ANTIFREEZE RECYCLING

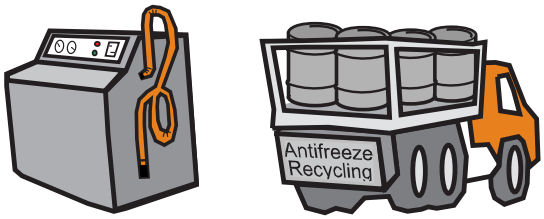
Best Environmental Practices for Auto Repair and Fleet Maintenance • May 2000

Why recycle antifreeze?

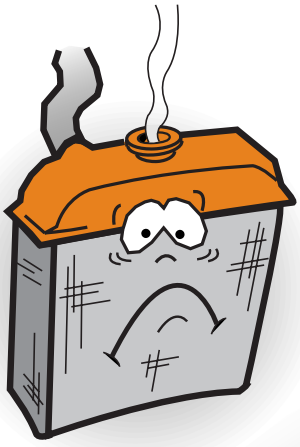
Dumping waste antifreeze may be illegal: waste antifreeze may contain heavy metals such as lead, cadmium, and chromium in high enough levels to make it a regulated hazardous waste. A hazardous waste may never be dumped on land or discharged into a sanitary sewer, storm drain, ditch, dry well or septic system.

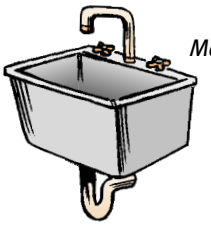
It's Cost-Effective: recycled antifreeze is less expensive than virgin antifreeze.

It Saves Resources: ethylene glycol is produced from natural gas, a non-renewable resource.

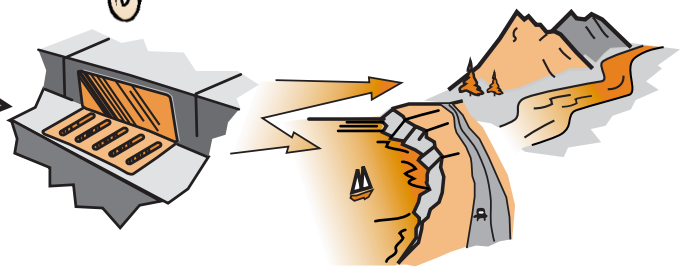


Waste antifreeze should be recycled either 1) in an on-site unit, 2) by a mobile service, or 3) off-site.





Many sewage treatment agencies responsible for wastewater treatment discourage or forbid waste antifreeze disposal into sanitary sewers.



Waste antifreeze should never be disposed of down storm drains or into surface waters because it causes serious water quality problems and may harm people, pets or wildlife. Doing so is illegal and punishable by fines of up to $25,000.

WHY BE CONCERNED?

It is estimated that only 12% of all waste antifreeze generated in the United States is recycled each year.

Understanding your options

Due to the many on-site and off-site recycling options available, recycling antifreeze is feasible in all parts of the country. Waste antifreeze can be recycled by three methods:

1) On-Site Recycling: waste antifreeze is recycled in units purchased by the facility, located on site, and operated by facility employees.

2) Mobile Recycling Service: a van or truck equipped with a recycling unit visits the facility and recycles waste antifreeze on site.

3) Off-Site Recycling: waste antifreeze is transported to a specialized recycling company; these services can also resupply the facility with recycled antifreeze.

All waste antifreeze recycling methods involve two steps: 1) removing contaminants either by filtration, distillation, reverse osmosis, or ion exchange and 2) restoring critical antifreeze properties with additives. Additives typically contain chemicals that raise and stabilize pH, inhibit rust and corrosion, reduce water scaling, and slow the breakdown of ethylene glycol.

The type of antifreeze recycling that is best suited to your facility depends on many factors. The table below summarizes some of these factors for different antifreeze recycling alternatives.

Managing recycling wastes

Antifreeze recycling wastes may be contaminated with metals such as lead, chromium, cadmium, copper, or zinc. Depending on the type of recycling performed, wastes may include filters, sludge or resins. As with all wastes, you should obtain data, or test the waste to determine whether it is hazardous and dispose of it accordingly. Off-site and some mobile recycling service vendors will dispose of the wastes for you. If your vendor manages your wastes for you, make sure that proper waste determination and disposal is performed.

Using recycled antifreeze

Can I recycle organic acid technology (OAT) (long-life) coolants?

In 1999, about 30 percent of new passenger vehicles and 5 percent of heavy duty equipment were factory filled with OAT coolants. Many antifreeze recycling units can recycle OAT coolants such as DexCool™. The most important factor when recycling OAT coolant is to use a technology that completely removes the "chemistry" from the waste coolant. Once the coolant has been recycled, it may be returned to a conventional or OAT coolant or depending on the additive package used.

Numerous auto repair and fleet maintenance facilities have used recycled antifreeze produced from on-site recycling units and mobile and off-site recycling services for years without experiencing engine damage or other problems as a result. However, there are a few issues you should be aware of.

Consumer protection and manufacturer warranty issues

As of September, 1999, there is no ASTM quality standard for recycled antifreeze. However, several state agencies, for example California Weights and Measures, have issued product specifications for recycled antifreeze. Also, some vehicle manufacturers, (e.g. General Motors, Ford Motor Company, Detroit Diesel and Cummins) test and certify antifreeze recycling equipment or have developed standards for recycled antifreeze.

Because there is currently no single national recycled antifreeze standard that all recycling methods must achieve, you should select an antifreeze recycling method after discussing coolant quality specifications and vehicle warranty concerns directly with your recycling unit or service vendors. Some vendors can provide certification letters from vehicle manufacturers or state agencies, or will otherwise guarantee the recycled antifreeze they produce.

Comparisons of antifreeze recycling methods

	On-Site Closed Loop	On-Site Batch	Mobile Service	Off-Site Service
Common recycling technologies	filtration or ion exchange	filtration or distillation	filtration or reverse osmosis	distillation
Capacity (gallons per hour)	4 to 5	4 to 100	55 to 210	375 to 500
Facility worker training required	yes	yes	no	no
Facility disposes of recycling wastes	yes	yes	some services	no
Capital cost range (1998 dollars)	$2,500 to $13,800	$3,700 to $18,000	None	None
Cost range per gallon to recycle antifreeze*	filtration: $3.00 to $4.50 ion exchange: $4.45 to $7.20	$0.74 to $4.50	$1.75 to $3.00	$3.20 to $3.70
Average labor time required for coolant change per vehicle (minutes)	30 to 60	25 to 35	20 to 30	20 to 30

*Note: Cost ranges are after unit capital cost payback and do not include labor costs. Cost ranges calculated using cost worksheet (see page 3).

Cost analysis worksheet for antifreeze recycling

Complete this worksheet, calculate, and compare antifreeze recycling costs. Compare the highlighted rows (rows E, I, N, and GG) to determine the recycling method with the lowest annual cost. The values provided in the sample column serve only as an example, as actual costs and savings will vary according to facility specific conditions. **Before beginning, refer to page 4 for preliminary questions you should ask vendors.**

	BASELINE WASTE ANTIFREEZE GENERATION	your facility	sample
A	Gallons of waste antifreeze generated annually		2,250
	OFF-SITE ANTIFREEZE DISPOSAL	**your facility**	**sample**
B	Cost per gallon for disposal		—
C	Gallons of antifreeze (virgin or recycled) purchased annually		—
D	Cost per gallon to purchase antifreeze (virgin or recycled)		—
E	**Total annual cost = (A x B) + (C x D)**		—
	OFF-SITE ANTIFREEZE RECYCLING SERVICE	**your facility**	**sample**
F	Cost per gallon for off-site recycling		$5.10
G	Gallons of antifreeze (virgin or recycled) purchased annually		2,250
H	Cost per gallon to purchase antifreeze (virgin or recycled)		$3.50
I	**Total annual cost = (A x F) + (G x H)**		$19,350
	MOBILE ANTIFREEZE RECYCLING	**your facility**	**sample**
J	Cost per gallon for mobile recycling		$3.29
K	Gallons of antifreeze (virgin or recycled) purchased annually		25
L	Cost per gallon to purchase antifreeze (virgin or recycled)		$3.85/gal
M	Annual waste disposal costs (filters, residual, etc)		$0
N	**Total annual cost = (A x J) + (K x L) + M**		$7,500
	ON-SITE ANTIFREEZE RECYCLING	**your facility**	**sample**
	General		
O	Gallons of regular (r) or extended life (e) antifreeze (virgin or recycled) purchased annually		378(r) & 452(e)
P	Cost *per gallon* to purchase antifreeze (virgin or recycled)		$4.71(r) & $7.48(e)
Q	Annual antifreeze recycling (number of vehicles or batches)		150 batches
R	Average time to recycle antifreeze (one vehicle or batch) in hours		15 hours per batch
S	Annual maintenance and repair costs		$800
	Equipment		
T	Purchase and shipping of recycling unit		$8,500
U	Unit installation		$0
	Additives		
V	Annual use rate of regular (r) or extended life (e) additives (gallons or packages per year)		32 gals.(r) & 35 gals.(e)
W	Cost to purchase additives *per gallon or per package*		$.25/gal(r) & $.96/gal(e)
	Filters		
X	Cost to purchase filters		NA
Y	Annual filter use rate		NA
Z	Annual cost to test filters		NA
	Energy		
AA	Unit voltage (volts)		240
BB	Unit current (amperes)		16
CC	Energy cost (per kilowatt-hour)		0.12
DD	Total energy cost [(AA x BB) ÷1,000 x CC x Q x R]		$1,037 /year
	Wastes and disposal		
EE	Annual cost to dispose of recycling wastes (other than antifreeze)		$0
FF	Gallons of waste antifreeze generated per year		75
	CALCULATIONS	**your facility**	**sample**
GG	**Total annual cost for on-site recycling [(O x P) + S + (V x W) + (X x Y) + Z + DD + EE + (FF x B or F)]**		$7,423
HH	On-site unit capital cost (T + U)		$8,500
II	Payback period in years for on-site recycling (HH ÷ annual cost difference). Annual cost difference = difference in calculated annual cost for on-site recycling (GG) and alternative method (E, I, or N)		0.7 (off-site vs. on-site recycling)

Getting started recycling your antifreeze: Questions for vendors

Answers to many of these questions will help you complete the cost analysis worksheet on page 3.

On-site, mobile, or off-site recycling

- What types of additives are added to the recycled antifreeze?
- What is the availability, length, and coverage of the warranty on the unit or recycled antifreeze?
- Is the unit or recycled antifreeze certified by any vehicle manufacturers?
- Can you provide performance data about antifreeze recycled by this equipment?
- What wastes are generated (filters, sludge, resin, still bottoms)?
- Who will dispose of the wastes?
- What is the waste generation rate?
- Is the waste considered hazardous?
- What is the cost per gallon to recycle the antifreeze? What does this cost include?
- What contaminants prevent your unit or service from recycling antifreeze?
- Does the technology recycle OAT coolants and propylene glycol?
- Can you provide any references in the area who are using your unit or service?

On-site, closed loop antifreeze recycling unit flushes the coolant system during recycling.

On-site, batch antifreeze recycling units are available with filtration or distillation recycling technology.

Additional questions for on-site equipment vendors

- Does the technology feature filtration, distillation, reverse osmosis, or ion exchange?
- Is the on-site unit designed for portable, closed-loop use or stationary, batch processing?
- Is the unit powered by electricity or compressed air?
- What voltage or pressure is required to operate the unit?
- How is the unit operated?
- How much operator time is required to operate the unit?
- How much additive is needed per gallon of recycled antifreeze?
- Do you provide additive packages for OAT coolants?
- How much do the additives cost?
- How are the additives obtained?
- Is antifreeze testing required to determine how much additive to add or is it fixed?
- What type of antifreeze testing equipment is provided with the unit (litmus paper, refractometer, titration kit, other)?
- Will you train our mechanics how to properly use the unit?
- Is a unit available for a short demonstration or trial period?
- What is supplied for the demonstration?
- Where is the nearest technical sales representative?
- How much does the unit cost?
- Are there any other initial costs such as accessories or special additive costs?
- Do you offer lease options; if so, what is the monthly lease cost?

Your state or local government environmental agencies have additional information about compliance and pollution prevention opportunities for auto repair shops and fleet maintenance operations in your state or area.For information on California regulatory compliance issues contact your nearest Department of Toxic Substances Control (DTSC) Regional Office by calling 1-800-728-6942. You may also access the CAL EPA website at www.calepa.ca.gov for links to California Regulatory Agencies. To obtain additional copies "The Pollution Prevention Tool Kit, Best Environmental Practices for Auto Repair" (publication number EPA-909-E-99-001) or "The Pollution Prevention Tool Kit, Best Environmental Practices for Fleet Maintenance" (publication number EPA-909-E-99-002) contact "DTSC's Office of Pollution Prevention and Technology Development (OPPTD)" at (916) 322-3670. Accompanying videos, "Profit Through Prevention"are available at the same phone number for either auto repair (number EPA-909-V-99-001) or fleet maintenance (number EPA-909-V-99-002). DTSC's OPPTD also provides technical assistance and pollution prevention resources to businesses and government agencies. Electronic versions of the fact sheets can be found at www.epa.gov/region09/p2/autofleet.

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