

ANTIFREEZE RECYCLING

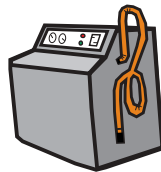
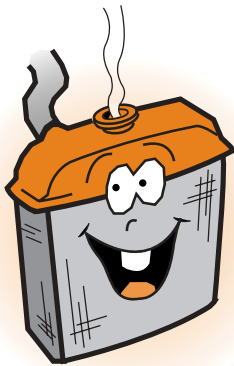
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Why recycle antifreeze?

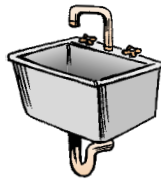
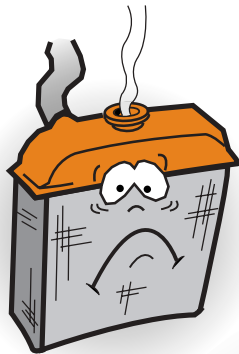
Dumping waste antifreeze may be illegal: waste antifreeze may contain heavy metals such as lead, cadmium, and chromium in high enough levels to make it a regulated hazardous waste. A hazardous waste may never be dumped on land or discharged into a sanitary sewer, storm drain, ditch, dry well or septic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

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

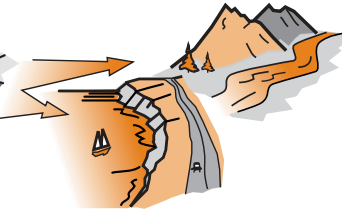
It Saves Resources: ethylene glycol is produced from natural gas, a non-renewable resource.



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 this printing, recycled antifreeze for automobile and light duty must meet the ASTM standards 6471 and 6472, respectfully. Recycled antifreeze is similar to virgin antifreeze standards (ASTM 3306 and 5216) except for electrochemical pitting and storage stability tests. Both the automobile and light duty recycled antifreeze must meet chloride and sulfate standards of 33 ppm and 140 ppm respectively, or complete fleet testing. User, not equipment manufacturer, is required to meet present ASTM standards.

Recycled heavy-duty antifreeze has no ASTM standards at this time, as does the ASTM 6210 and 6211 virgin antifreeze. Department of Food and Agriculture, Division of Measurement Standards is expected to adopt ASTM antifreeze recycling standards for those persons selling or distributing recycled antifreeze in the State of California. Law allows variance for chloride levels of up to 149 ppm if certain requirements are met. References: Section 13710, Business and Professions Code, and Title 4, Division 9, Chapter 6, Article 7, Section 4161.

To meet the upcoming ASTM standard for heavy-duty recycled antifreeze or current ASTM standards for automotive and light duty recycled antifreeze method or equipment that can meet these standards. Meeting the ASTM standards will comply with current vehicle warranty concerns. Ask vendor if they can provide certification letters from vehicle manufacturers standards.

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 <i>per gallon</i> 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 <i>per gallon or per package</i>		\$.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?
- Will unit meet new 2002 ASTM standards?

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" (Document number 626) or "The Pollution Prevention Tool Kit, Best Environmental Practices for Fleet Maintenance" (Document 625) contact "DTSC's Office of Pollution Prevention and Technology Development (OPPTD)" at 1-800-700-5854. Accompanying videos, "Profit Through Prevention" are available at the same phone number for either auto repair (Document number 1504) or fleet maintenance (Document number 1504). 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.dtsc.ca.gov/PollutionPrevention/Vehicle_Service_Repair.html



Mention of trade names, products, or services does not convey, and should not be interpreted as conveying, U.S. EPA, California Department of Toxic Substances Control (DTSC) or any local governments approval, endorsement, or recommendation.

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