



*A COMMERCIAL APPLICATION OF  
VIROFLOW™ TECHNOLOGY*

## CASE STUDY LARGE MECHANICAL SCREW ELECTROPLATING PLANT

*“The company was in continual breach of its trade waste limits until ViroFlow™ Technology was applied. This had the remarkable ability to efficiently remove heavy metals from electroplating process water...”*



## PROBLEM

A large mechanical screw electroplating company in Melbourne, Australia, was experiencing many problems associated with their waste water treatment. The electroplating effluent was characterised by highly variable metal concentrations and effluent flow rates.

The major issues faced by the company were:

- > High production downtime due to waste water plant cleaning arising from scale formation in dewatering screens.
- > Non-compliance in regards to trade waste requirements.
- > High volumes of unstable, hazardous sludge requiring specialist removal to landfill.

## VIROTEC TOTAL SOLUTION

ViroFlow™ Technology, a total solution service which includes reagents, technical support and liaison with regulatory authorities, was implemented with the following outcomes:

- > Significant reduction in heavy metal concentrations in discharge water. Full compliance with Melbourne Water Authority trade waste standards. All metals are now consistently below the required ten ppm threshold prior to discharge into the sewer.
- > Minimisation of capital plant upgrades that would normally have been necessitated by growth in effluent plant volumes.
- > Reduction of 50% in sludge volumes resulting in a direct landfill cost saving.
- > Re-classification of sludge to “Non-Prescribed” waste allowing for potential solids re-use or recycling.
- > Increased dewatering efficiency resulting in improved water quality and increased plant throughput.
- > Reduced production bottlenecks caused by the time taken to treat effluent water in batch effluent treatment processes.
- > Significant improvement in production availability due to elimination of scaling in the dewatering system. Cleaning frequency decreased from weekly to three-monthly intervals
- > Potential for future water re-use in the process due to enhanced treated water quality.

## BACKGROUND

The waste water produced from the mechanical screw electroplating plant is characterised by high and variable metal concentrations. It was necessary for the company to ensure their waste water systems were capable of effectively removing these high metal loadings. The existing treatment plant used at different times aluminium sulphate, lime, and magnesium oxide to adjust pH and remove metals from the process water. Although some metals were removed, the company repeatedly breached its trade waste limits, and therefore had to look for an effective and economic alternate technology.

Production downtime was also a major issue for the company. The sludge produced from the existing chemical treatment was scaling the dewatering equipment, resulting in the process being shut down for many hours in order for operators to de-scale the dewatering equipment. This was an inherent problem specifically with the use of lime and a problem that the company had tolerated for many years at the expense of production.

The company was also paying a high price to have the sludge removed from site. Because the sludge was a “Prescribed” waste under Victorian environmental legislation, the cost was excessive.

Over a six-month period, ViroFlow™ Technology was applied. Previous work by Virotec had shown that ViroFlow™ Technology had the remarkable ability to efficiently remove heavy metals from electroplating process water, including copper, zinc, tin, iron nickel and chromium.



*Current estimates indicate that about 496,141 tons of hazardous sludge are produced annually in the US alone by electroplating.*

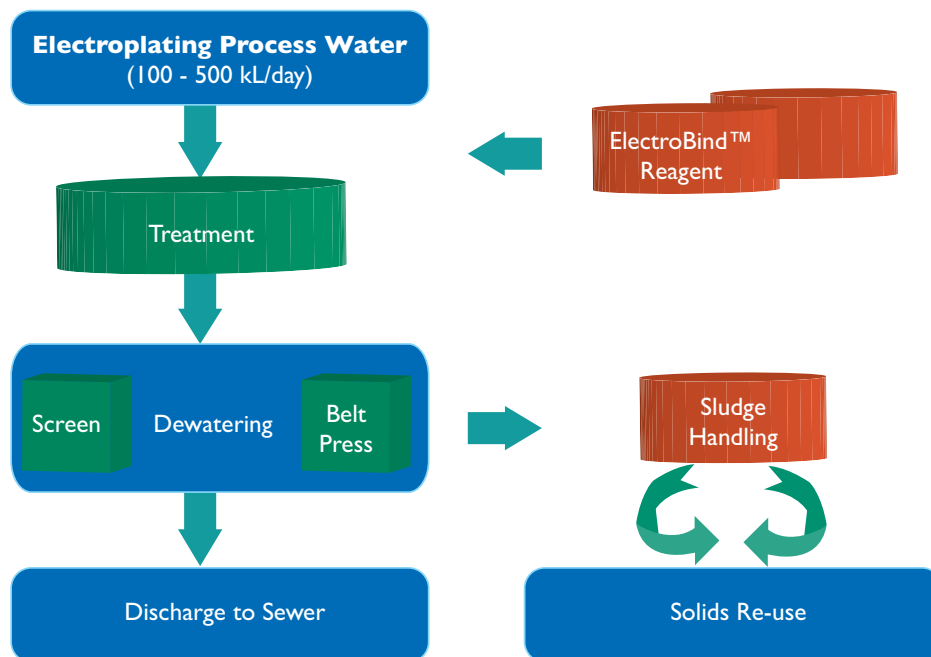
## TREATMENT METHODS

ViroFlow™ Technology incorporates the use of ElectroBind™ reagent, a patented environmentally safe reagent. ElectroBind™ reagent properties include high acid neutralising capacity, fast settling rate characteristics, reduced sludge volumes, and high metal binding efficiency.

ElectroBind™ reagent was mixed with the electroplating process waste water at a predetermined volume-to-mass ratio to ensure optimum contact time and treatment efficiency. This was accomplished via an automated dosing system in a ten kL mixing vessel. ViroFlow™ Technology replaced the conventional alkaline treatment and produced a dense, stable sediment that was easily recovered and dewatered. ElectroBind™ reagent was provided to the electroplating company as a 45% slurry solution.

ViroFlow™ Technology was used in conjunction with existing treatment facilities and required only minimal capital works and plant modifications.

The schematic below shows the application of ElectroBind™ reagent.



## RESULTS

During the application of ViroFlow™ Technology, heavy metal concentrations in the treated water were consistently below the Melbourne Water Authority trade waste standards. The following Table is a summary of the results obtained using ViroFlow™ Technology. Due to the high variability of metal loading in the process water, ranges are given.

### Results of ViroFlow™ Technology, Water Quality

Parameter	Electroplating Wasterwater	Effluent quality using conventional treatment	Effluent quality after ViroFlow™ Technology
Flow Rate	500 kL/day	500 kL/day	500 kL/day
pH	3.6 - 4.5	6.5 - 7.5	6.5 - 7.5
Copper	1,870 ppm	5.0 - 50.0 ppm	0.11 ppm
Chromium III	1000 - 3000 ppm	5.0 - 50.0 ppm	0.03 ppm
Iron	1,550 ppm	5.0 - 50.0 ppm	0.12 ppm
Nickel	2,500 ppm	5.0 - 50.0 ppm	0.07 ppm
Tin	2,500 ppm	5.0 - 50.0 ppm	0.74 ppm
Zinc	1,000 - 2,790 ppm	5.0 - 50.0 ppm	0.23 ppm

The ViroFlow™ Technology and ElectroBind™ reagent did not scale the dewatering equipment, which resulted in minimal production downtime. Results for Toxicity Characteristic Leaching Procedure (TCLP) tests for the treated sludge are shown in the Table overleaf. Reductions in sludge volume and sludge classification are also shown.

### Results of ViroFlow™ Technology, Sludge Quality

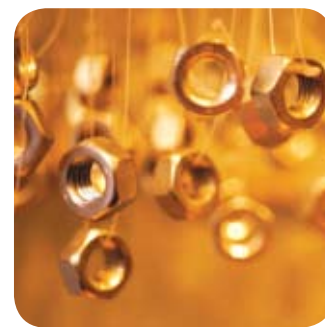
Parameter	Sludge quality using conventional treatment	Sludge quality after ViroFlow™ Technology
Classification	Prescribed (VIC) Industrial (NSW)	Non-Prescribed (VIC) Inert (NSW)
Sludge Volume	16.8 Timoth	8.14 Timoth
Copper TCLP	2.1 ppm	0.5 ppm
Chromium III TCLP	4.3 ppm	0.2 ppm
Iron TCLP	2.6 ppm	0.15 ppm
Nickel TCLP	4.5 ppm	0.05 ppm
Tin TCLP	3.4 ppm	0.06 ppm
Zinc TCLP	3.4 ppm	0.06 ppm

## CONCLUSION

The use of ViroFlow™ Technology to treat electroplating effluent is a major advance – proving to be both environmentally sustainable and economically viable.

Treated water quality, after the application of ViroFlow™ Technology, complies with the stringent trade waste limits imposed by Water Authorities. Heavy metal concentrations are several times below the required water quality limits.

ElectroBind™ reagent is non-toxic, non-hazardous and environmentally safe. Used ElectroBind™ reagent is not a hazardous or prescribed waste material. Even after use in many applications, it can be usefully reused in other applications.



*ElectroBind™ reagent helps improve operating efficiencies and meets stringent environmental regulations for waste water produced by the electroplating industry.*

## TESTIMONIAL

*“The commercial development of ElectroBind™ reagent occurred over a six-month period in Australia’s largest mechanical screw electroplating facility. Before the application of ViroFlow™ Technology, the company was facing varied waste water problems on a daily basis. Trade Waste licence limits were constantly exceeded and sludge handling was a big issue due to the nature of the bulky and hazardous sludge. The cost of disposal was a major issue for the Company.*

*The implementation of ViroFlow™ Technology has brought about substantial cost savings and environmental improvements for the Company. The Virotec team were very professional in the design, commissioning and implementation of the Technology.*

*Ongoing monitoring ensured that a quality product was delivered on time and in specification. Technical support provided by Virotec during the application of ViroFlow™ Technology was excellent, as was general customer support.*

*I am confident that ViroFlow™ Technology will revolutionise waste water treatment in the electroplating industry and other metals finishing applications.”*

### DAVID GUNN

Royal Melbourne Institute of Technology



*ElectroBind™ reagent is a new, superior and more economical alternative to traditional wastewater treatment utilising caustic, lime and magnesium oxide.*

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