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# Process Waste Assessment Mechanics Shop

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# PROCESS WASTE ASSESSMENT

# MECHANICS SHOP

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## ABSTRACT

This Process Waste Assessment was conducted to evaluate hazardous wastes generated in the Mechanics Shop. The Mechanics Shop maintains and repairs motorized vehicles and equipment on the SNL/California site, to include motorized carts, backhoes, street sweepers, trash truck, portable emergency generators, trencher, portable crane, and man lifts. The major hazardous waste streams routinely generated by the Mechanics Shop are used oil, spent oil filters, oily rags, and spent batteries. The used oil and spent oil filters make up a significant portion of the overall hazardous waste stream. Waste oil and spent batteries are sent off-site for recycling. The rags and spent oil filters are not recycled. They are disposed of as hazardous waste. Mechanics Shop personnel continuously look for opportunities to minimize hazardous wastes.

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## Introduction

Department of Energy (DOE) Orders 5400.1 and 5400.3 mandate the development of a waste minimization program.[1,2] The program's goals are to:

1. reduce volumes of hazardous wastes and toxicity,
2. implement a system of tracking and reporting improvements, and
3. devise a method for performing assessment and minimization tasks.

To satisfy the requirements of this program, process waste assessments (PWAs) are conducted to identify waste generating processes. The data collected from a PWA is used to identify waste minimization opportunities.

This PWA was conducted to evaluate hazardous waste generation in the Mechanics Shop, according to the revised *Sandia Process Waste Assessment Plan*.[3] It focuses on the hazardous chemical waste streams generated by the motorized vehicle and equipment maintenance processes. Special attention was given to waste streams generated by the motorized carts and the vehicle maintenance program (oil and spent oil filters).

## Summary

The Mechanics Shop, Building 9623, maintains and repairs motorized vehicles and equipment on the SNL/California site. Equipment serviced includes the following: motorized carts, backhoes, street sweepers, trash truck, portable emergency generators, trencher, portable crane, and man lifts. This equipment is serviced on a regular schedule. The frequency of this service varies with the different pieces of equipment. The normal service done is an oil and filter change, lubrication, and top off of fluids.

The Mechanics Shop does not perform services on motor pool vehicles or forklifts. These vehicles are serviced by outside contractors. Motor pool vehicles are taken off-site for service. Forklifts are serviced on-site by the contractor.

The major hazardous waste streams routinely generated by the Mechanics Shop are used oil, spent oil filters, oily rags, and spent batteries. The used oil and spent oil filters make up a significant portion of the overall hazardous waste stream. Over 70% of the waste oil is generated by the fleet of 146 motorized carts. Special attention was given to the waste stream generated by the carts. Waste oil and spent batteries are sent off-site for recycling. The rags and spent oil filters are not recycled. They are disposed of as hazardous waste.

Mechanics Shop personnel continuously look for opportunities to minimize hazardous wastes. Examples of their efforts are as follows:

- The volume of waste oil and spent oil filters has been reduced by extending the service schedule on carts not used regularly by the Maintenance Department.

Service scheduled on these carts was extended from three months to six months because they do not accumulate as much mileage as those used regularly. An additional benefit is the reduction in the cost of raw materials.

- The cleaning solvent used in the parts cleaner was changed from mineral spirits to a less hazardous citrus solvent (D-Limonene).
- Used tires and tubes are combined with LLNL's tires and tubes, which are shredded and ultimately recycled.
- When possible, a reusable air-powered spray can is used instead of disposable aerosol cans.
- Asbestos brake shoes on all vehicles with organic shoes will be replaced.

## Process Waste Assessment

### Facility

Mechanics Shop

### Products

Maintenance and repair of motorized vehicles and equipment.

### Process Description

The Mechanics Shop maintains and repairs motorized vehicles and equipment on the SNL/California site. The shop is located in Building 9623. It was relocated from Building 9632 in July 1992. Figure 1 shows the shop area layout.

The maintenance and repair service is done primarily on the following equipment:

- Motorized carts—146 (12 carts are electric)
- Backhoes—2
- Tractors—2
- Street sweepers—2
- Trash truck—1
- Portable emergency generators—2
- Trencher—1
- Portable crane—1
- Man lifts—3

Each of the above 182 units is serviced regularly. The carts are serviced on two schedules—every three months and every six months. The carts used by the Maintenance Department average approximately 150 to 200 miles per month and are on the three-month schedule. The rest of the carts, approximately 73, log only 25 to 50 miles per month and are on the six-month schedule. Frequent oil changes are necessary because, in normal operation, unburned fuel contaminates the oil. Except for the 24 generators, which are serviced once a year, the other pieces of equipment are serviced every three months. Basic service is an oil and filter change, lubrication, and fluids top-off (electric carts only require lubrication and fluids top-off). Repairs and adjustments are done as needed.[4]

The Mechanics Shop does not service the motor pool automobiles, trucks, and forklifts. The automobiles and trucks are serviced off-site by an independent contractor. The forklifts are serviced on-site by an independent contractor.

Figure 2 shows the process flow in the equipment areas.

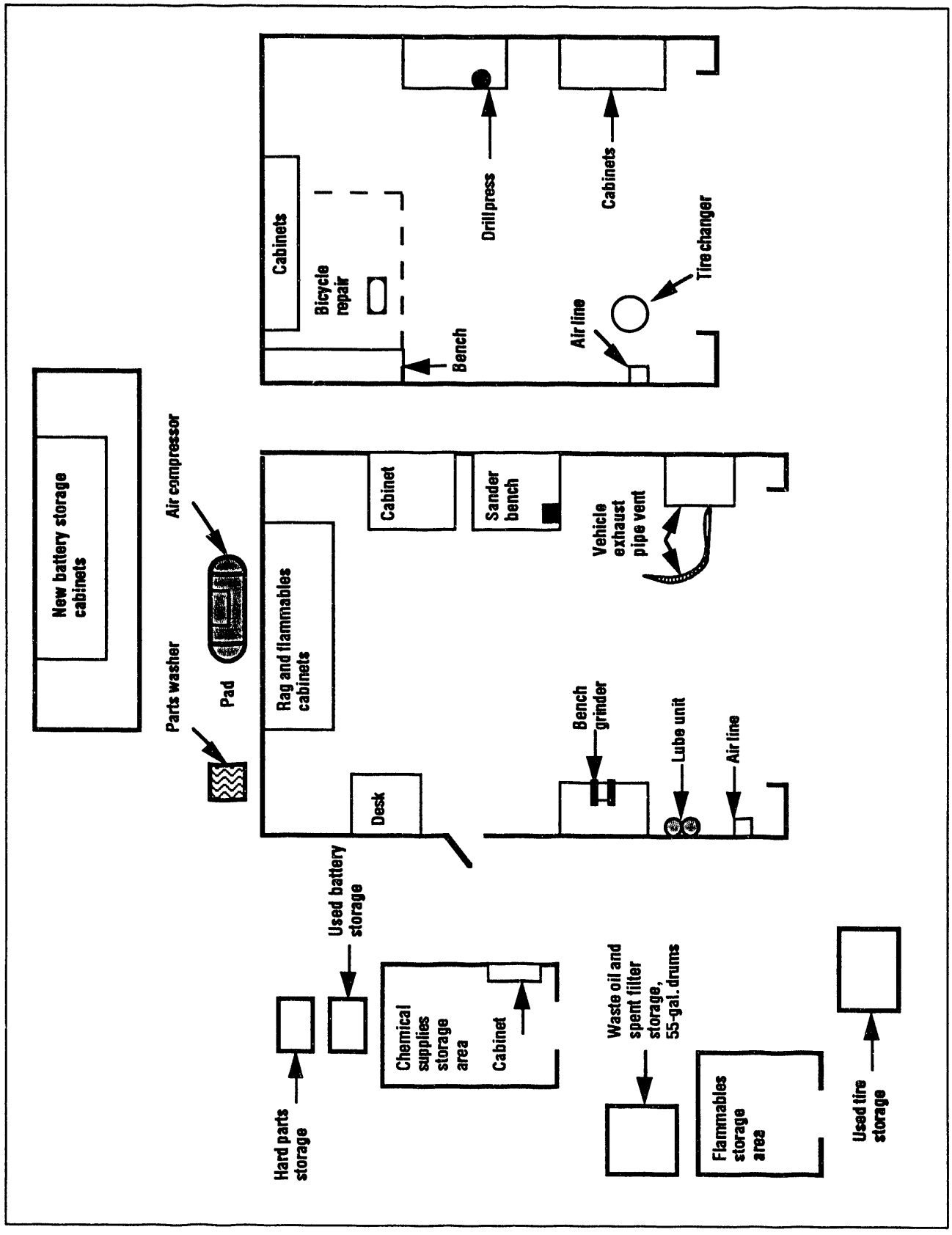


*Figure 1. Mechanics Shop area layout.*

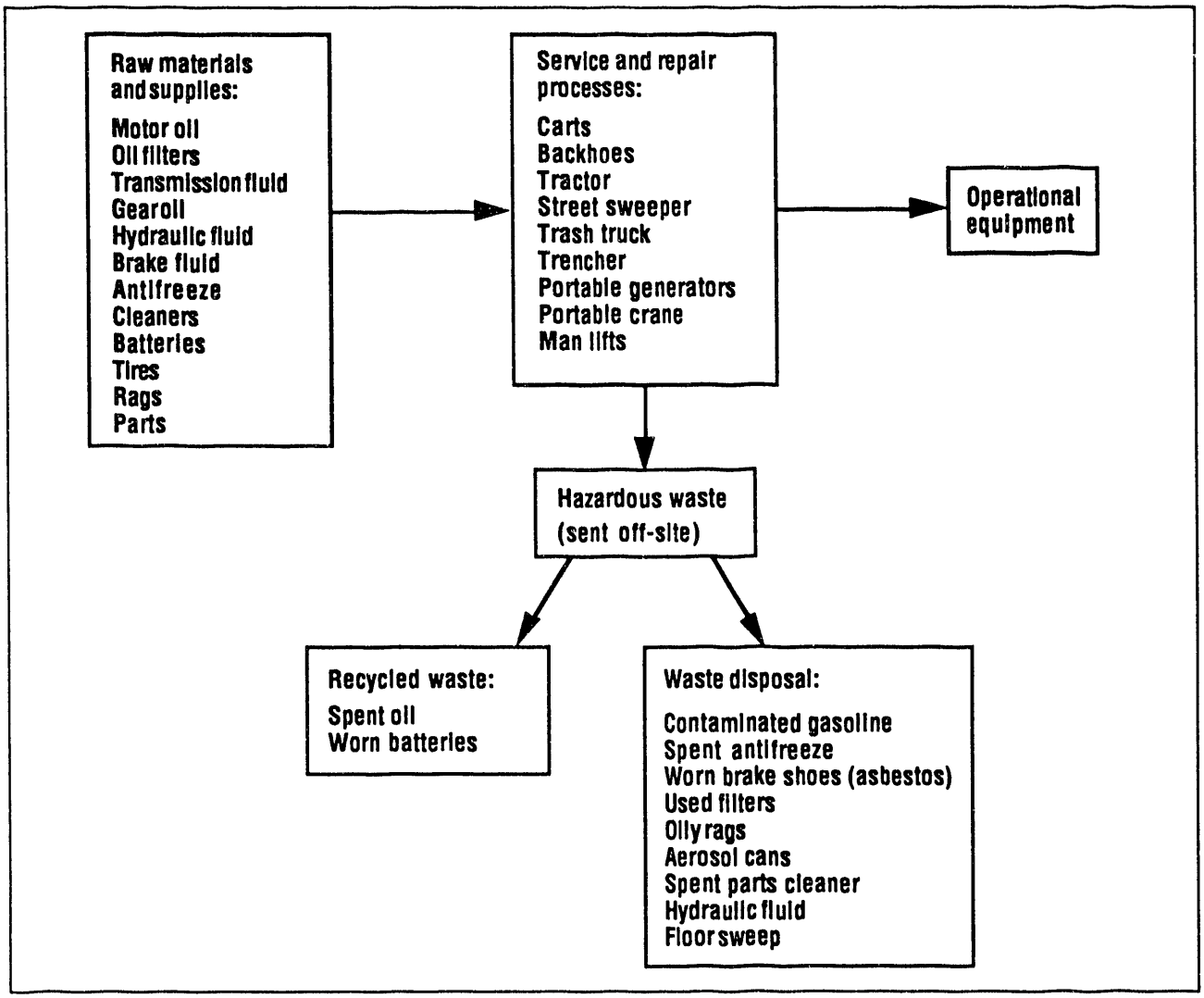


*Figure 2. Mechanics Shop area process flow diagram.*

## Waste Generation

Table 1 lists the hazardous waste generated by the Mechanics Shop from January 1, 1991, to September 1, 1992.

The major hazardous waste streams routinely generated by the Mechanics Shop are used oil, spent filters, oily rags, and spent batteries.

Waste oil, by volume, is the largest waste stream. It is generated during the regularly scheduled maintenance of the vehicles. The fleet of carts generates approximately 70% of the waste oil stream. The rest of the equipment generates the remaining 30%. The forklifts are serviced by an outside vendor, who does the service on-site and leaves the waste oil, approximately 120 gal./yr., at the site for disposal. The waste oil is sent off-site for recycling at a cost of $0.15 per gallon.

Spent oil filters are removed from the vehicle and drained of oil before they are disposed of as hazardous solid waste. Oil drained from the filters is combined with oil removed from the vehicles during the scheduled maintenance. The filters are not compacted to reduce volume because an additional waste oil stream is created; the oil from the drained filters contaminates the compactor.

Table 1. Mechanics Shop Hazardous Waste Generation (1/1/91–9/1/92).[5]

| Waste Stream | Waste I.D. | Volume | Disposal Cost |
|---|---|---|---|
| Oil | oil | 445 gal. | $0.15/gal.<br>Total = $66.75 |
| Gasoline | gasoline/water mixture<br>gasoline/diesel mixture | 10 gal.<br>35 gal. | $120/55-gal. drum<br>Total = $120 |
| Diethylene glycol | diethylene glycol | 4.2 gal. | $1.85/gal.<br>Total = $8 |
| Rags | oily rags | 665 lbs. | $950/55-gal. drum +<br>$85 transportation<br>Total = $3100 |
| Solvent | mineral spirits,<br>1,1,1-trichloroethane | 26 gal.<br>1 pint | $120/55-gal. drum<br>$125/55-gal. drum<br>Total = $57 |
| Batteries | lead acid<br>NiCad | 149 ea<br>5 ea | $1.00/battery<br>Total = $154 |
| Empty Containers | empty containers | 35 lb. | $950/55-gal. drum +<br>$85 transportation<br>Total = approx. $181 |
| Aerosol Cans | aerosol cans | 70 ea. | $600/55-gal. drum<br>Total = $210 |
| Miscellaneous | oil filters<br>contaminated floor dry | 167 lbs.<br>5 lbs. | $950/55-gal. drum +<br>$85 transportation<br>Total = $210 |
| | asbestos brake shoes | 75 lbs. | $1006.50/rolloff<br>Total = $minimal |

Spent batteries are recycled by an outside vendor. Oily rags are compacted in 55-gallon drums and disposed of as solid hazardous waste. Some waste gasoline is also disposed of non-routinely. Occasionally, the gasoline will be contaminated with water or diesel fuel.

Mechanics Shop personnel have taken steps to minimize the other waste streams, when possible:[4]

- The use of disposable rags has been evaluated, but an alternative that saves money or generates less waste has not been identified.
- Service scheduled on the carts not used regularly by the Maintenance Department was extended from three months to six months because the carts do not accumulate as much mileage as those used regularly.
- The Mechanics Shop personnel conducted a study to try to find longer lasting batteries so that the volume of spent batteries could be reduced. The study shows that lead-acid batteries used now last the longest.
- The parts cleaning solvent was changed from mineral spirits to a less hazardous citrus solvent (D-Limonene).
- Used tires and tubes (approx. 150/yr.) are combined with LLNL's tires and tubes, which are shredded and recycled. All sizes of tires and tubes (e.g., bicycle, cart, car,

and truck) are collected on a pallet for about six months. The pallet is then bundled and sent to LLNL.

- Some of the older carts (Otis Carts) no longer have available replacement parts; when they cannot be repaired, they are scrapped and all usable parts are saved for repair of the other older carts.
- When possible, a reusable air-powered spray can is used instead of disposable aerosol cans. The brake parts cleaner is now used with this reusable spray can.
- All asbestos brake shoes on all vehicles with organic shoes will be replaced.

Overall, the shop personnel are aware of the need to minimize hazardous wastes and are continuously looking for opportunities to do so.

### Material Balance

The fleet of 146 carts generates most of the hazardous waste; therefore, it was selected for a material balance (Fig. 3). Some of the fluids and greases were estimated based on the mechanics' process knowledge of cart servicing.

Spent oil and oil filters from the scheduled maintenance service done on all vehicles comprise most of the routinely generated hazardous waste. A material balance for this waste stream is shown in Fig. 4.

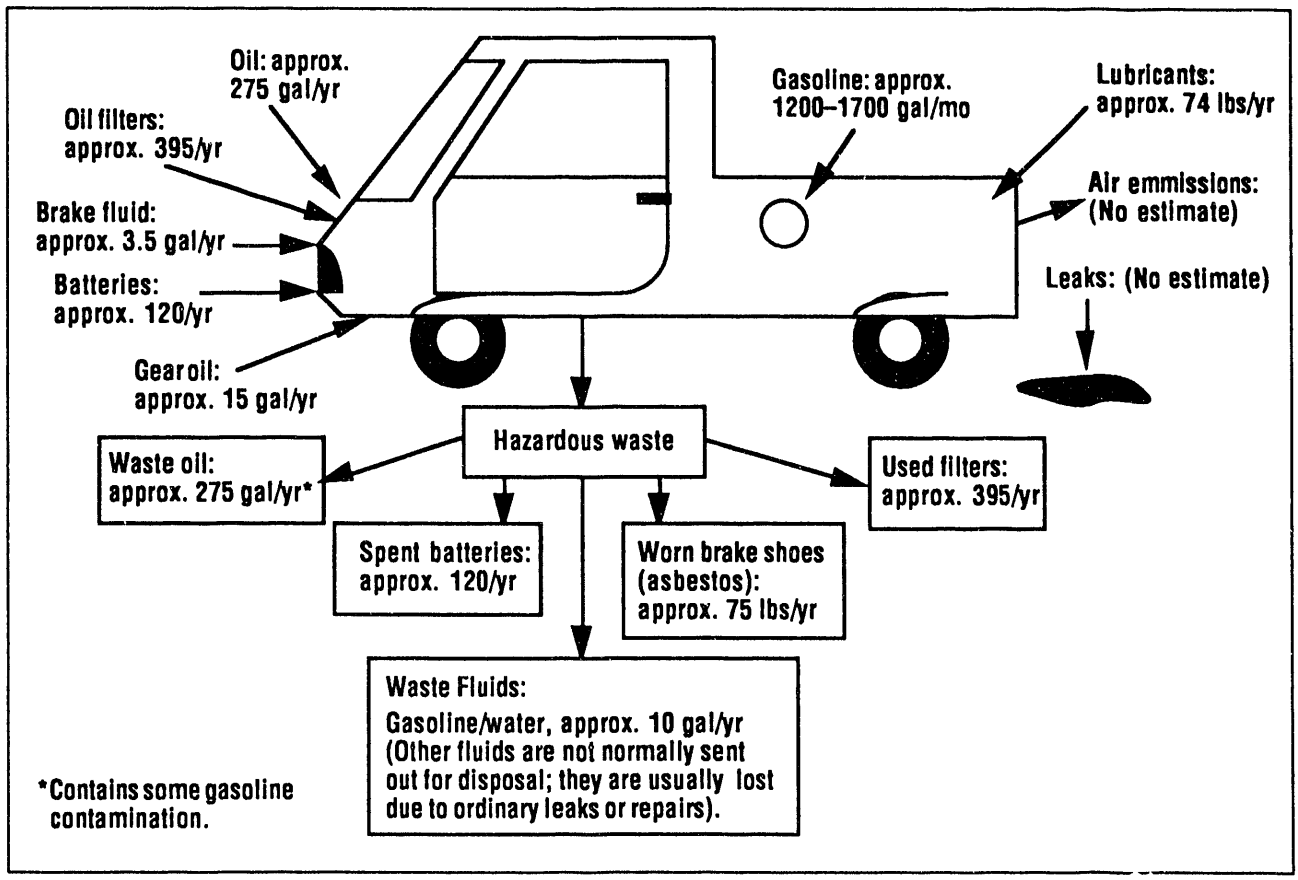


*Figure 3. Mechanics Shop cart material balance.*

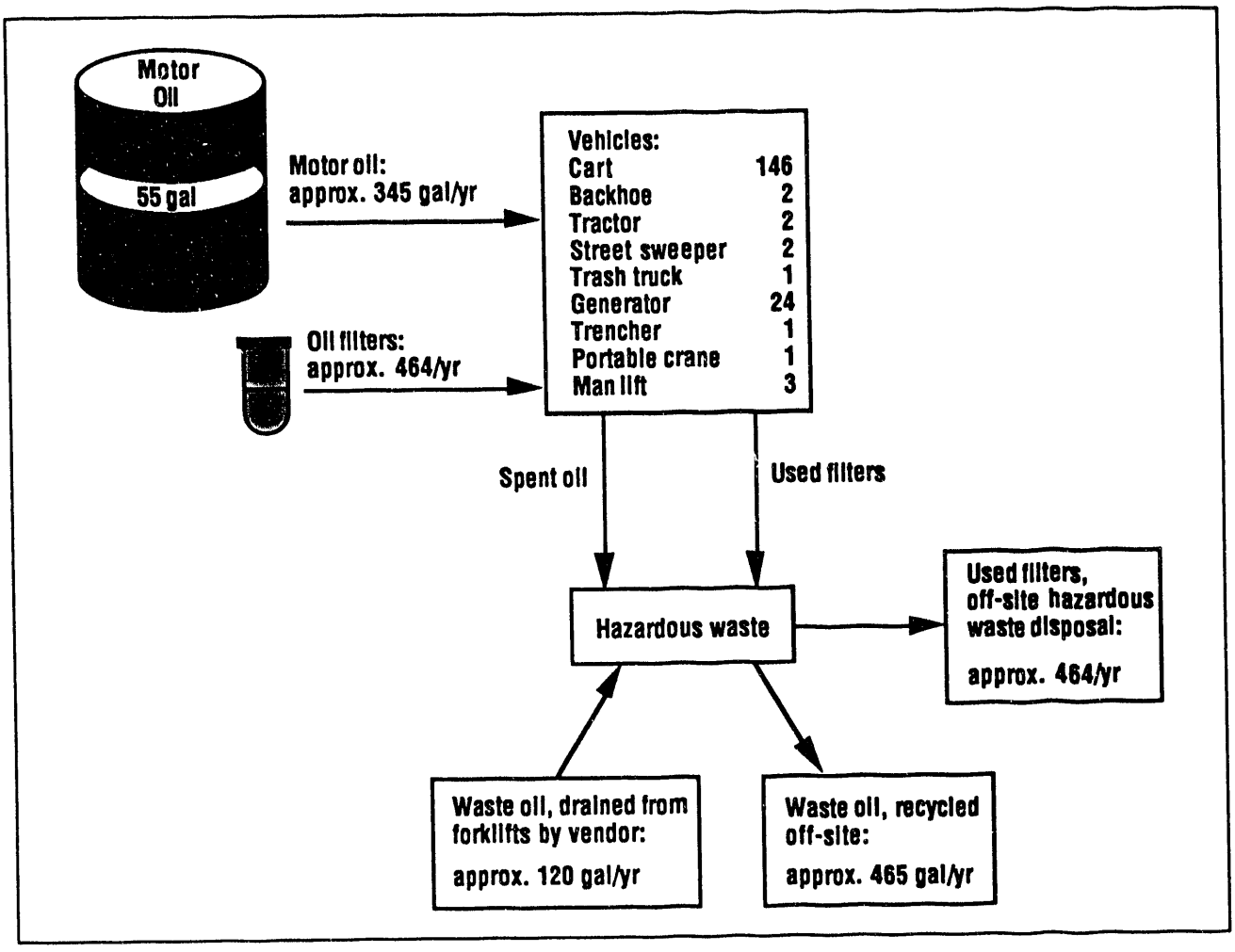


*Figure 4. Oil and oil filter material balance.*

## Recommendations

The following recommendations should be considered:

- The shop personnel already work to reduce wastes by recycling waste oil, spent batteries, and used cart parts. These activities should continue because they significantly reduce wastes and costs.
- The program to eliminate asbestos from all vehicle brake shoes and to replace them with organic shoes should be made a high priority. However, all precautions should be taken to protect the shop personnel from asbestos exposure during the exchange.
- To reduce the use of disposable aerosol cans, chemicals for use in air-powered spray cans should continue to be evaluated.
- The service schedules for all vehicles should be monitored to determine if any other options exist to extend the time between services.
- A safeguard should be implemented to prevent diesel fuel contamination of gasoline. One option might be simply to place a caution sign on each vehicle indicating the type of fuel to be used.
- A log should be set up to track the number of tires sent to LLNL, the date they are sent, and the net weight.

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