Recycled Wash Water Safety – Treatment Options

Wastewater contains inorganic and organic materials including bacteria and viruses. Some naturally occurring bacteria produce hydrogen sulfide gas which causes the wastewater to stink. Some bacteria are pathogens and can be harmful to personnel. If the wastewater stinks it may contain pathogens and it certainly shouldn't be recycled and used for washing operations without treatment. There are several approaches to eliminating naturally occurring bacteria, including pathogens, in wastewater:

1. Biological - The use of specially selected bacteria strains and enzymes to reduce (digest) organic biodegradable materials and compete with naturally occurring bacteria. Digestion is the primary wastewater control solution for sewage treatment plants. Many of these plants are permitted by the EPA to discharge to streams, lakes and estuaries.

2. Chemical, disinfecting or killing bacteria and other contaminants with the use of chlorine, ozone, hydrogen peroxide or similar oxidizer products. This process is typically used in potable water treatment, seldom used in sewage treatment but is used widely by competitors wash water treatment equipment.

BIOLOGICAL TREATMENT

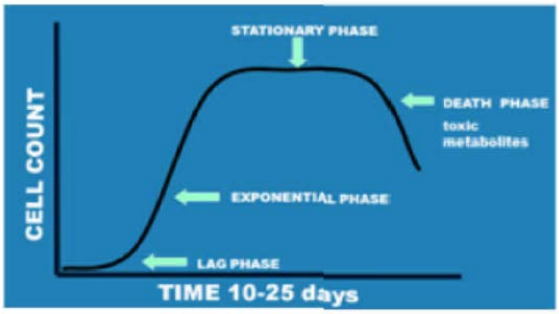
Hydro Engineering, Inc. was the first and continues to lead the way in using biological treatment, Hydro Biodigesters, for wash water. By continuously dosing high cell counts of Hydro Biodigesters bacteria into an optimal environment, naturally occurring bacteria are controlled. The digestion process that reduces organics (food) that naturally occurring bacteria relies on is accelerated.

There are over 15,000 known strains of bacteria. They are classified as: aerobic, anaerobic, and facultative. Aerobic bacteria require oxygen, anaerobic don't tolerate oxygen, and facultative acclimate to either oxygen rich or oxygen deprived environments.

Hydro-Biodigesters are facultative bacteria. In anaerobic conditions theybecome less active, but continue to work. When exposed to oxygen they become more active. Metabolism and reproduction rates increase by as much as 5-7 times.

Hydro-Biodigester bacteria is certified to be selected from the United States Food and Drug Administration and the Association of American Feed Control Officials lists of Generally Regarded as Safe bacteria.

In a patented process Biodigester bacteria are microencapsulated and then packaged with lab grade purified enzymes, micro and macro nutrients. This dry powder remains safely dormant until activated upon contact with water.



Lifecycle of one Hydrobiodigester bacterium

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Liquid Biodigesters are produced using a process that suspends the encapsulated bacteria in a solution along with the enzymes and nutrients.

Liquid Biodigesters are added to the wastewater in small doses. Once added to the wastewater Biodigester enzymes immediately react with organic materials converting them to simple fats and sugars that provide a food source for the bacteria. Biodigester bacteria begin to activate, they begin to consume available food, create more enzymes and replicate. Once activated in an aerobic environment Hydro-Biodigesters are prolific, they double in numbers every 15-20 minutes. In 12 hours one cell will become 17 million.

Naturally occurring bacteria take days to adjust to their environment. The enzymes included with the Biodigester formula eliminate this acclimation period for the Biodigester bacteria and their exponential phase is very short. As a result, they convert and consume the available food before the naturally occurring bacteria can acclimate to the food.

The Stationary Phase of the Hydro Biodigester bacteria is the period where bacteria metabolism and reproduction rates are very high. Over time successive generations become less capable of maintaining these high rates. Recurring doses of fresh bacteria guarantee that this phase is maintained continuously in the wash water treatment system.

HYDRO BIODIGESTER BACTERIA LOVE TO EAT

Hydro-Biodigesters consume virtually all organic material found in the wastewater. This includes soaps, waxes, oil and most other organic compounds.

The reduction in organic waste drives the reduction in naturally occurring bacteria and pathogens. Tests of Hydro Engineering filtration systems using Hydro Biodigesters show fecal coliform levels at system inlet of 5,000 colony forming units (CFU's)/ 100ml reduced to less the 2 CFU's at the discharge. *Note: the EPA recommends no more than 200 CFU's /100ml for discharge to open recreational waters.*

Systems with below-ground sumps typically find that Hydro-Biodigesters have digested everything in the sump tank leaving behind nothing but dirt and sand. No longer a hazardous material, in many cases it is simply removed to the dumpster, and to the landfill.

Those accustomed to paying significant fees to pump their sumps clean of hazardous waste are pleasantly surprised at the savings:

CUSTOMER STORY
"We have experienced in our waste water removal savings is $14,500.00 per month. We would normally pay in excess of $16,500.00 for water removal in the past. The savings is taking in account the consumables we are using and it should be noted that we have seen an increase of work in the range of 30-40% in the past 6 months. So the savings are in actual fact much more."
Justin Bayliff
General Manager ACDEN
Source: https://www.hydroblaster.com/files/ACDEN-LoR.pdf

With the proper use of Hydro Biodigesters there will be absolutely no foul sewer odors in the recycled wash water and CFU's will be reduced to levels acceptable for recycling and reuse as wash water or for discharge to drain.

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CHEMICAL TREATMENT

Competitor's wash water treatment systems rely on chemical oxidizers - ozone, chlorine or hydrogen peroxide - to control naturally occurring bacteria including pathogens. Oxidizers may be used with Hydro Engineering, Inc. wastewater treatment systems but they are secondary treatment tools with the Hydro Biodigester focused process.

Ozone is a gas that is bubbled into a tank of wastewater. Ozone resides in the wastewater for a very short time (typically less than a few minutes) and must be continuously added to the solution to be effective. Because of the short residence time and the difficulty of dispersing the ozone in the water it is the least effective of any oxidizer in the treatment of wastewater. Because the ozone exits the solution quickly much of the oxidizer remains actively available and must be vented or neutralized with activated carbon to prevent personnel health issues or corrosion to surrounding equipment.

Oxidizers are very effective when controlling bacteria in purified water. For example, chlorine does a great job of sanitizing drinking water because the amount of biodegradable material and bacteria in the water is very low. Containment of the chlorine in closed piping systems is also helpful because it doesn't off-gas. It remains in the solution.

Small amounts of oxidizers can control small amounts of pathogens but it takes a lot of oxidizer to eliminate pathogens in wastewater; first because there is so much to oxidize, second because the size of the contaminate particles can envelop and protect pathogens from the oxidizer, and third because the wastewater is contained in tanks that are open to the atmosphere which allows the oxidizers to off-gas from the solution.

Oxidizers do little to remove the food sources in the waste stream that bacteria rely on. As a result, if the concentration of oxidizer in the wastewater drops the naturally occurring bacteria re-populate the wastewater very quickly.

Oxidizers are hazardous. Chlorine in gas form has been used as a weapon called mustard gas. Like chlorine, ozone is harmful to inhale.

Chlorination, even considering handling hazards, is the best chemical approach because of cost and retention time in the solution. But chlorinated effluent may have zero indicators and zero pathenogenic bacteria, and still be laden with nearly all its original viruses. Pathenogenic bacteria (and indicators like fecal coliform) can "hide" from chemical treatment inside suspended solids. If treated water is turbid, the safety of the water and the suspended solids can be very different. If the samples don't capture the suspended solids, the reading will be low.

When chlorine is added there is an immediate absorption due to chemical reactions with various constituents (this is the case with all oxidizers). Sufficient chlorine must be added before residual free chlorine can be detected. This chlorine 'demand' is due to oxidizable minerals and organic materials such as proteins.

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When amounts of chlorine lower than the demand are added, the reaction of the chlorine is partitioned between these constituents and the bacteria. While a certain amount of bacteria disinfection takes place, complete disinfection can only be expected if a dose of chlorine in excess of the demand is added and if the chlorine is allowed a sufficient period of contact time.

Sources:

*http://www.allergyclean.com/problems-with-ozone-generators-and-ionizers-that-produce-oxone/

**https://www.health.ny.gov/environmental/emergency/chemical_terrorism/chlorine_tech.htm