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

VIROFLOW™ TECHNOLOGY TECHNICAL DATA SHEET

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

ViroFlow™ Technology, provided by Virotec International plc, has the remarkable ability to remove heavy metals from process and waste waters 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, tin, iron and chromium, from process and waste waters.

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 waste water to be treated.

VIROFLOW™ TECHNOLOGY APPLICATIONS

ViroFlow™ Technology can be applied to the majority of industrial waste water treatment applications. ViroFlow™ Technology incorporates the use of ElectroBind™ reagent, a patented environ-mentally 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 waste water 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.

ViroFlow™ Technology 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.
- Prevention of major capital upgrades by increasing effluent throughput.

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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 change-to-mass ratio. During aging, elements are redistributed to become structural components of new minerals during recrystalisation.

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 International plc recommends checking with local environmental regulations before final disposal.

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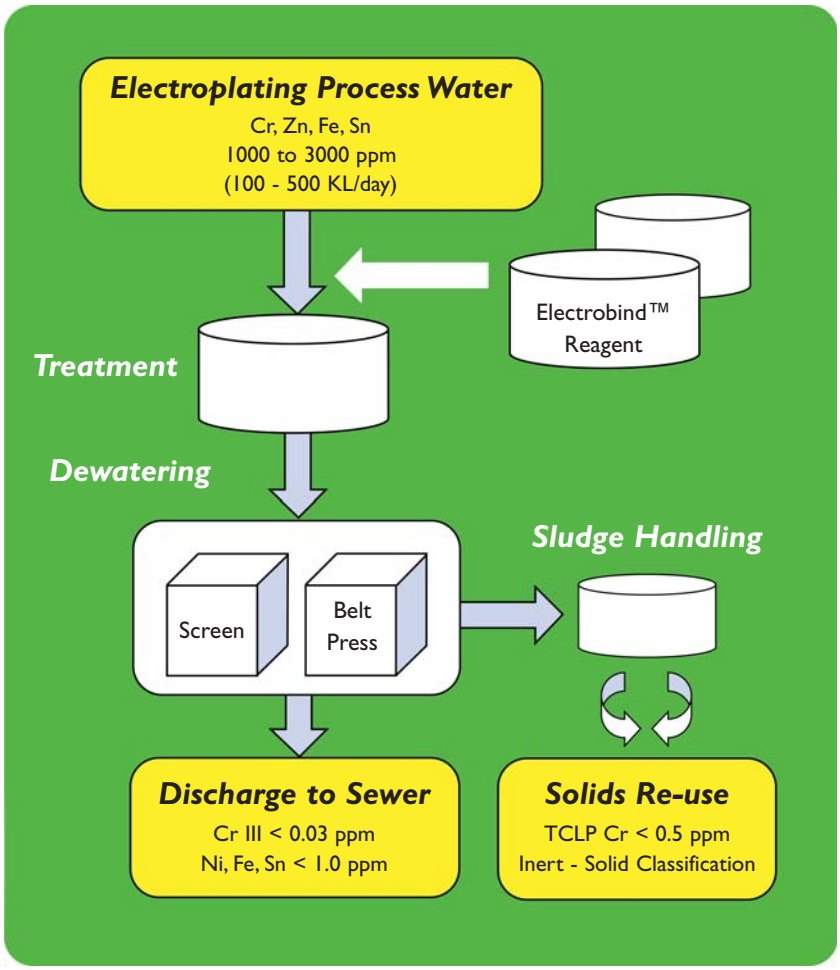
Electroplating Process Water
Cr, Zn, Fe, Sn
1000 to 3000 ppm
(100 - 500 KL/day)
Electrobind™
Reagent
Treatment
Dewatering
Sludge Handling
Screen
Belt
Press
Discharge to Sewer
Cr III < 0.03 ppm
Ni, Fe, Sn < 1.0 ppm
Solids Re-use
TCLP Cr < 0.5 ppm
Inert - Solid Classification

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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 waste water treatment were as follows:

- High levels of 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

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.
- Prevention of scaling in dewatering screens. Cleaning frequency decreased from weekly to three-monthly.

Technical Data		***Existing Technology***	***ViroFlow™ Technology***
	Influent	Effluent	Effluent
Waste water 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