



*A COMMERCIAL APPLICATION OF  
VIROFLOW™ TECHNOLOGY*

## CASE STUDY AUSTRALIAN PAPER WESLEY VALE MILL

*“ViroFlow™ Technology has alleviated a problem that had existed in our plant for over ten years... (it) effectively removed the mercury containing compounds from our storage vessel, enabling discharge to marine waters.”*



## PROBLEM

Australian Paper's Wesley Vale Mill was faced with a significant environmental problem, whereby a large volume of mercury contaminated water had been allowed to accumulate after demolition of a mercury cell plant. The storage vessel was showing signs of corrosion and there was a need to treat and release the mercury contaminated water to ensure that an environmental incident did not occur.

Previous research by Australian Paper had found no economically viable method of treating the mercury contaminated water. Virotec was subsequently consulted to see if the water could be treated using ViroFlow™ Technology.

## VIROTEC TOTAL SOLUTION

The use of ViroFlow™ Technology allowed Australian Paper to treat and release the contaminated water with the following outcomes:

- > Elimination of a major environmental liability and potential environmental incident;
- > Treated effluent with mercury concentrations below ANZECC 2000 regulatory guideline values was achieved, enabling its release into a marine environment;
- > Government sign off on the project; and
- > Customer satisfaction.

Virotec's ViroFlow™ Technology comprised the following elements:

- > Initial full analysis and characterisation of the water;
- > Chemical treatment of the contaminated water to remove mercury;
- > Validation of treated water quality before release;
- > Release of treated water into process water system;
- > Encapsulation of sludge; and
- > Liaison with regulatory authorities.

## BACKGROUND

Australian Paper is Australia's largest fine paper manufacturer and has four large-scale pulp and paper mills operating within the country. The Wesley Vale Mill, in Northern Tasmania, produces over 200,000 tonnes of fine printing paper each year.

The redundant mercury cell plant at the Wesley Vale Mill had been decommissioned for over ten years. The mercury plant site is classed as "contaminated", and there is an on-going environmental management plan to clean it up.

Within the mercury cell plant is a steel vessel that contained approximately 80,000L of mercury contaminated water. The vessel



*Mercury sludge tank.*

was originally used as a liquid dumping point during the initial decommissioning of the plant, and the concentration of mercury in the water had been determined to be 1.44 mg/L. This mercury concentration is very high and posed a risk to human and aquatic life if the waste liquid were to be released in an uncontrolled manner.

Moreover, the steel vessel was showing advanced signs of corrosion and its ability to contain liquids in the future was uncertain.

Australian Paper was looking for a cost-effective chemical treatment method to remove the mercury from the water so that it could be released to the existing process drain and wastewater system.

On request from Australian Paper, the mercury bound in the sludge was concrete encapsulated *in-situ*.

## TREATMENT METHODS

The treatment steps taken are detailed below:

### > Initial Acidification

In order to remove the mercury effectively, the wastewater was acidified to lower the pH to less than 7.0. Acidification was accomplished by adding concentrated acid to the top of the tank. A temporary mixer ensured the efficient distribution of acid in the vessel.

### > Addition of ElectroBind™ reagent A

Once the acid was well distributed, ElectroBind™ reagent A was added to the vessel in order to convert the complex mercury compounds into a form that could be bound and removed by ElectroBind™ reagent B.

### > Addition of ElectroBind™ reagent B



ElectroBind™ reagent B was added to absorb the mercury and raise pH. The reagent was thoroughly mixed after addition from the top of the vessel and then allowed to settle. Mercury was trapped not only by simple adsorption but also by precipitation of neo-formational minerals and isomorphous substitution. The sludge that settled to the bottom of the tank contained the mercury that was previously in solution.

The treatment method resulted in 98.82% of the mercury being removed from the solution. The initial mercury concentration in the steel vessel was 1.44 mg/L and the ViroFlow™ Technology treatment reduced this concentration of mercury to 0.017 mg/L.

### > Encapsulation of Sludge

The application of ViroFlow™ Technology resulted in a thin layer of

*Encapsulation of the mercury sludge.*

sludge at the bottom of the tank. Laboratory tests had shown that the mercury loaded material meets the stringent NSW EPA TCLP guidelines for classification as an inert waste.

Although the resulting sludge met the TCLP guidelines for inert waste, it was requested by Australian Paper that a sufficient volume of concrete be poured onto the remaining sludge to encapsulate it. This would allow the tank to be demolished with the treated sludge being disposed of as part of the major cell plant demolition. Mercury concentrations in the resulting cement bound sludge are comparable to those in brickwork and foundations at the mercury cell plant.



*Addition of the ElectroBind™ Reagent.*

Holes were drilled into the tank after application of the ViroFlow™ Technology to ensure that the tank does not fill with water after future rainfall events. This is a temporary measure until demolition of the plant.

### > Water Release

ANZECC 2000 guidelines for mercury discharge into marine waters is 0.0004 mg/L. The objective of the treatment was to ensure that this level was not exceeded at any time during the release of treated water through Australian Papers wastewater system. This was accomplished through a process of dilution of the wastewater prior to release.

## RESULTS

The results of the treatment are detailed in Table 1.

**TABLE 1 – TREATMENT RESULTS (NATA Certified).**

	Before Treatment	After Treatment
Mercury (mg/L)	1.44	0.017
pH	12.18	8.8

**TABLE 2 – TREATMENT RESULTS (NATA Certified).**

	Discharge Concentration	ANZECC 2000 Limit
Mercury (mg/L)	<0.00005	0.0004
pH	8.0	6.5 - 9

Table 2 shows the level of mercury that was discharged to the environment.

All analyses were performed by Analytical Services Tasmania, a Government operated NATA certified laboratory.

## CONCLUSION

The implementation of ViroFlow™ Technology using our patented and specially formulated ElectroBind™ reagents proved to be effective in treating mercury contaminated solutions. These reagents were highly effective in reducing mercury in the solution to below the stringent limit for discharge to a marine environment. The ViroFlow™ Technology treatment had prior approval of the Department of Primary Industry, Water and the Environment, and treatment outcomes were signed off by the regulator.

The Virotec total solution for mercury removal has proven to be extremely cost-effective when compared to other disposal options, and the customer has identified other applications at this site for treatment by ViroFlow™ Technology.

## TESTIMONIAL

*“The implementation of ViroFlow™ Technology has alleviated a problem that had existed in our plant for over ten years. Australian Paper was faced with very expensive disposal costs and was looking for a cost-effective solution to our significant environmental problem.*

*ViroFlow™ Technology effectively removed the mercury containing compounds from our storage vessel, enabling discharge to marine waters. The job performed by Virotec was cost effective, completed on time, and all work was of an extremely high standard.*

*Occupational health and safety is an underlying principle for all operations at Australian Paper. During the application of ViroFlow™ Technology, the Virotec staff followed our strict safety procedures at all times with no reportable incidents.*

*We were impressed with the overall professionalism shown by the Virotec staff. Their staff were technically competent and worked well with Australian Paper employees.*

*Australian Paper intends to use ViroFlow™ Technology for other projects in the future, and has no hesitation in recommending Virotec for similar types of applications requiring heavy metal removal from water.”*

### **KAREN PASCOE**

Environmental Co-ordinator

Australian Paper – Tasmanian Mills



*The treatment method resulted in 98.82% of the mercury being removed from the solution.*

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