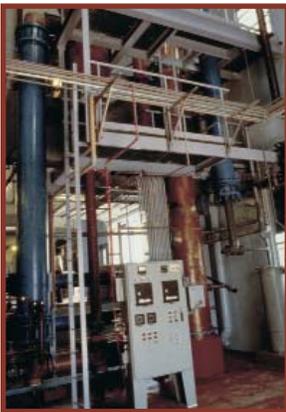
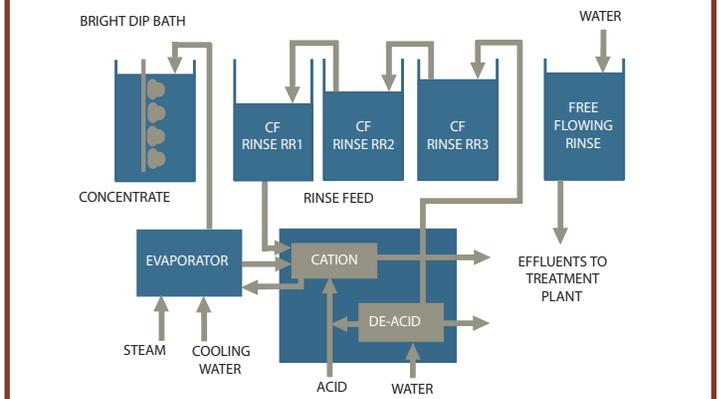
Most plants operate their rinses such that phosphoric acid is collected as a 35% solution to be reused as fertilizer feedstock. A better idea, however, is to purify the rinses of aluminum so the phosphoric acid may be returned back to the bright dip. Eco-Tec's DPU does just that.



Bright Dip Process



Recovery Process



The DPU's efficient regenerant chemical reuse feature minimizes operating costs, and an Eco-Tec designed vacuum evaporator concentrates the purified rinsewater back to 80% strength. This cost effective alternative to selling the rinsewater has provided brilliant results.

DPU Partial User's List

Customer	Location
Columbia Pacific	USA
Anomatic	USA
Alcoa (Alumax) Multiple Units	USA
Western Extrusions	USA
Kyoritsu Alumi (Sankyo)	JAPAN

Caustic Etch Recovery

Architectural and aerospace industries benefit from Eco-Tec's Caustic Etch Recovery (CER) systems. Etching or chemical milling with caustic soda is often the greatest operating expense in aluminum finishing. For example, up to 80% of an architectural anodizing plant's waste comes from the etching operation.

Eco-Tec CER systems continuously crystallize aluminum from caustic solutions under controlled conditions. The aluminum tri-hydrate is extracted as a nearly dry, compact material that can be sold to aluminum manufacturers. The purified caustic is returned to the etching/milling tanks for reuse.



Caustic Etch Recovery Issues

Some of the issues faced by finishers are:

- Caustic soda usage/costs
- Additive usage/costs
- Sludge generation/waste treatment costs

Example Etch/Anodize Operation Solid Waste

Al dissolved in etching (1.5 mil etch)	20.3 lb.
Al dissolved in anodizing (0.7 mil film)	2.1 lb.
Waste sludge produced (15% w/w)	431 lb.
Waste sludge with etch regeneration	64 lb.
Waste reduction with etch regeneration	85%

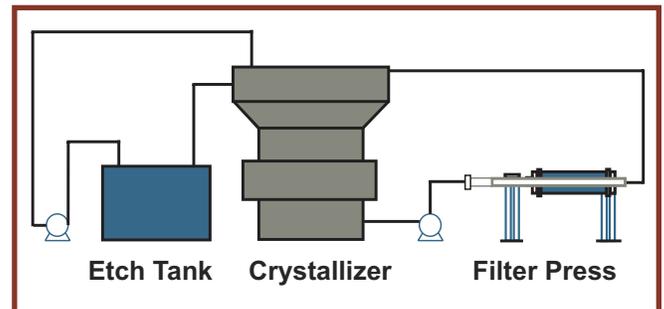
Note: Based on 1000 sq ft of anodized surface area weighing about 400 lb.

Caustic Etch Recovery Benefits

A CER system will reward you with:

- 85% savings of NaOH
- Reduced additive costs versus never dump chemistry
- Salable by-product
- Tremendous reduction in sludge generation
- Consistent, predictable bath performance

Flow Diagram



Caustic Etch Partial User's List

Customer	Location	Model
Alcoa Architectural Products Multiple Units	USA	CER14
Vistawall Division	USA	CER14
Speedstamp (Division of Magma Int.)	CANADA	CER9
The Eilliam Bonnell Co. Multiple Units	USA	CER14
Inespal	SPAIN	CER9

maximum recovery ~ simple package ~ proven reliability

Features	Benefits	Impacts
Short bed height and small resin volume	Small equipment size with easy maintenance	Maximum recovery efficiency, lower operating costs
Counter-current regeneration	Efficient resin Effective resin rinsing	High purity, concentration and pH control; high productivity, and quality; over 95% recovery with less waste
Pre-assembled, skid mounted	Easy installation	Reduced installation and capital costs
Fully automated with full factory pre-testing	Fast installation, consistent operation	Reduced operating and installation costs

Why Use Recoflo®?



Operational impact through proven product quality with:

- Operating cost savings
- Maintenance savings
- Time savings
- Installation savings
- Space savings
- Chemical consumption savings
- Waste reduction savings

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