



syntekenvironmental
industrial wastewater treatment and reuse

TECHNICAL CASE STUDY

Ecosynergy® system application in treatment of wastewater from vehicle washing

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Type of industry

The Ecosynergy® bio-engineering treatment process is being applied at various vehicle washing facilities. These facilities range from commercial facilities for washing small cars to industrial and municipal facilities for washing fleet trucks, garbage trucks, transit busses and dairy and tanker trucks. Wastewater from these washing facilities must be treated to remove suspended solids and contaminants such as oil and grease and heavy metals before reuse as wash water or discharge to sewer. Any detergents used in the washing process also need to be removed as they may not be biodegradable or may provide bioavailable phosphate which can contribute to algal blooms. Typically wastewater from vehicle washing is treated by gravity settling of coarse particulate material, enhanced gravity separation of oil and suspended material by cyclones or coalescing plate separators, flocculation of suspended material, and sand and carbon filtration followed by pH adjustment and chlorine treatment. These treatment methods typically produce large amounts of sludge and separated waste oil which need to be disposed of.

Pre-existing treatment process

Before the introduction of the Ecosynergy® system wastewater from garbage truck washing was treated by passive flotation of oil and grease, gravity settling of coarse particulate material followed by pH adjustment, chlorine treatment and UV disinfection. Wastewater was collected in a collecting pit where oil and grease was allowed to float. The water from this pit was pumped to two settling tanks in series and the sludge which settled in these tanks was returned to a sludge pit which was periodically pumped out for disposal in landfill. The supernatant water from the treatment tanks was pH adjusted, chlorinated and UV disinfected prior to reuse.

Problems need to be solved

- The gravity settling and oil and grease flotation typically produced large amounts of oil, grease and sludge requiring frequent pump out of the raw water and sludge pits.
- The existing systems tended to require high levels of maintenance (including pump out of sludge, oil and grease) and hence had a high running cost.
- The system tended to give off bad odors when stagnant water developed at times of no flow.
- Under stagnant conditions anaerobic environments developed which were conducive to the breeding of harmful bacteria.

What is the Ecosynergy® process

The Ecosynergy® system has been developed with the aim of reducing capital costs and space restraints when a biological treatment application is required in treatment of industrial wastewater. It is based on the concept of simulation of the natural bacterial ecosystems so that synergistic interactions are formed between the species in the population. The degradation of organic and some inorganic compounds can be enhanced where selected specialised bacteria, or bacteria as plasmid donors for degradative pathways, are added. The system is designed to provide a growth environment under aerobic and anaerobic conditions. Further enhancements to water quality are also achieved by the application of a natural coagulant and various novel membrane filtration systems.

How the Ecosynergy® process is applied

Initial investigation to solve the plant problems required laboratory scale bench trials of the various synergistic bacteria combinations in aerated samples of plant wastewater. From the lab trials appropriate bacterial consortia were chosen for plant trials. Process analysis was then carried out to determine the best points to add the bacteria into the system. This analysis consisted mainly of determining retention times in various stages of the process and determination of effective aeration, mixing and temperature regimes. No major modifications were made to the existing layout except for the introduction of aeration discs into the collecting tanks and the addition of a conical bottom settling tank after the raw water tanks (both to improve settling and to increase retention time).

Achieved outcomes

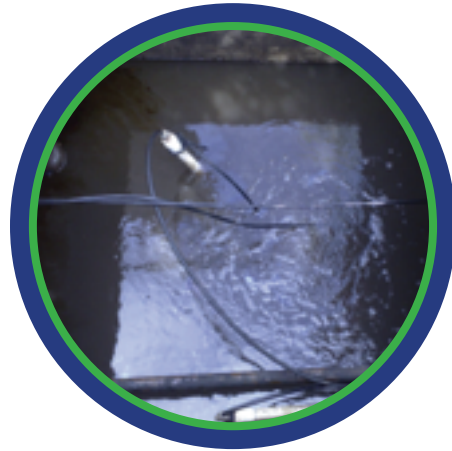
After the introduction of the Ecosynergy® system there was a significant reduction in sludge, oil and grease volume and in odour. The system was much more able to cope with inconsistent flow rates and changing solids loadings due to the consideration given to retention times, multiple bacteria dosing points and bacteria dosing levels. The effluent had greater water quality meeting all water board discharge limits to the sewer.

Sludge Reduction

Sludge reduction is achieved by using specifically formulated synergistic bacteria rapidly digesting the solids in the wastewater. Sludge reduction can be seen in both the raw water tank where oil and grease float from the wastewater and in the sludge tank (containing settled material from the treatment tanks). Sludge reduction was significant with considerable decrease in the sludge removal frequency (from every three months to once a year). The estimated sludge, oil and grease reduction is 85%.



(a) Raw water pit before biological treatment



(b) Raw water pit after biological treatment



(a) Sludge pit before biological treatment



(b) Sludge pit after biological treatment

Odour Reduction

Odour generated by anaerobic conditions in stagnant water in collecting pits and treatment tanks was controlled immediately after the introduction of aeration disks and application of synergistic bacteria.

Improved water quality

Wastewater quality was significantly improved in odour, clarity and surface activity. The treated water was much clearer, had minimal odour and no foaming indicating removal of surfactants. An analysis of the biotreated water is shown below.



Wastewater from raw water pit and after biological treatment.

Test	
Oil and grease	<5
BOD5	47
COD	960
Total Suspended solids	148
pH	5.9
Ammonia-N	2.7
Methylene blue active substances	0.5

Analysis of biologically treated water.

Cost Reduction

By implementing the synergistic bacteria control system, and using the naturally derived chemicals, the total operating cost for wastewater treatment has reduced by over 70% at this site.

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