National Pollution Prevention Roundtable MVP2 Award Application

Auto Shop Pollution Prevention Improvements at the Los Alamos National Laboratory

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Project Outline

The auto shop employees at the Los Alamos National Laboratory wanted to reduce the amount of waste oil-contaminated soil that was being generated. Oil leaks occasionally develop from broken hoses in heavy equipment such as garbage trucks or backhoes. The soil that this fluid contaminates must subsequently be removed and handled as New Mexico special waste. In addition to the effort involved with the cleanup and the expense associated with the disposal, the waste volume affects the Laboratory's ability to meet its waste reduction goals.

The auto shop examined the source of the problem to determine the best method to reduce the amount of oil-contaminated soil and debris waste. The majority of fluid leaks from the vehicles were caused when the aluminum fittings at the joints of the rubber hoses transporting fluid failed. Aluminum is easily bent, and fittings that are crushed or damaged during the course of normal operations allow leaks. The auto shop decided to replace all of the aluminum fittings with studier steel ferrules. The changeovers were completed in the vehicles with the highest use first, and the remainder of the upgrades took place over time whenever a vehicle was brought in for normal maintenance or when an aluminum fitting was damaged.

The volume of oil-contaminated soil generated diminished as steel ferrules were installed on more and more pieces of the equipment. Progressively less storage space at the auto

shop was required for the oil-contaminated soil waste. Eventually the waste volume was so small that the auto shop staff decided to try an experiment.

Three metal tubs were set up behind the auto shop to create a miniature land farm, and the small volume of soil contaminated with oil was placed in these tubs. A type of oil-digesting bacteria called Oil-Sponge was added to the soil, and then the soil was mixed with water and a nutrient solution called Micro-Blaze every day. Over a period of several weeks, the bacteria digested and removed all of the oil in the contaminated soil. Once all of the oil was gone, the soil did not qualify as waste. The employees at the auto shop began using this soil as base fill for holes in roads and parking lots on Laboratory property.

The effectiveness of the soil bioremediation was very impressive, and some of the staff developed a new idea to reduce waste even further based on the results from the miniature land farm. Oil Sponge is a fine, white powder laced with oil-digesting bacteria. Oil Sponge has similar properties to the vermiculite that was always used inside of the auto shop to soak up fluid spills. After vermiculite was used to clean up a spill of oil or hydraulic fluid, it was disposed of with the oil-contaminated soil waste. A team from the auto shop experimented with using Oil Sponge to soak up fluid spills inside the shop, and it proved to be very effective. Its tiny particles actually allowed Oil Sponge to absorb liquids even more completely than vermiculite.

One employee designed and built a special bin for used Oil Sponge. The bin is a hollow rectangular column with a sealed bottom, an open top, and a hatch on one of the walls at the bottom. The bin is partially filled with Oil-Sponge, and the hatch can be opened to take out as much as necessary. After the Oil-Sponge is used, it is swept off the floor and put into the top opening of the bin. Over time, the bacteria in the Oil-Sponge break down all of the oil, so by the time the contaminated Oil-Sponge reaches the bottom of the bin, the Oil-Sponge is clean and ready to be used again. By continually regenerating a supply of Oil-Sponge for use inside the shop, the amount of vermiculite purchased at the shop was cut by over 95%.

After proving the effectiveness of the bioremediation in the tubs and in the Oil-Sponge dispenser bin, no oil-contaminated soil waste was generated at all by the auto shop. The shop employees exceeded their original goal of reducing the volume of this waste stream.

Innovative Policy and Technology

The miniature land farm approach to handling soil contaminated with oil-based fluids had never been tried at the Laboratory before. The waste was previously sent to a large land farm near Albuquerque where the soil was bioremediated using the same method of mixing the soil after adding oil-digesting microbes, nutrients, and water.

The special Oil-Sponge bin that was designed and built by an auto shop employee was a completely new innovation. After discovering that Oil-Sponge worked so well for eliminating oil from contaminated soil, the auto shop stocked a small supply of Oil Sponge and then realized that it would also work very well as a replacement for vermiculite to clean up most spills.

Steel ferrules are not a new technology, but the auto shop had always used aluminum ferrules in the past because they are less expensive. Switching to steel ferrules despite the higher procurement cost represents an increasing sensitivity to environmental issues and a commitment to environmental improvement. By making the change, the overall costs at the auto shop were reduced.

Results

Over 70% fewer oil spills occur from heavy equipment now compared with pre-project levels. As a result, a lot less time is required to clean up these spills, and a lot less waste is generated. Labor savings are estimated at $40,000 annually. The auto shop used to generate about 13 metric tons of New Mexico special waste every year in the form of oil-

contaminated soil, and now none of that waste is generated at the auto shop. About $78,000 per year is avoided now on waste disposal costs.

Oil-Sponge is very effective at removing oil from soil. Over a six-week period, the contaminated soil in the miniature land farm tubs went from having a concentration of about 40,000ppm of oil to less than 1ppm.

Since the Oil-Sponge can clean itself and be reused, the auto shop uses Oil-Sponge almost exclusively to soak up spills inside the shop. As a result, the shop has cut its purchases of vermiculite from about 800 bags per year to less than 30 for a savings of approximately $5000.

Project Transferability

This project is transferable to any organization that uses heavy equipment, experiences oil and hydraulic fluid leaks, or any auto shop or factory that uses vermiculite to clean up fluid spills on the floor. Oil-Sponge is a commercially available product that can be purchased by anyone. The model that the auto shop has established is easily transferable and could be copied by a wide range of industries.

Organizational Changes

Almost all organizations experience some resistance to change. The auto shop had a great experience with pollution prevention prior to their effort to reduce oil-contaminated spill waste, so there was less resistance to new ideas than there might have been otherwise. The shop previously purchased a special washer for metal machine parts that uses steam and hot water to remove dirt and grease. Previously staff members would perform the same task manually using brushes and solvent. The hot water parts washer was very popular with the staff since it was effective, saved them so much time and effort, reduced exposure to hazardous chemicals, and reduced solvent waste volume.

As a result of this previous success, the staff was more open to trying new pollution prevention methods. In fact, the staff was consciously seeking out new methods to eliminate waste since they became familiar with the concept of pollution prevention.

The auto shop expanded its environmental efforts to include affirmative procurement. Whenever possible, items with recycled content such as recycled oil, retread tires, and re-refined engine coolant are purchased instead of comparable products made entirely from virgin materials. In some situations, a biodegradable hydraulic fluid, called Bio-Soy, is used in forklifts that operate in radiological control areas. In case of small spills of this fluid, no remediation is necessary since the fluid will degrade by itself in a short time. With regular hydraulic fluid, this type of contaminated soil in a radiological control area qualifies as low-level waste, which is more expensive to treat than normal soil contaminated with oil or hydraulic fluid.

Resources Available

The auto shop received a grant from the Laboratory to purchase and install the hot water parts washer. The money saved from avoided solvent disposal helped to pay for a supply of steel ferrules and different type of crimping machine that would work with the steel ferrules. The staff saved time by not cleaning metal parts manually and not having to clean up fluid spills as frequently, so the staff used the time to set up the metal land farm bins and mix the soil daily to remove the oil. They also had time to design and construct the special bins for recirculating and dispensing Oil-Sponge, the self-bioremediating floor clean up. Once pollution prevention principles were established in the auto shop, the projects were completely self-sustaining and paid for themselves in a short time.

The custom bin for storing and recycling Oil-Sponge

The “land farm” – metal bins behind the shop