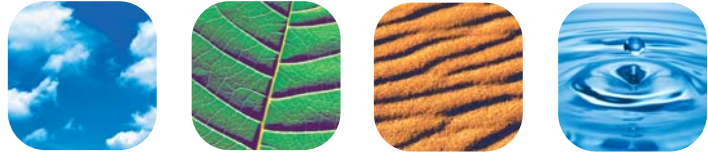


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A COMMERCIAL APPLICATION OF VIROFLOW™ TECHNOLOGY

CASE STUDY: QUEENSLAND RAIL JILALAN ROLLING STOCK MAINTENANCE DEPOT

“Implementation of ViroFlow™ Technology has resulted in compliance with all EPA discharge standards. The clarity of the treated water produced has been extremely good, and markedly better than our previous system. Additionally, there has been significant odour reduction...”



>>> CASE STUDY: QUEENSLAND RAIL



The rail line at Jilalan serves coal mines in the area and the Hay Point Coal Terminal, the largest coal export terminal in the Southern Hemisphere.

PROBLEM

Virotec Global Solutions was contracted by Queensland Rail to implement ViroFlow™ Technology to treat industrial wastewater at the Jilalan Rolling Stock Maintenance Depot.

The Jilalan Rolling Stock Maintenance Depot site had not been able to meet its EPA discharge requirements for copper, phosphorous, BOD, and suspended solids over many years of operation. With a further reduction in the limits to come into effect in the near future, Queensland Rail decided a look for a solution to their wastewater compliance issues. In addition, Queensland Rail had on-going problems with sludge management and disposal.

The effluent to be treated was mildly acidic, with an initial pH of 5.0 and a high metal content – particularly copper, iron, and aluminium – and high suspended solids, BOD and phosphorus.

VIROTEC TOTAL SOLUTION

The Virotec total solution proved to be an innovative, efficient, effective and immediately applicable means of treating the contaminated effluent at Queensland Rail's Jilalan Rolling Stock Maintenance Depot.

The major advantages of using ViroFlow™ Technology are summarised below:

- > Significant reduction in heavy metal concentrations in discharge water, meeting EPA guidelines.
- > High pH buffering capacity.
- > Potential reclassification of the sludge.
- > Decreased settling times and improved flocculation efficiency resulting in improved water quality.
- > Eliminated the need for major capital upgrades by increasing effluent throughput.
- > Odour reduction.

The sediment formed when ElectroBind™ reagent settles and dries can also be reclassified as non-hazardous because it holds the bound metals sufficiently tightly that they can neither be taken up by plants nor released in leachate.

>>> CASE STUDY: QUEENSLAND RAIL



The Jilalan Rolling Stock Maintenance Depot and locomotive.

The ViroFlow™ Technology solution components included selection of the best treatment strategy, system design, engineering, management of trials, ongoing monitoring and full-scale commercial application. The solution was ideally suited to this application as an ongoing treatment for process water.

Management of the treatment process is based on Virotec's extensive research database, and years of practical experience with commercial-scale applications.

BACKGROUND

The rail line at Jilalan is electrified and serves a number of coal mines in the area as well as the Hay Point Coal Terminal, the largest coal export terminal in the Southern Hemisphere. The Jilalan site is used by Queensland Rail for maintaining and servicing locomotives and rolling stock.

The locomotives are acid washed to remove copper oxide build-up on the roof and windows deposited via the overhead power supply cables. This acid washing causes the effluent to be acidic with a high concentration of metals, predominantly copper.

The waste water has always had high levels of odour due to organic compounds.

TREATMENT METHOD

ViroFlow™ Technology incorporates the use of ElectroBind™ reagent, which is a patented environmentally safe reagent. ElectroBind™ reagent has a high acid neutralizing capacity, fast settling rate characteristics, and a high metal binding efficiency.



The ViroFlow™ Technology plant which treats waste water with ElectroBind™ reagent.

>>> CASE STUDY: QUEENSLAND RAIL



The inert sludge produced from ViroFlow™ Technology treatment.

ElectroBind™ reagent is mixed with process waste water in a 50,000L mixing vessel at a pre-determined addition rate and agitated to ensure optimum contact time. ViroFlow™ Technology replaced the conventional alkaline (lime) treatment and produced a dense, stable sediment that is easily recovered and dewatered.

ViroFlow™ Technology is applied using the existing treatment facilities and requires minimal capital works and no plant modifications.

RESULTS

ViroFlow™ Technology was successful in meeting all EPA discharge limits. Following treatment using ViroFlow™ Technology, the effluent showed a significant improvement in water clarity and colour. Queensland Rail personnel also commented that odour was much less than with the standard treatment. This outcome was expected because other applications had previously indicated that ViroFlow™ Technology reagents have excellent odour reducing properties. Queensland Rail personnel also commented on the clarity of the treated water, stating that it was as “clean as they had ever seen”.



Effluent before and after treatment utilising ViroFlow™ Technology.

>>> CASE STUDY: QUEENSLAND RAIL

In addition to improving the appearance and smell of the effluent, treatment using ViroFlow™ Technology reduced the concentrations of all metals in the water to well below the applicable water quality targets.

An important finding was the ease with which ViroFlow™ Technology could be integrated with the existing treatment system.

The Table below summarises the results obtained using ViroFlow™ Technology over a five-month period. All samples were tested at an independent NATA certified laboratory.

TABLE 1: ViroFlow™ Technology Treated Water Quality Results, NATA Certified.

Parameter	Before Treatment	Feb 2005	Mar 2005	Apr 2005	EPA Discharge Limit
pH	6.5	6.54	6.73	6.6	6.5 – 8.5
Copper (mg/L)	0.54	0.07	0.03	0.05	0.1 mg/L
Phosphorus (mg/L)	10	1.6	0.53	2.0	2.0 mg/L
Suspended Solids (mg/L)	53	8	3	24	30 mg/L
Oil & Grease (mg/L)	29	<2.0	<2.0	<2.0	10 mg/L
BOD (mg/L)	201	14.0	6.0	10	20 mg/L
Odour	High	None	None	None	No odour

TREATED SLUDGE QUALITY

Currently sludge generated from the treatment plant is transported long distances to suitable landfill. A significant benefit in using ViroFlow™ Technology is the ability to reduce leachable metals levels in treated solid waste. Dependant upon TCLP levels, sludge may be accepted at landfills that follow guidelines set by the Queensland Environmental Protection Agency (EPA).

After ViroFlow™ Technology had been in place at Jilalan Waste Water Treatment Plant for a month, the resultant sludge was sampled, analysed and compared to the EPA guidelines. The results appear in the following Table (overleaf).

The results in Table 2 overleaf indicate the suitability for ViroFlow™ Technology treated sludge to be accepted into a general clay-lined landfill. This will result in considerable cost savings by Queensland Rail as treated sludge will be able to be discharged to a local landfill.

>>> CASE STUDY: QUEENSLAND RAIL

TABLE 2: Treated Sludge Quality Results.

Parameter	ViroFlow™ Treated Sludge TCLP level	EPA Allowable leaching contaminant levels (TCLP) for clay lined landfills
Silver (mg/L)	0.002	0.5
Arsenic (mg/L)	0.008	0.5
Cadmium (mg/L)	0.007	0.05
Chromium (mg/L)	0.057	0.5
Copper (mg/L)	7.6	10
Nickel (mg/L)	0.21	0.5
Lead (mg/L)	0.002	0.5
Selenium (mg/L)	0.001	0.1
Zinc (mg/L)	1.20	50
Mercury (mg/L)	0.001	0.01

CONCLUSION

ViroFlow™ Technology has proven to be applicable in the treatment of acidic metal-contaminated effluent in a typical large industrial setting. At Queensland Rail's Jilalan Rolling Stock Maintenance Depot the addition of ElectroBind™ reagent proved to be successful in neutralising acidity and removing heavy metals, suspended solids, nutrients and odour from the effluent. Furthermore, increased residue settling rates meant that capital works to upgrade the existing treatment plant could be deferred or avoided completely, and the high stability of the residue meant that it could be handled as a non-hazardous material.

ViroFlow™ Technology has proven to meet all of Queensland Rail environmental discharge limits.

ElectroBind™ reagent is non-toxic, non-hazardous and environmentally safe. Used ElectroBind™ reagent is not a hazardous or prescribed waste material.

>>> CASE STUDY: QUEENSLAND RAIL



TESTIMONIAL

“Virotec was initially contracted to perform a trial using ViroFlow™ Technology. After the success of the trial in meeting all EPA discharge parameters, Queensland Rail contracted Virotec to implement ViroFlow™ Technology on a permanent basis.

We have found the ViroFlow™ Technology dosing plant to be easy to operate with the Technology being easily implemented into our existing infrastructure. Implementation of ViroFlow™ Technology has resulted in compliance with all EPA discharge standards. The clarity of the treated water produced has been extremely good, and markedly better than our previous system.

Additionally, there has been significant odour reduction from the treatment plant since implementation of ViroFlow™ Technology.

Virotec staff have been friendly and keen to co-operate with Queensland Rail staff at all times during the project. Virotec staff followed all site safety and environmental procedures whilst on site. Queensland Rail are happy to recommend Virotec for any similar industrial projects involving heavy metals, suspended solids, BOD, and nutrient removal.”

IAN BOLES
Operations Manager
Jilalan Rolling Stock Maintenance Depot