

METAL PROCESSING APPLICATION

WASTEWATER TREATMENT AND RECOVERY

Esmil Process Systems together with our partners have conducted much research and constructed many plants gaining vast experience in the metal industry. From bench scale studies right the way through to full scale plant operations we strive to offer BAT (Best Available Technology) using state of the art membrane separation and dewatering processes.

GENERAL PROCESS DESCRIPTION

Our wastewater treatment technology for metal processing plants are based on combination of conventional pre-treatment methods such as **Dissolved Air Flotation** and **Media Filtration** followed by **Membrane Technologies** and polishing methods as **Ion Exchange**, **Activated Carbon** or **Advanced Oxidation Processes** to meet the most challenging discharge requirements. The actual process stages is governed by the site requirements: to improve recovery of water, acids and metals, and to reduce off-site disposal costs by improving plant effluent quality to match ever-increasing environmental constraints.

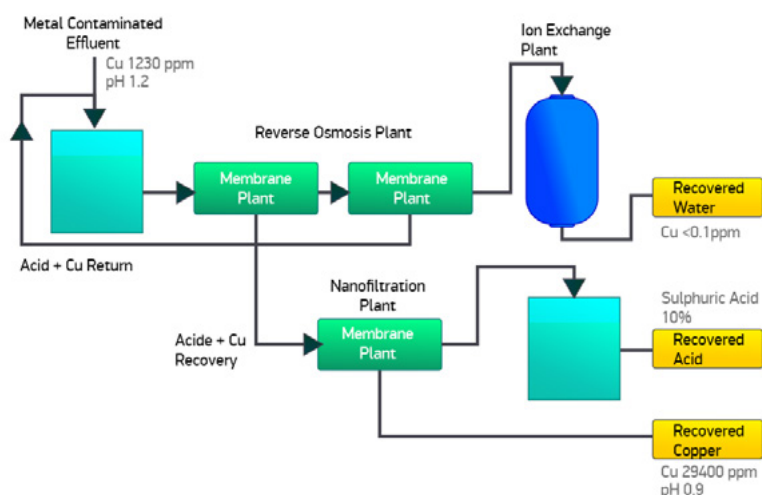
TYPICAL ESMIL TECHNOLOGY APPLICATION IN METAL PROCESSING INDUSTRIES

Metal processing effluents that have been treated by Esmil technology include:

- Acid Rinse Waters
- Acid Recovery
- Copper Sulphate/ Rinse Water Recovery
- Heavy Metals Removal/ Recovery
- Shipyard Effluents

Depending on the process requirements, Esmil will explore a range of technological solutions to achieve the treatment, recovery and economical requirements

ACID AND METAL RECOVERY

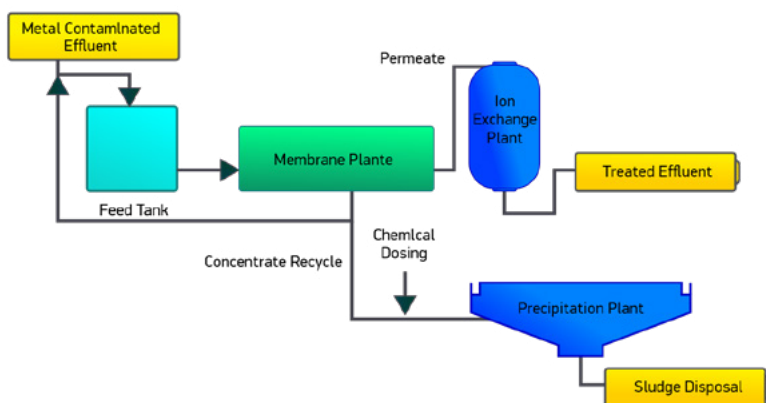


The technology is designed to optimise recovery of both residual metals and spent acid rinse waters offering the following advantages:

- Rapid investment pay-back
- Electrolyte / Metals recovery
- Acid and rinse water recovery
- Reduced environmental liability

Using our technology based on membrane systems and ion exchange, two very different plants, including a copper rod plant and printed circuit board (PCB) manufacturer have both been able to achieve similar **water recovery** from spent acid rinse waters (**95%**) and valuable **copper recovery (99%)** from their effluent streams.

HEAVY METALS REMOVAL



Heavy metal removal/ recovery is particularly important in the metals industry across a range of sectors from mining tailing ponds to processing applications. Esmil physical-chemical treatment technologies together with membrane technology are well suited to solving the problem of heavy metals due to the high rejection efficiency by the membrane materials. This can reduce the load on current conventional treatment systems such as ion exchange or act as a standalone plug and play system to achieve the desired effluent qualities.

TYPICAL TREATMENT EFFICIENCY

Metals	Feed, mg/l	Permeate, mg/l	Concentrate, mg/l	Rejection, %
Zinc	193	0.8	550	99.6
Iron	210	0.7	710	99.8
Cadmium	1.98	0.09	7	99.6
Nickel	21.5	0.05	66.2	99.7
Manganese	625	2.50	2050	99.8
Copper	775	3.55	2060	99.5
Chromium	2.2	0.008	3.6	99.5

METAL APPLICATIONS DESIGN PHILOSOPHY

We strive to use the most appropriate solution to suit your treatment and/or recovery requirements. We are not limited to a single technology as we have a vast range of experience in the majority of treatment technologies. This includes membrane bio reactors, aerobic treatment, media filtration, ion exchange and other membrane technologies across a range of effluents and industries.

As no two processes are equal it is essential to follow a number of steps to ensure that your tailored metal application treatment/recovery process performs as well and economically as possible to achieve your treatment goals.

- Lab scale dewatering and membrane trial and selection to ensure process feasibility.
- Long term site pilot trial to allow for feed variation and data gathering.
- Extensive plant design and OPEX calculations.
- Build, Installation and Commissioning.
- Comprehensive service support including maintenance and system upgrades.

REFERENCES

- Phelps Dodge Copper Rod Mill, USA (RO, NF, IEX)
- A & P Appledore, Shipyard Docks, UK
- Asarco Globe Plant, Heavy Metals Refinery, USA
- Toppan, PCB Manufacturer, San Diego
- NLMK, Metallurgic Plant, Lipetsk, RF

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