Polyurethane Resins Remediation

Background:

WC Co. is a small manufacturer of reinforced polyurethane boards used in boat and recreational vehicle construction located in the Houston, Texas area. By the spring of 1994, production had accumulated over 80 partially filled drums and pails of off-spec A and B component waste (polyurethane resins) along with several partial drums of old latex paint sludge mixed with acetone. A waste stream history from management and production personnel showed no extremely hazardous wastes. Composite samples were made from the material containers, and separate samples pulled from the acetone-laden barrels.

From testing the barrels and learning their history, their organic nature was determined. Being a very small company, WC's funds for disposal were very limited. Along with proposals for hauling off for incineration or burial, a feasibility study of bioremediation was also made. The quoted amounts for hauling and burning or burial were anywhere from $250.00 to $400.00 per barrel. Two sales reps for environmental companies suggested WC "pool" the barrels together (most of the drums were only 6" – 8" full) and triple rinse the emptied ones, adding the rinseate together to decrease the barrel count. Even so, the least expensive quote totaled around $20,000.00, an amount this little company could not afford.

A distributor for Verde Environmental, Inc., located in Houston, talked to WC's safety and environmental coordinator. After running Micro-Blaze® Emergency Liquid Spill Control at a 3% to 6% dilution rate on the highly viscous, odorous wastes. The higher dilution rate would be used in the acetone waste bioreactor. To further reduce costs, several 350-gallon totes, empty of A and B component resin, were used to serve as the bioreactors.

Implementation:

The environmental coordinator for the plant oversaw the implementation and operation of the bioremediation. The site was secured where the barrels would be cleaned and triple rinsed, ensuring no runoff of rinseate into nearby storm drains. Plant air was available so a PVC "carburetor" was designed and built with four adjustable brass ball valves used to regulate the air pressure into the tanks. Air hose from a local aquarium supply house was purchased for the airlines going into the tanks and, at the end of each line, a 5-ounce fishing weight was wired to keep it near the tank bottom while agitating the diluted wastes. The plant air was regulated so that the force of the air wold move the weighted airlines' ends around the tank bottoms and keep optimum oxygen levels all through the tanks.

A brass hoe, machined to fit the curvature of the drums, was used to "scoop" the thick gooey waste material into the tanks so no sparking would occur. This also helped get out as much waste out as possible, making the triple rinsing more effective. The rinseate from the emptied drums was poured into the biotanks to help dilute the mixture. Additional water helped dilute the waste mixture further.

Two totes held the off-spec ooze of A and B component along with drum rinseate. Two other totes held approximately 75 gallons each of the acetone-paint sludge with the remainder of

the rinseate and plain water. The totes were connected to the air supply and the contents allowed to emulsify with the water.

After two days of blending, Micro-Blaze® Emergency Liquid Spill Control was introduced into the biotanks, with its microbial population activating within minutes. Initially the surfactant within the product produced quite a tall bubble column out of the totes' openings, but this soon dispersed. The totes were checked on a daily basis for proper air supply and water was replaced as needed.

At the end of four weeks, a big change in viscosity was noticed, and the "chemical" smell around the tanks had diminished greatly. Two quarts of Biocatalyst, sold as Budkicker by Verde Environmental, Inc. was administered at this time. This is like vitamins for the microbes and helped stimulate the colony for optimum degradation of the contaminants.

Samples were pulled from the tanks for analysis after fourteen weeks. These samples were kept and marked per tank in case one or more required additional remediation time. Results for all tanks, including the acetone-paint sludge tanks, showed a marked decrease of TPH to levels below acceptable threshold levels. The original testing of the acetone-paint sludge had kept freezing the testing instruments!

Final Disposal:

Permit applications were made to the proper city authorities and everything was cleared for final disposal of the remediated waste (now totally watery and the color of weak tea). With the city contact called the morning of the disposal as he had asked, WC personnel used a "funnel" apparatus to unload the tank contents into a sanitary drain on the plant grounds. The unloading took less than one hour.

Later that same afternoon, the city contact called WC to ask when they were going to unload into the sanitary lines. When he heard it had been done an hour after the call to him that morning, he laughed. He said that after my call, he had immediately diverted WC's waste stream to a holding pond and had been testing the inflow all day, and had found no hydrocarbon slugs or anything else that could jeopardize their wastewater facility.

Results:

The bioremediation process took around four months to complete. The degradation probably took less time than that, but it was four months from initial setup until production could spare personnel to help drain the tanks. From a 20,000+ TPH count to under the City of Houston threshold level, the cost of waste disposal by bioremediation by WC Co. less than 10% of original "haul and burn" quotations.

Procedure for Remediating Drum Wastes, Rinseates, Acetone-Paint Sludges, Etc.

Submitted by customer

1. Determine content of drums, barrels, or other containers. Get their history from company management, personnel working with the waste stream of company, old records, etc. If this is not possible, more extensive and expensive testing of the waste must be done.
2. With waste stream identification, determine feasibility of waste by biodegradation. Inorganics, heavy metals, extremely toxic wastes may require other methods of disposal.
3. If biodegradation is feasible, figure amount of waste ratio to rinseate and water for proper dilution and optimum biotreatment. The microbes must have good dilution with water and a good air supply with agitation for thorough blending and oxygenation. Highly viscous contaminants, settling to the tank bottoms, may need to be "stirred up" with a paddle device to help the blending.
4. Set up the biotanks according to air and water supply locations and ease of movement. Room enough for a forklift will be needed to move treated liquid to sanitary drain. The drain should be on facility grounds.
5. Carefully pour wastes in biotanks and fill with rinseate and water needed to fill and dilute. If is better to use extra biotanks allowing plenty of dilution; the bioremediation will proceed more quickly. Take care to handle the contaminants and the rinseate according to their MSDS's safe handling procedures. Use appropriate personal protective equipment (PPE). Add air supply and let agitate 24 to 36 hours before adding the Micro-Blaze® Emergency Liquid Spill Control. Pull samples from tanks for baseline readings before adding Micro-Blaze according to identity of the wastes and requirements of local authorities.
6. Add the microbes per the amount of wastes, its viscosity, the dilution rate, etc. A Verde Environmental representative can help determine the amount needed. Additional microbes and Biocatalyst (works like vitamins for the microbes) may be needed during the treatment process to create optimum degradation.
7. Test when entire contents become watery, or approximately every 30 days. The new tests can determine if project is ready for final disposal or needs more treatment.
8. Check with local regulatory authorities on proper final disposal method of the remediated wastes.