



*THE APPLICATION OF VIROFLOW™ TECHNOLOGY  
USING VIROCHROME™ REAGENT  
IN THE TANNERY INDUSTRY*

**TECHNICAL PAPER**



Tanning, in particular chrome leather production, is characterised by the production of highly polluted wastewater, solid wastes and odour. The primary environmental issue facing tannery operations is the treatment of the toxic chromium-rich waste in treated waters and sludge. Wastewater treatment systems must ensure high levels of metal removal, whilst sludge disposal is a major issue due to the limited availability and high cost of suitable disposal sites.

ViroFlow™ Technology, provided by Virotec, has been developed specifically to remove trivalent Chromium (Cr III) from tannery wastewaters.

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

- > Extensive research database;
- > Practical experience with commercial scale applications; and,
- > Results of laboratory trials for each wastewater to be treated.

## VIROFLOW™ TECHNOLOGY APPLICATIONS

ViroFlow™ Technology incorporates the use of ViroChrome™ reagent, a patented environmentally safe reagent. ViroChrome™ reagent is ideally added to the effluent liquor after initial separation of fats and greases, although ViroChrome™ reagent may also be added prior to the fat and grease removal process.

ViroFlow™ Technology replaces the conventional lime treatment and produces desirable, dense sediment that is easily recovered and dewatered. ViroFlow™ Technology can be customised to suit any individual application.

ViroFlow™ Technology can be easily added to existing treatment facilities and requires minimal capital works, depending on the application.

The sediment formed when ViroChrome™ 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 the plants, nor released in leachate. This property combined with the high organic content of the sludge has potential for use as a soil conditioner.

### **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;
- > Increased settling times resulting in improved water quality; and,
- > Significant odour reduction.

## CHEMISTRY OF VIROFLOW™ TECHNOLOGY

ViroChrome™ reagent works by forming strong ionic bonds with the Cr III ions in the effluent; effectively immobilising the metal into an insoluble, non-reactive sediment.

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

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

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

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

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

## ENVIRONMENT AND SAFETY

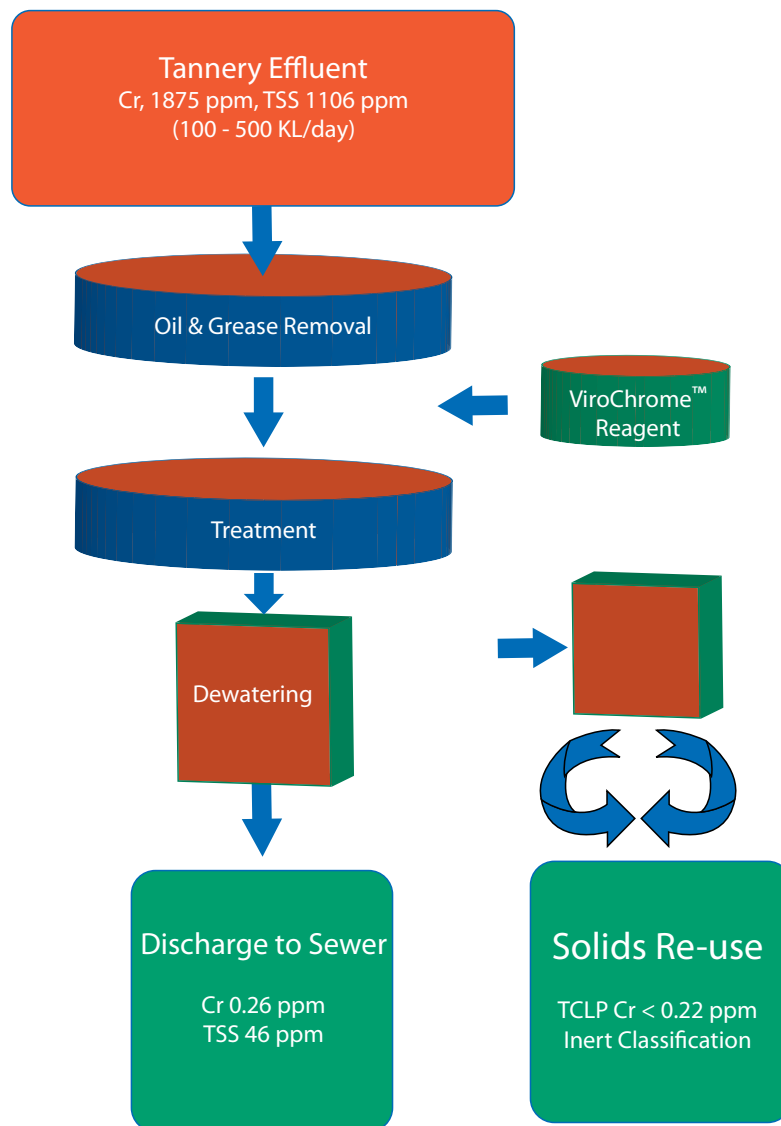
The use of ViroFlow™ Technology to treat tannery effluent is both environmentally sustainable and economically viable. ViroChrome™ reagent is environmentally safe and the exhausted material may be disposed as a non-leachable solid residue.

Used ViroChrome™ reagent is not a hazardous or prescribed waste material. Even after use in many applications, it can be usefully reused in other applications. Exhausted ViroChrome™ reagent can also be used in selected downstream applications depending on individual circumstances. The leaching of used or spent ViroChrome™ reagent cannot result in the release of any trace elements at potentially environmentally hazardous concentrations.

ViroChrome™ reagent is classified as a non-hazardous substance for transport and is safe for unskilled workers to handle.

ViroChrome™ reagent consists of minerals that are not known to pose any environmental hazard. ViroChrome™ reagent residue meets the requirements for an inert solid based on the Australian NSW EPA TCLP test. Virotec International plc recommends checking with local environmental regulations before disposal.

# SCHEMATIC OF TANNERY EFFLUENT TREATMENT WITH VIROFLOW™ TECHNOLOGY



## CASE STUDY : LARGE-SCALE TANNERY

Tannery effluent is characterised by variable concentrations of suspended solids, Bio-chemical oxygen demand and chromium. The issues with regards to wastewater treatment were as follows:

- > Non compliance with Local Water Authority trade waste standards;
- > High volumes of unstable, hazardous sludge; and,
- > Significant odour problems.

The use of ViroFlow™ Technology enabled residual fats to be broken down, arising in enhanced Chromium removal. It has been found that up to 99.8% Chromium removal can be achieved.

### The following results were achieved with the use of ViroFlow™ Technology:

- > Compliance with Local Water Authority Standards;
- > Potential water re-use due to improved treated effluent quality;
- > Significant landfill cost savings by sludge reclassification;
- > Potential for solids re-use; and,
- > Comprehensive metal ion removal.

Technical Data	Influent	Existing Treatment	After Treatment with ViroFlow™ Technology
		Effluent	
Wastewater Volume (KL/month)	7,000		
pH	6.3	6.6	8.4
Chromium III (ppm)	15.0 - 20.0	7.0 - 12.51	0.26
Biological Oxygen Demand (ppm)	1,163	717	864
Total Suspend Solids (ppm)	1,106	70.0	46.0
Total Phosphorus (ppm)	5.6	0.75	0.55
Odour	High	Medium	Zero
Sludge Volume (T/month)		464	
TCLP Chromium III (ppm)		>20.0	0.22
Sludge Water Classification		Hazardous	Inert