Parts Washing Pollution Prevention Alternatives

COMMONLY OBSERVED PRACTICES

Petroleum-based solvents (such as mineral spirits) are widely used by vehicle maintenance facilities to remove oil, grease and dirt from parts. Once the solvent becomes spent, it must be managed and disposed as a hazardous waste because of its ignitability or toxicity. Since most vehicle maintenance facilities operate one or more parts washing basins containing a petroleum-based solvent, a significant portion of hazardous waste generated at these facilities may consist of waste parts washing solvent.

Typically, parts washing basins are serviced on a set time schedule. Servicing may be performed by facility personnel or, more commonly, by a hazardous waste management company.

POLLUTION PREVENTION OPTIONS

Many proven options exist to reduce the toxicity and/or volume of waste generated from parts washing activities. These options range from simple administrative controls to modest product, equipment and/or technique changes. The following provides a description and cost evaluation of possible pollution prevention alternatives to traditional petroleum solvent parts washing operations. Information obtained from various vehicle maintenance facilities visited as part of the IPPI pilot project and a number of equipment vendors was used to evaluate each alternative.

Administrative Controls

The first and most easily implemented pollution prevention/waste reduction alternative for parts washing solvent involves a re-evaluation of existing parts washing practices, solvent quality and scheduled maintenance. The first step is to modify parts cleaning practices in an effort to extend solvent life. Examples of simple administrative practices that can be implemented to extend solvent life include:

- Evaporation shortens solvent life by making it more concentrated with dirt, oil and grease. To minimize the amount of solvent lost through evaporation, parts washers should be shut off and closed when not in use. Parts should also be allowed to drain completely before they are removed to reduce dragout losses.
- Preclean parts (i.e. by wiping with a launderable rag or scraping) to remove the bulk of any oil, grease or dirt prior to cleaning with the parts washer.

Solvent quality and parts washer service intervals are also important administrative control considerations in regard to waste reduction. Parts washer service intervals are typically based on a service company's best estimate, a routine schedule or the appearance of the solvent rather than its cleaning ability. As a result, service intervals may be overly conservative or based on conditions that change over time. Basing parts washer service intervals on solvent cleaning ability rather than set time schedules is particularly beneficial for facilities that experience seasonal fluctuations in production and/or maintenance activities. There are no set procedures for establishing optimum service intervals. The best method is to rely on the experience of the personnel that use the solvent on a daily basis.

If two units are used at a facility, one unit should be used for preliminary cleaning. If additional, higher quality cleaning is desired, the second unit can be used after the preliminary wash. When the

operator believes the solvent quality in the preliminary unit is no longer adequate, the second unit can be brought into preliminary use, and the dirty preliminary unit serviced and put into use as the final wash. By evaluating solvent quality, alternating parts washer servicing between a preliminary and secondary unit, and by servicing the units only when solvent quality dictates, solvent waste generation can be significantly reduced.

In some cases, the service company may not be willing to service the unit on a less frequent or "as needed" basis, particularly when the parts washing unit is leased from the servicing company. In this case, parts washer basins may be purchased and serviced in-house. Waste parts washer solvent can be recycled by most hazardous waste management companies. Common parts washer basins cost approximately $600. Solvent may be purchased and disposed through a chemical distributor in 55-gallon quantities. Based on information obtained from chemical distributors, mineral spirits can be purchased at a cost of approximately $2.40 per gallon in 55-gallon quantities (the smallest quantity sold). Solvent blends with flashpoints above 140°F are also available at a cost of approximately $3.20 per gallon. These blends reportedly have less odor and are easier on the worker's skin. Costs for disposing/recycling the waste solvent through these same companies is approximately $120 to $135 per 55-gallon drum. A list of chemical distributors that sell and dispose of parts washing solvent is presented in Appendix A.

Hybrid Petroleum Solvent Parts Washer Units

A second method to reduce waste solvent generation rates involves the use of "hybrid" units. These units are equipped with devices that purify the circulating solvent to significantly increase its service life. Hybrid parts washing units include distillation units, centrifugal filtration units, conventional filtration units, and biodegradation units.

Distillation and Centrifugal Filtration Units

Distillation and centrifugal filtration parts washing units may be leased from a number of hazardous waste management companies that service parts washers. A distillation unit resembles a conventional recirculating parts washer but is equipped with a small solvent distillation unit. Solvent is continually distilled and returned to the basin. Oil, grease and other impurities removed with the distillation unit are collected as "still bottoms" for subsequent disposal.

Centrifugal filtration units use centrifugal force to separate oil, grease and other impurities from the solvent. Contaminants removed from the solvent become trapped in a holding chamber where they are removed periodically for disposal.

Benefits associated with these type of units include:

1. Reduced hazardous waste generation and off-site transportation liabilities. For example, the distillation unit reportedly reduces solvent waste by 90 percent. The centrifugal unit reportedly reduces waste solvent by 50 percent. Reduced hazardous waste generation rates may place the vehicle maintenance facility in a less restrictive hazardous waste generator category (i.e. from a Small Quantity Generator to a Conditionally Exempt Small Quantity Generator).
2. A consistently cleaner solvent is available when using hybrid units. As a result, one hybrid unit may replace two or more conventional parts washing units. However, reducing the number of parts washers may not be an option for the facility if the number of washers was selected to ensure washers are readily accessible for employee use.

Literature on distillation and centrifugal parts washing units is enclosed as Appendix B. Example costs obtained during the IPPI pilot project for leasing and servicing these units are as follows:

- A 30-gallon distillation unit with (a 20-gallon solvent-holding capacity) could be leased and serviced for approximately $100 per month ($1,200 per year). This includes $40 per month for the parts washer basin and $60 per month for the distillation unit. According to vendor infomation, the same distillation unit may also be used to service up to three parts washer basins if additional parts washer basins are required.
- A lease and service cost obtained for a 30-gallon centrifugal filtration unit was approximately $266 for a 16 week period ($798 per year). Since centrifugal filtration consistently provides a more effective cleaning solvent than conventional parts washing units, equipment suppliers claim one centrifugal filtration unit will replace two conventional units.

Conventional Filtration

Conventional filtration parts washers extend solvent life by removing particulates from the solvent. According to a manufacturer of conventional filtration equipment, solvent life may be extended 3 to 10 times depending on the amount of parts washing performed, the administrative controls in place and the type of solvent used. Example vendor literature for conventional filtration equipment is enclosed as Appendix C.

Based on information obtained during the IPPI project, the retail price for a conventional filtration parts washing unit is approximately $500 to $700. Filtration retrofit kits are also available to facilities that own a parts washing unit. These kits cost approximately $120 to $150 depending on the kit required. Filter cartridges for the parts washer filtration units cost approximately $10 each and must be replaced whenever they become too plugged (typically every 4 to 8 weeks). Since spent filter cartridges are potentially hazardous, a $400 laboratory fee (for toxicity characteristic leaching procedure [TCLP] testing) should be included when calculating the cost associated with this alternative. If the filters test hazardous, a relatively small hazardous waste disposal fee should be included in the calculation. If nonhazardous, landfill disposal costs would be insignificant.

Unless a hazardous waste management company is willing to change out spent solvent on an “as needed” basis, the purchase of a conventional filtration unit will require the vehicle maintenance facility to purchase solvent and perform its own service work (see Appendix A for a list of chemical distributors).

Biodegradation Units

Based on vendor performance information, biodegradation units use a “nonhazardous” solvent that reportedly never requires disposal. Oil and grease accumulating in the unit are degraded by bacteria contained in a replaceable filter. Benefits associated with the use of a biodegradation unit are the same as identified for distillation and centrifugal filtration units.

Vendor information on biodegradation units is enclosed as Appendix D. The following are anticipated costs associated with biodegradation units.

- A unit cost of $1400
- Monthly replacement of the $10 bacteria filter
- Addition of approximately 5 gallons of solvent every 2 months (at a cost of $60 per five gallons of solvents) to make up for evaporation and carry-out.

- This option requires TCLP testing of the waste filters prior to disposal (estimated to cost approximately $400).

Alternative Cleaners

While mineral spirits is a relatively nontoxic solvent, it must be managed as a hazardous waste because of the characteristic of ignitability and, possibly, toxicity if it picks up toxic contaminants from the items cleaned. Alternative solvents are available that may provide comparable cleaning while generating less hazardous waste or nonhazardous waste that will be less costly to dispose of. Two possible alternatives include the use of d-limonene and aqueous parts washers.

D-limonene

D-limonene is a citrus-based product (derived from citrus peels) that may be used as an alternative to petroleum-based solvents in existing parts washer basins. D-limonene is available in a pure form and as d-limonene/solvent blends. Straight (pure) d-limonene offers the following advantages over mineral spirits:

- It is a highly effective cleaning solvent that can be used for a wide variety of applications.
- It is reportedly capable of holding two to 2.5 times its own weight in oil and grease before becoming ineffective as a cleaning agent. In comparison, mineral spirits can only hold approximately half its weight in oil and grease. Consequently, its life expectancy should be considerably longer than traditional petroleum-based solvents and hazardous waste generation rates should be reduced.
- D-limonene carries a "GRAF" (generally recognized as safe) rating from the Food and Drug Administration, and offers a safer workplace for employees.
- It is readily biodegradable and derived from a renewable resource.
- It has a slower evaporation rate than traditional solvents. Therefore, less solvent should be lost to evaporation during parts washing applications.

Disadvantages of straight d-limonene include:

- Straight d-limonene has a flashpoint below 140°F. Once it becomes spent, it will likely require disposal as a hazardous waste because of ignitability and possibly toxicity.
- It is slower to dry than other solvents.
- D-limonene is expensive. Prices for d-limonene obtained from manufacturers and chemical distributors ranged from approximately $14 to $20 per gallon in 55-gallon quantities (as compared to $2.40 per gallon for mineral spirits).

The advantage of using a d-limonene/solvent blend is that many are available with flashpoints above 140°F. The disadvantages of d-limonene/solvent blends include the following:

- Although they may not be hazardous because of ignitability when they become spent, contaminants introduced during parts cleaning may cause the spent d-limonene/solvent blends to be hazardous because of toxicity. TCLP testing would be required to determine if it is hazardous from toxic metal or benzene contamination. A $400 laboratory fee should be included in this alternative's cost/benefit analysis to account for costs associated with characterizing the waste solvent as hazardous or nonhazardous.

- The cleaning capability and life expectancy of d-limonene/solvent blends is less than straight d-limonene.
- D-limonene/solvent blends are also expensive.

Aqueous Parts Washers

Aqueous (water-based or hot-soap) parts washers consist of high temperature-high pressure sprayers, steam cleaners, hot soap washers and immersion tanks. Cleaning chemicals typically consist of nonhazardous soaps, detergents, mild caustics or citrus based products.

High temperature-high pressure sprayer units, in sizes appropriate for vehicle maintenance facilities, cost $3,000 to $5,000. Some vendors allow facilities to use demonstration units on a trial basis or take advantage of a "lease to own" program. Aqueous cleaning products vary in cost and form, ranging from approximately $5.50 per gallon for a cleaning solution (in 55-gallon quantities) to approximately $100 for 50 pounds of powdered detergent. A list of aqueous parts washer vendors is provided as Appendix E.

In addition to providing effective, consistent cleaning results, aqueous parts washers also offer the following advantages over traditional solvent parts washers:

1. Employee exposure to petroleum-based solvents (through inhalation and dermal contact) is reduced or eliminated.
2. Aqueous parts washers reportedly save businesses time and money as they generally require no operating supervision other than placing the part in the unit and starting the washer. As a result, a vehicle maintenance facility should realize an increase in productivity and the parts washer should pay for itself in a relatively short period of time from savings in labor costs alone.
3. Fire hazards are significantly reduced or eliminated.
4. The amount of hazardous waste requiring disposal is eliminated or greatly reduced. This often results in a significant reduction in disposal costs and may reduce a facility's hazardous waste generator status.

Maintenance of aqueous parts washers typically consists of periodically replenishing the system's reservoir with water and detergent (to make up for evaporative losses) and removal of any sludge that accumulates within the basin. Periodically, the water in the system's reservoir will also need changing. Although direct discharge to the municipal sanitary sewer system will likely be allowed, prior notification and approval from the city wastewater treatment plant superintendent or city engineer must be obtained before the purchase of a unit. Some vendors also claim the water can be removed from the washer, filtered and placed back into the washer for reuse. As a result, no wastewater is discharged and only sludge from cleaning the unit is generated.

Facilities are encouraged to purchase an aqueous parts washer equipped with an oil skimmer. Oil skimmers recover the free floating tramp oil that accumulates in the washer reservoir. Skimmers prevent oil, grease and other associated contaminants from being discharged in high concentrations with the wastewater and prolongs the service life of the washwater. Any oil recovered from the washer may be managed and recycled as used oil.

Wastewater from aqueous parts washers may not be discharged to septic systems or aboveground discharge sources because of regulatory restrictions and potential environmental liabilities. As a result, facilities that are not serviced by a municipal sanitary sewer system must either 1) eliminate

this option as an alternative, or 2) invest additional money for an on-site wastewater recycling system. On-site wastewater recycling systems are available at costs of approximately $8,000 and up. Recycling units will generate a small amount of sludge and/or spent filters that will require TCLP testing and solid waste disposal.

COST/BENEFITS

An example cost comparison reference guide for parts washing alternatives is presented as Table 2-1. Cost comparison estimates presented in Table 2-1 were determined based on vendor information and costs obtained during the IPPI pilot project. Other factors affecting the cost comparison estimates in Table 2-1 include waste characterization requirements, solvent life estimates, waste disposal costs and labor costs.

As indicated in Table 2-1, each alternative is compared to a vehicle maintenance facility with one or two 30-gallon parts washers maintained by a service company. The cost for having the service company change out approximately 15 to 20 gallons of waste mineral spirits every 8 weeks (6.5 times per year) is $78.50 per service event (approximately $510 per year per washer). A percent estimate by which the waste solvent generation rate will be reduced is also included for each alternative. Since the use of d-limonene in a conventional parts washer basin would likely be cost prohibitive, the d-limonene cost comparison presented in Table 2-1 reflects its use with a conventional filtration system. Combining filtration with d-limonene should extend solvent life, making d-limonene a more economically feasible alternative. Example calculation spreadsheets and assumptions used to make the cost comparisons in Table 2-1 are provided in Appendix F.

As indicated in Table 2-1, if improved administrative controls can be used to extend solvent life to 10 weeks, the facility would realize an annual cost savings of approximately $102 per parts washer and waste solvent would be reduced by 20 percent. Use of an aqueous parts washer would result in the greatest cost savings for the facility (largely due to the labor hours saved on parts cleaning) and would pay for itself in approximately 4 to 9 months. Waste solvent generated at the facility would also be reduced by 100 percent if solvent parts washers are replaced with an aqueous washer. Based on the calculations performed and vendor information obtained, the use of a conventional filtration parts washer would also result in a cost savings for the facility and reduce waste solvent generation rates by approximately 80 percent. However, a payback would not be realized until approximately 34 months (or 25 to 29 months if laboratory testing proves the disposable filters are nonhazardous).

Other parts washing alternatives evaluated in Table 2-1 (i.e. solvent distillation, centrifugal filtration, biodegradation units and the use of d-limonene with a conventional filtration unit) would result in slightly higher annual parts washing costs. However, it should be stressed that these alternatives are still excellent waste reduction alternatives and, based on vendor information, would reduce the facility's waste solvent generation rate by 50 to 100 percent. It is also important to note that one hybrid unit may replace two conventional units because of its consistently higher quality solvent. If a two-to-one replacement is possible, a greater annual savings and, possibly, an acceptable payback period may be realized with these alternatives.

Due to the variables and assumptions involved in cost comparisons, the information presented in Table 2-1 should only be used as a preliminary reference tool for evaluating parts washing alternatives. More accurate cost comparisons may be performed by completing the cost/benefit estimate worksheets provided as Figures 2-1 through 2-7. To assess each alternative, locate equipment vendors to obtain pricing information. Cost estimates for laboratory analysis, solvent purchases, waste disposal and supplies are required.

Table 2-1
Parts Washing Alternatives - Cost/Benefit Summary Guide

Option	Estimated First Year Cost	Estimated Subsequent Annual Cost	Estimated Annual Savings (Loss)	Estimated Payback Period (months)	Estimated % Reduction of Waste Solvent/yr
Lease from a Service Company					
1 unit	$510	$510	N/A	N/A	0%
2 units	$1,020	$1,020	N/A	N/A	0%
Improved Administrative Controls[a]					
1 unit	$408	$408	$102	N/A	20%
2 units	$816	$816	$204	N/A	20%
Solvent Distillation (lease)					
1 washer w/1 distillation unit	$1,200	$1,200	($690)	N/A	65%
2 washers w/1 distillation unit	$1,680	$1,680	($660)	N/A	65%
Centrifugal Filtration (lease)					
1 unit	$865	$865	($355)	N/A	50%
2 units	$1,730	$1,730	($710)	N/A	50%
Conventional Filtration[b]					
1 unit	$1,235	$335	$175	34	~80%
2 units	$2,070	$670	$350	34	~80%
Biodegradation					
1 unit	$2,620	$580	($70)	N/A	100%
2 units	$4,840	$1,160	($140)	N/A	100%
Filtration Unit with D-limonene Solvent					
1 unit	$1,425	$525	($15)	N/A	~90%
2 units	$2,450	$1,050	($30)	N/A	~90%
Aqueous Parts Washer					
(1 unit replaces 1 solvent parts washers)	$4,780	$780	$5,175[c]	9	100%
(1 unit replaces 2 solvents parts washers)	$4,780	$780	$10,685[c]	4	100%

[a] Assumes improved administrative controls can extend solvent life to 10 weeks
[b] Using a high flashpoint solvent
[c] Cost savings largely from labor hours saved

Figure 2-1
In-House Servicing of Parts Washer with Administrative Controls Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Est. Gallons of parts washing solvent purchased / year	200	
B	New solvent purchase cost per gallon	$2.40	
C	Annual solvent purchase cost = A x B	$480.00	
D	Est. Gallons of waste solvent generated / year	150	
E	Waste solvent disposal cost / gallon	$2.45	
F	Annual waste solvent disposal cost = D x E	$367.50	
G	Total annual in-house servicing cost = C + F	$847.50	
	EXISTING CONDITIONS (12 MONTH)		
H	Number of parts washers currently leased at facility	1	
I	Current cost per service event per washer	$80.00	
J	Number of service events per year per parts washer	12	
K	Total annual servicing cost = H x I x J	$960.00	
	RESULTS		
	ANNUAL IN-HOUSE COST SAVINGS = K - G	$112.50	

Figure 2-2
Distillation Parts Washer Unit
Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Number of parts washing basins required	1	
B	Servicing cost per washer per service event	$40.00	
C	Number of service events per year per parts washer	12	
D	Total annual parts washer servicing cost = A x B x C	$480.00	
E	Number of distillation units required	1	
F	Servicing cost per distillation unit per event	$60.00	
G	Number of service events per year per distillation unit	12	
H	Total annual distillation unit servicing cost = E x F x G	$720.00	
	EXISTING CONDITIONS (12 MONTH)		
I	Number of parts washers currently leased at facility	1	
J	Current cost per service event per washer	$80.00	
K	Number of service events per year per parts washer	12	
L	Total current annual servicing cost = I x J x K	$960.00	
	RESULTS		
	ANNUAL IN-HOUSE COST SAVINGS (LOSS) = L - H - D	($240.00)	

Figure 2-3
Centrifugal Filtration Parts Washer Unit Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Number of centrifugal filtration parts washers required	1	
B	Servicing cost per washer per service event	$266.00	
C	Number of service events per year per parts washer	3	
D	Total annual parts washer servicing cost = A x B x C	$798.00	
	EXISTING CONDITIONS (12 MONTH)		
E	Number of parts washers currently leased at facility	1	
F	Current cost per service event per washer	$80.00	
G	Number of service events per year per parts washer	12	
H	Total current annual servicing cost = E x F x G	$960.00	
	RESULTS		
	ANNUAL IN-HOUSE COST SAVINGS = H - D	$162.00	

Figure 2-4
Conventional Filtration Parts Washer Unit
Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Number of conventional filtration parts washers required	1	
B	Purchase cost of conventional filtration parts washer	$600.00	
C	Total equipment purchase cost = A x B	$600.00	
D	Est. gallons of parts washing solvent required/year	75	
E	New solvent purchase cost per gallon	$2.40	
F	Annual solvent purchase cost = D x E	$180.00	
G	Gallons of waste parts washing solvent generated/year	45	
H	Waste solvent disposal cost/gallon	$2.45	
I	Est. annual waste solvent disposal cost = G x H	$110.25	
J	Number of replacement filters required/year	8	
K	Cost of replacement filters	$10.00	
L	Est. annual filter replacement cost = J x K	$80.00	
M	Est. cost for TCLP laboratory analysis of used filters	$400.00	
N	Estimated annual disposal cost for used filters	$100.00	
O	Total equipment and laboratory costs = C + M	$1,000.00	
P	Total annual operating cost = F + I + L + N	$470.25	
	EXISTING CONDITIONS (12 MONTH)		
Q	Number of parts washers currently leased at facility	1	
R	Current cost per service event per washer	$80.00	
S	Number of service events per year per parts washer	12	
T	Total current annual servicing cost = Q x R x S	$960.00	
	RESULTS		
U	ANNUAL IN-HOUSE COST SAVINGS = T - P	$489.75	
	PAYBACK PERIOD (Years) = O / U	2	

Figure 2-5
Biodegradation Parts Washer Unit
Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Number of biodegradation parts washers required	1	
B	Purchase cost of biodegradation parts washer	$1,400.00	
C	Total equipment purchase cost = A x B	$1,400.00	
D	Amount of startup solvent required (gallons)	20	
E	Cost of solvent per gallon	$12.00	
F	Startup solvent cost = D x E	$240.00	
G	Amount of replacement solvent required/year (gallons)	30	
H	Subsequent annual solvent purchase cost = E x G	$360.00	
I	Number of replacement filters required/year	12	
J	Cost of replacement filters	$10.00	
K	Est. annual filter replacement cost = I x J	$120.00	
L	Est. cost for TCLP laboratory analysis of used filters	$400.00	
M	Estimated annual disposal cost for spent filters	$100.00	
N	Total equipment, lab and startup costs = C + F + L	$2,040.00	
O	Total annual operating cost = H + K + M	$580.00	
	EXISTING CONDITIONS (12 MONTH)		
P	Number of parts washers currently leased at facility	1	
Q	Current cost per service event per washer	$80.00	
R	Number of service events per year per parts washer	12	
S	Total current annual servicing cost = P x Q x R	$960.00	
	RESULTS		
T	ANNUAL IN-HOUSE COST SAVINGS = T - O	$380.00	
	PAYBACK PERIOD (Years) = N / T	5.4	

Figure 2-6
D-limonene with Conventional Filtration Parts Washer Unit Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Number of conventional filtration parts washers required	1	
B	Purchase cost of conventional filtration parts washer	$600.00	
C	Total equipment purchase cost = A x B	$600.00	
D	Est. gallons of parts washing solvent required/year	40	
E	New solvent purchase cost per gallon	$15.00	
F	Annual solvent purchase cost = D x E	$600.00	
G	Gallons of waste parts washing solvent generated/year	20	
H	Waste solvent disposal cost/gallon	$2.45	
I	Est. annual waste solvent disposal cost = G x H	$49.00	
J	Number of replacement filters required/year	8	
K	Cost of replacement filters	$10.00	
L	Est. annual filter replacement cost = J x K	$80.00	
M	Est. cost for TCLP laboratory analysis of used filters	$400.00	
N	Estimated annual disposal cost for used filters	$100.00	
O	Total equipment and laboratory costs = C + M	$1,000.00	
P	Total annual operating cost = F + I + L + N	$829.00	
	EXISTING CONDITIONS (12 MONTH)		
Q	Number of parts washers currently leased at facility	1	
R	Current cost per service event per washer	$80.00	
S	Number of service events per year per parts washer	12	
T	Total current annual servicing cost = Q x R x S	$960.00	
	RESULTS		
U	ANNUAL COST SAVINGS = T - P	$131.00	
	PAYBACK PERIOD (Years) = O / U	7.6	

Figure 2-7
Aqueous Parts Washer Unit
Cost/Benefit Estimate Worksheet

ITEM	VARIABLE	EXAMPLE	YOUR FACILITY
A	Number of aqueous parts washers required	1	
B	Purchase cost of aqueous parts washer	$4,000.00	
C	Total equipment purchase cost = A x B	$4,000.00	
D	Est. annual soap/cleaning agent cost/year	$100.00	
E	Est. utility costs per month	$10.00	
F	Est. annual utility cost = 12 x E	$120.00	
G	Est. Annual sludge laboratory testing and disposal cost	$450.00	
H	Cost of labor per hour	$10.00	
I	Est. monthly maintenance hours for aqueous washer	2	
J	Annual aqueous washer maintenance cost = H x I x 12	$240.00	
K	Total annual operating cost = D + F + G + J	$910.00	
	EXISTING CONDITIONS (12 MONTH)		
L	Number of parts washers currently leased at facility	1	
M	Current cost per service event per washer	$80.00	
N	Number of service events per year per parts washer	12	
O	Total current annual servicing cost = L x M x N	$960.00	
P	Number of service technicians	3	
Q	Hours spent cleaning parts per day per technician	0.75	
R	Total Hours spent cleaning parts per year = P x Q x 250	562.5	
S	Annual parts cleaning labor cost = H x R	$5,625.00	
T	Total annual parts cleaning cost = O + S	$6,585.00	
	RESULTS		
U	ANNUAL COST SAVINGS = T - K	$5,675.00	
	PAYBACK PERIOD (Years) = C / U	0.7	