

*THE APPLICATION OF  
VIROFLOW™ TECHNOLOGY USING  
ELECTROBIND™ REAGENT IN THE  
ELECTROPLATING INDUSTRY*

**VIROFLOW™ TECHNOLOGY  
TECHNICAL PAPER**



The wastewater produced from the electroplating industry is characterised by high metal concentrations. It is necessary for electroplating plants to ensure their wastewater systems are capable of effectively removing these high metal loadings.

ViroFlow™ Technology, provided by Virotec Global Solutions, has the remarkable ability to remove heavy metals from process and wastewaters from a wide range of industries. ViroFlow™ Technology, a total solution service which includes reagents, operating personnel and turnkey solutions is currently being used commercially in the electroplating industry to remove heavy metals, including Zinc (Zn), Tin (Sn), Iron (I) and Chromium (Cr) from process and wastewaters.

ViroFlow™ Technology ensures selection of the best application strategy. Management of the treatment process is based on Virotec's:

1. Extensive research database
2. Years of practical experience with commercial scale applications
3. Results of laboratory trials for each wastewater to be treated

## VIROFLOW™ TECHNOLOGY APPLICATIONS

ViroFlow™ Technology can be applied to the majority of industrial wastewater treatment applications. 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 and high metal binding efficiency.

ElectroBind™ reagent is mixed with the process wastewater at a predetermined volume-to-mass ratio to ensure optimum contact time. This is normally accomplished in a mixing vessel. ViroFlow™ Technology replaces the conventional alkaline treatments and produces a dense, stable sediment that is easily recovered and dewatered.

ViroFlow™ Technology is customised to suit each individual application and it can be complemented to existing treatment facilities and typically requires minimal capital works and plant modifications.

The sediment formed when ElectroBind™ reagent settles and dries has potential re-use options. The sediment holds the bound metals sufficiently tightly that they can neither be taken up by plants nor released in leachate.

The major advantages of using ViroFlow™ Technology can be summarised below:

- > Reduction in sludge volumes generated;
- > Significant reduction in heavy metals in discharge water;
- > High pH buffering capacity;
- > Prevention of scaling in dewatering screens;
- > Increased settling times resulting in improved water quality, and;
- > Prevention of major capital upgrades by increasing effluent throughput.

## CHEMISTRY OF VIROFLOW™ TECHNOLOGY

ViroFlow™ Technology works by forming strong ionic bonds with the various metal ions in the effluent. ViroFlow™ Technology effectively immobilises metals into an insoluble, non-reactive sediment.

ElectroBind™ reagent has a high charge-to-mass ratio that increases its ability to strip metals ions from solution.

The heterogeneous mineral surfaces in ElectroBind™ reagent catalyse metal precipitation from solution at a pH lower than that achievable with conventional alkaline treatments such as lime, magnesium oxide and sodium hydroxide, by providing nucleating surfaces and acting as substrates for precipitation.

The primary mechanism of acid neutralization and metal uptake in ElectroBind™ reagent is the dissolution of readily soluble alkaline minerals which supply hydroxides, carbonate ions for the precipitation of insoluble metal hydroxides, carbonates and hydroxy carbonate compounds on the products surfaces.

The ability of ElectroBind™ reagent to strip trace metals increases with time. Most metals bound by ElectroBind™ reagent are held as structural components of the mineral and therefore cannot be easily removed.

Most trace metals are initially trapped by adsorption. ElectroBind™ reagent is dominated by particles with a high surface area-to-volume ratio and high charge-to-mass ratio. During aging, elements are redistributed to become structural components of new minerals during recrystallisation.

## ENVIRONMENT AND SAFETY

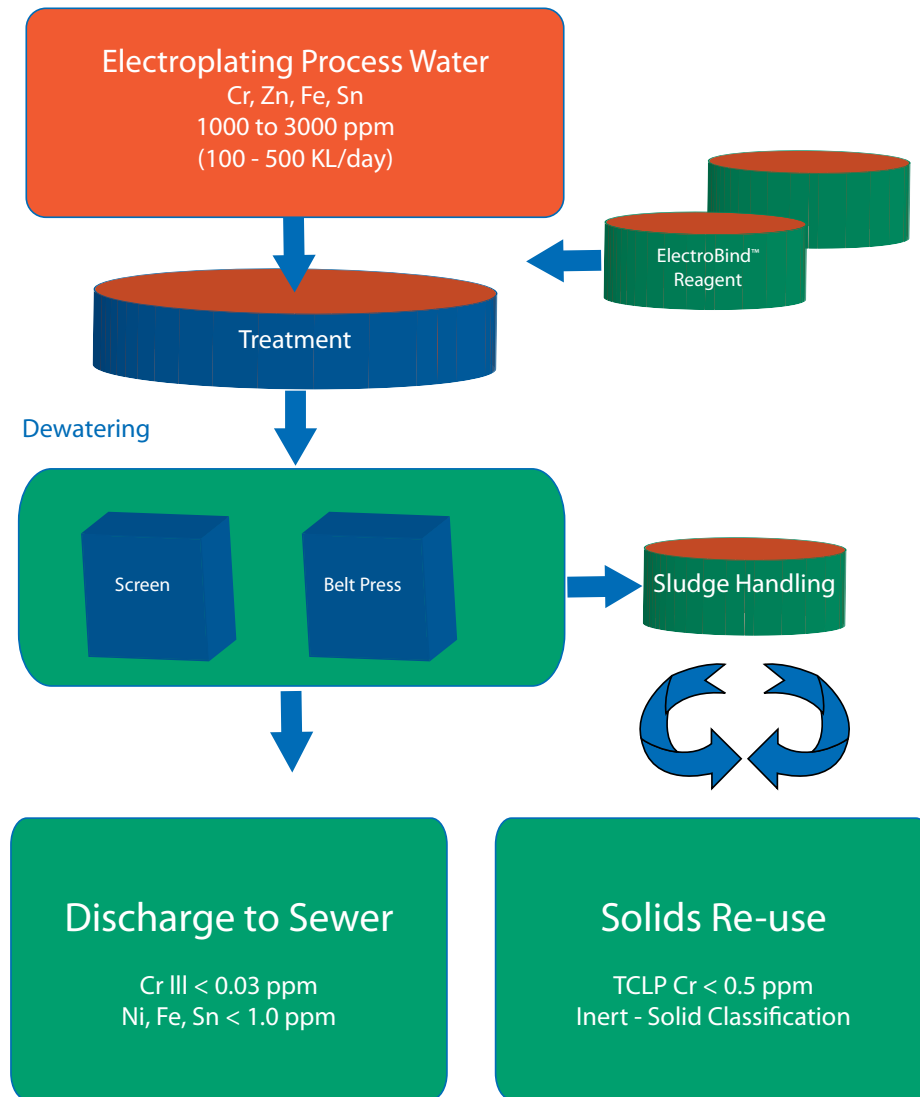
The use of ViroFlow™ Technology to treat electroplating effluent is both environmentally sustainable and economically viable. ElectroBind™ reagent is environmentally safe and the exhausted material may be disposed as a non-leachable solid residue.

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. Exhausted ElectroBind™ reagent can also be used in selected downstream applications depending on individual circumstances.

The leaching of used or spent ElectroBind™ reagent cannot result in the release of any trace elements at potentially environmentally hazardous concentrations. ElectroBind™ reagent sediment is classified as a non-hazardous, inert or solid substance for transportation and is safe for unskilled workers to handle.

ElectroBind™ reagent consists of minerals that are not known to pose any environmental hazard. Virotec Global Solutions recommends checking with local environmental regulations before final disposal.

## SCHEMATIC OF VIROFLOW™ TECHNOLOGY



## CASE STUDY : LARGE-SCALE ELECTROPLATING PLANT

Electroplating effluent is characterised by high variability in metal (typically Zn, Cr III, Sn and Fe) concentration and effluent flow rates. The issues with regards to wastewater treatment were as follows:

- > High levels of production downtime due to wastewater plant cleaning arising from scale formation in dewatering screens;
- > Non-compliance in regards to trade waste requirements; and,
- > High volumes of unstable hazardous sludge.

### ViroFlow™ Technology was applied and the following outcomes were achieved:

- > Compliance with Local Water Authority trade waste standards. All metals are now consistently below the required 10 ppm prior to discharge into sewer;
- > Prevention of capital plant upgrades that would normally have been necessitated by growth in effluent plant volumetric throughput;
- > 50% reduction in sludge volumes. This resulted in a direct landfill cost saving, allowing for potential solids re-use or recycling;
- > Increased settling times resulting in improved water quality and plant throughput;
- > Reduction of production bottlenecks caused by the time taken to treat effluent water in batch effluent treatment process;
- > Significant improvement in production availability due to elimination of scaling; and,
- > Prevention of scaling in dewatering screens. Cleaning frequency decreased from weekly to threemonthly.

Technical Data	Influent	Existing Treatment	After Treatment with ViroFlow™ Technology
			Effluent
Wastewater Volume (KL/month)	4,500		
pH	3.6 - 4.5	6.5 - 7.5	6.5 - 7.5
Chromium III (ppm)	3,000	5.0 - 50.0	0.03
Iron (ppm)	1,550	5.0 - 50.0	0.12
Tin (ppm)	2,800	5.0 - 50.0	0.74
Zinc (ppm)	2,790	5.0 - 50.0	0.23
Sludge Volume (T/month)		16.8	8.4
Sludge Waste Classification NSW EPA		Hazardous	Inert