



# Smart Purchases Big Impact

**Sustainable Purchasing Guide**  
**Antifreeze**

*Sustainability... your university, your world*

A small, stylized black silhouette of a tree with many leaves.



## Introduction

This section provides information on currently available options for **antifreeze** that can help to move the University of Saskatchewan toward its sustainability goals. Living within the boundaries of our sustainability goals requires us to apply two main strategies:

**Dematerialization** requires that we reduce the amount of materials as much as possible; and that we continually move toward the use of 100% recycled content.

**Substitution** requires that we find less harmful materials to replace those that currently damage and are not recyclable.

**Sustainable purchasing** is about including social, environmental, financial and performance factors in a systematic way. It involves thinking about the reasons for using the product (the service) and assessing how these services could be best met. If a product is needed, sustainable purchasing involves considering how products are made, what they are made of, where they come from and how they will be used and disposed.

Finally, remember that this is an evolving document – it will change with new information as our understanding of sustainability impacts and potential solutions improves.

### Purchasing Services

Tel: (306) 966-6704  
Email: [purchasing.services@usask.ca](mailto:purchasing.services@usask.ca)

### Office of Sustainability

Tel: (306) 966-1236  
Email: [fmd.sustainability@usask.ca](mailto:fmd.sustainability@usask.ca)

**Smart Purchases  
Big Impact**

Wherever possible **CHOOSE** products that employ a combination of characteristics listed in the left hand column, and **AVOID** products that demonstrate characteristic in the right-hand column.

### CHOOSE

- EcoLogo certified
- Recycled
- Extended-life antifreeze
- Polypropylene Glycol

### AVOID

- Ethylene Glycol

## Option: Use EcoLogo Certified Products

**Strategy: Dematerialization – Less Waste (SO 1, 2, 3, 4)**

Environmental Choice certified antifreeze is assessed based on its production methods and product contents, and is generally more sustainable than other alternatives. Selecting these products does not eliminate all sustainability impacts, but they are among the best options available on the market at present.

## Option: Use Recycled Antifreeze

**Strategy: Dematerialization – Less Waste (SO 2)**

Recycling antifreeze enables the reuse of glycol, which reduces the amount of glycol introduced into nature.

There are two main steps involved with recycling antifreeze: 1) removing contaminants and, 2) restoring critical antifreeze properties with additives. These processes still have sustainability implications due to the removal and subsequent disposal of heavy metals and the addition of persistent additives. However, these are less harmful overall than using virgin antifreeze products.

## Option: Use Extended Life Antifreeze

**Strategy: Dematerialization – Resource Efficiency (SO 1, 2)**

Extended Life Antifreeze differs from conventional antifreeze in that organic acid salts replace traditional corrosion inhibitors. Conventional antifreeze lasts only two or three years while extended-life antifreeze is designed to last five years, or more than 150,000 km. This greatly reduces the need to purchase and dispose of antifreeze products. As glycol is derived from natural gas, using extended life antifreeze reduces the amount of petroleum or natural gas extracted from the Earth's crust. Most extended life antifreezes do not contain silicates and phosphates, which are common in conventional antifreeze. The elimination of phosphates will eliminate associated eutrophication effects.

## Option: Substitute Propylene Glycol (PG) for Ethylene Glycol (EG)

**Strategy: Substitution – Nature-like (SO 2)**

Propylene Glycol (PG) based antifreeze is less toxic than ethylene glycol (EG). When antifreeze is required, choosing the less harmful substance is likely to reduce the negative impacts



# Arriving at the currently preferred options

## 1. Identify the service

In heating systems or internal combustion engines, antifreeze is used to prevent cooling water from freezing and causing damage.

## 2. Assess the need

The University of Saskatchewan requires functioning systems and vehicles in all weather conditions.

## 3. Identify the contents

There are two main types of antifreeze, each categorized by their primary component: 1) **ethylene glycol** (EG) - a synthetic solvent, and 2) **propylene glycol** (PG). Additional components added to antifreeze products include **corrosion inhibitors**, **anti-foaming agents**, **colouring agents**, and **metal and glycol antioxidants**.

## 4. Identify sustainability impacts

i. ....systematically increasing concentrations of substances from the earth's crust?

- The disposal of used antifreeze contributes to systematic increases of concentrations of **heavy metals** in nature, even though these elements were not introduced into the system through the antifreeze itself. Used antifreeze contains heavy metals (e.g. lead, mercury, cadmium, chromium, copper, and zinc) and other contaminants (e.g. oils, benzene from gasoline) that are picked up as antifreeze circulates through the engine. This is particularly true in older vehicles that have metal radiators with soldered joints.
- The feedstocks for both ethylene and propylene glycols (EG and PG) are derived from non-renewable **natural gas** resources, which are extracted at a rate much greater than their components can be assimilated by natural systems. This extraction can therefore create a build-up of carbon in the ecosphere once the glycol breaks down.

ii. ....systematically increasing concentrations of substances produced by society?

- Both **ethylene glycol** and **propylene glycol** are synthetic substances made by society. Although these glycols do not directly accumulate in nature, they break down to form carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). CO<sub>2</sub> accumulates in nature causing negative impacts, such as climate change.

- Substances added to antifreeze products, such as **corrosion inhibitors**, **anti-foaming agents**, **colouring agents**, and **metal** and **glycol antioxidants**, can accumulate in natural systems, becoming toxic to life at unknown thresholds.

iii. ....systematically degrading nature by physical means?

- In cases where **petrochemicals** are derived from developments where land is not properly reclaimed and restored, this can contribute to the degradation of nature by physical means.
- Antifreeze that is not **disposed** of properly contaminates water, which negatively impacts aquatic habitat and associated riparian environments.

iv. ....systematically undermining people's ability to meet their basic human needs?

- EG is **highly toxic** to humans. It is both a nasal irritant and a neurotoxin and its vapors contribute to the formation of urban ozone pollution (smog). Because EG has a sweet taste that may attract unsuspecting animals or children, proper handling, storage and disposal is extremely important. PG is similar to EG, however, it requires much higher concentrations to be toxic.

## 5. Envision sustainable antifreeze

Ultimately, the vision for coolants in a sustainable society depends on the design of the automobile or system. Internal combustion engines fabricated with materials having greater heat absorbent properties, such as ceramics or composites, could lessen or eliminate the need for engine coolant systems altogether. However, if antifreeze is necessary in the short term, it could be managed sustainably if:

- Petroleum feedstocks could be replaced with sustainably-harvested and renewable and biological feedstocks.
- It does not contain persistent synthetic compounds, such as additives.
- Components are 100% recycled in tight technical cycles so that no persistent synthetic substances or substances that originate from the earth's crust disperse and build up in nature.

continued on page 3...



## 6. Identify and prioritize alternatives

Step 6 helps identify the product or service that offers the best pathway toward meeting all four of our Sustainability Objectives by using the following three criteria for assessment:

- a) Does the product or service move us in the right direction with regards to our four Sustainability Objectives?
- b) Does the product or service create a flexible platform for the next step toward sustainability?
- c) Is the decision financially viable?

## Resources and Additional Information

1. Ecologo – Glycol Free Anti-freeze  
[http://www.ecologo.org/en/seeourcriteria/details.asp?ccd\\_id=283](http://www.ecologo.org/en/seeourcriteria/details.asp?ccd_id=283)



This guide was made possible through the generosity of the Whistler 2012 project, which shared its template and much of its research.