



*A COMMERCIAL APPLICATION OF
VIROFLOW™ TECHNOLOGY*

**CASE STUDY
REMEDIATION OF CCA TREATMENT
FACILITY, HUNE TIMBER, YANDINA,
QUEENSLAND**



*Internal moats contaminated by CCA
waste being successfully treated by
ViroFlow™ Technology.*

PROBLEM

Hyne Timber were in the process of decommissioning their timber preservation facility at Yandina on the Sunshine Coast in Queensland, Australia. High concentrations of copper, chrome and arsenic (CCA) in the moats beneath the former CCA chemical storage and treatment enclosure required remediation before Hyne could safely proceed to close down the site.



The Hyne Timber preservation facility being decommissioned.

Hyne Timber had been searching for a cost-effective, versatile technology capable of remediating its confined internal moat structures. The objective was to treat the solution in the moats to reduce CCA concentrations to below local council trade waste policy guidelines, whereby the treated solution could be safely and responsibly discharged into the local sewerage network.

VIROTEC TOTAL SOLUTION

Virotec's solution involved adopting ViroFlow™ Technology using proprietary ViroBond™ reagent to effectively and permanently remove the metals from the solution and to bind them in a nontoxic layer on the bottom of the moats. The ViroFlow™ Technology treatment is a custom designed multi-stage treatment applied in three integrated stages, using the mobile ViroFlow™ Technology mixing and dosing plant to apply the ViroBond™ reagent evenly around the moats.

The Virotec Total Solution comprised the following elements:

- > Initial full analysis and characterisation of the water;
- > Chemical treatment of the contaminated water to remove CCA;
- > Validation of treated water quality;
- > Ongoing technical support, and;
- > Liaison with regulatory authorities.

BACKGROUND

The treatment of pine logs begins with a steaming process that opens the cells in the timber. Once opened, these cells stay open, allowing a more effective CCA impregnation. The dominant chemical treatment used in Australia is known as chromated copper arsenate (CCA). Copper and arsenic protect the timber from insect and fungal degradation, and chromium is used to chemically seal the copper and arsenic into the timber.

The treatment chamber that the logs pass through and the CCA storage tanks are positioned in a secured and confined area on the site, above a series of moats that were developed as a safeguard against any unforeseen structural failures or leaks. Occasionally, as



Exposed internal moats contaminated by CCA where ViroFlow™ Technology treatment was applied.

a result of the loading and unloading of logs in the treatment chamber, the moats would accumulate small amounts of CCA treated shavings and minor leaks over many years, without cause for concern.

However, as a result of rain seeping into the moats from outside the building, water levels in the moats began to climb towards their capacity at a rate that required a solution. The water was clearly contaminated and was unsuitable for release into the environment. Prescribed water quality standards imposed by Maroochy Shire Council were to be met before the water could be released.

Hyne Timber's decision to remediate the moats was brought about when the timber treatment operations were relocated, and alternate plans were made for redeveloping the site.

TREATMENT METHODS

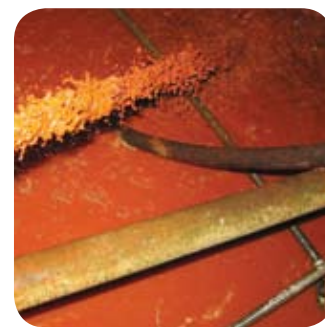
ViroFlow™ Technology incorporates the use of ViroBond™ reagent, a patented environmentally safe reagent that can be added directly to the moat, leachate pond or contaminated water body or used as the active ingredient in flow-through treatment systems. When mixed with contaminated soil, or water, ViroBond™ reagent will immobilise CCA permanently to allow safe disposal and the discharge of treated water.

ViroFlow™ Technology is an innovative, new treatment strategy which results in treated water that meets the stringent National Environmental Protection Council Measures for Contaminated Sites (1999) Guidelines. ViroFlow™ Technology can be customised to suit any individual application, and the use of ViroFlow™ Technology requires little or no capital works.

The sediment formed when ViroBond™ reagent settles and dries is not a waste and has potential re-use applications. The sediment holds the bound CCA metals sufficiently tightly that they can neither be taken up by plants, nor released back into the water body. This property, combined with the high organic matter content of the solids, makes them potentially useful as a soil conditioner.

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

- > Significant reduction in copper, chromium and arsenic concentrations in treated water;
- > Metals are permanently bound in the solid residues;
- > Shorter settling times resulting in improved water quality;
- > Significant odour reduction;
- > Reduction in CCA concentration in stormwater runoff; and
- > Re-classification of contaminated soil or hazardous sludge as an inert solid.



Virotec's mobile ViroFlow™ Technology Mixing and Dosing Plant being used to treat the moats.



Virotec's mobile ViroFlow™ Technology Mixing and Dosing Plant being used to treat the moats.

THE CHEMISTRY OF VIROFLOW™ TECHNOLOGY

ViroBond™ reagent works by forming strong chemical bonds with the copper, chromium and arsenate ions in the moat, leachate pond, or water body. ViroBond™ reagent effectively immobilises the metal into an insoluble, non-reactive sediment.

The heterogeneous mineral surfaces in ViroBond™ 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 for acid neutralisation and metal uptake in ViroBond™ reagent involves the dissolution of slightly soluble alkaline minerals that supply hydroxide and carbonate ions for the precipitation of very low solubility metal hydroxides, carbonates and hydroxy carbonate compounds on the product's surfaces.

The ability of ViroBond™ reagent to strip trace metals increases with time and because most metals bound by ViroBond™ reagent are held as structural components of low solubility minerals, they cannot be easily removed. ViroBond™ reagent immobilises heavy metals into an insoluble, non-hazardous sediment.



ViroBond™ Reagent immobilises heavy metals into an insoluble, non-hazardous sediment.

RESULTS

The ViroFlow™ Technology treatment was applied in three separate stages to the series of internal moats. Each moat was subject to a slightly different chemical dosing regime, based on defined preexisting conditions.

Following treatment, the CCA concentrations were dramatically reduced in the moats. Treatment results are summarised in Tables 1 and 2 below.

TABLE 1: METALS ANALYSIS OF TREATED WATER

Analyte	Before Treatment (mg/L)	After ViroFlow™ Technology Treatment (mg/L)	Council Limit (mg/L)	Contaminant Reduction
Arsenic	26	<0.01	5	99.9%
Chromium	15	1.8	20	88%
Copper	0.21	0.06	10	71%

TABLE 2: pH ANALYSIS OF TREATED WATER

Analyte	Before Treatment	After ViroFlow™ Technology Treatment	Council Limit
pH	7.3	8.1	6 - 10

The figure below shows the clarity of the treated solution in one moat, with a layer of non-toxic sediment remaining on the bottom.

CONCLUSION

The implementation of ViroFlow™ Technology achieved the following outcomes:

- > Elimination of a major environmental hazard, and a potential environmental incident;
- > Ability to obtain approval to discharge treated water to local sewerage network, after significantly reducing copper, chromium and arsenic concentrations to well within local council limits;
- > Fast mobilisation and treatment time; and
- > Customer satisfaction.

The ViroFlow™ Technology has proven to be a highly cost-effective treatment for CCA contaminated water bodies, and exceptionally versatile in its application to confined and remote locations.



Suspended ViroBond™ reagent particles that bound the heavy metals have settled to the bottom following treatment.