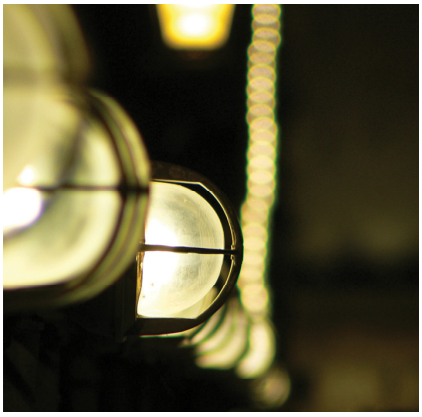
University of Saskatchewan

Smart Purchases Big Impact

Sustainable Purchasing Guide

Vending Machines

Sustainability... your university, your world



UNIVERSITY OF SASKATCHEWAN

Vending Machines

Introduction

This section provides information on currently available ***vending machine*** options 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.

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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	AVOID
• An appropriate number of machines • Energy Star approved machines • Efficient lighting • Proximity sensors	• Plastic components • CFC and HCFC refrigerants

Option: Choose the Appropriate Number of Vending Machines

Strategy: Dematerialization (SO 1, 2, 3)

Ensure that usage of vending machines is monitored and that infrequently used machines are removed. Underutilized vending machines waste energy without serving a useful purpose. Maintenance of machines should include prompt repair when required.

Broken vending machines continue to draw power, even while providing no function.

Option: Choose Energy Star Approved Vending Machines

Strategy: Substitution – Energy Efficient (SO 1, 3, 4)

The international ENERGY STAR symbol identifies major electrical appliances, including vending machines, which meet or exceed technical specifications designed to ensure that they are among the most energy efficient in their class, without compromising performance.

Option: Choose Energy Efficient Lighting

Strategy: Substitution – Energy Efficient (SO 1, 3, 4)

A typical vending machine with a front-lit display panel uses two or three high-output fluorescent lamps powered by conventional magnetic ballasts, drawing as much as 150 watts of power at a continuous load. The heat from the lights also increases the machine's refrigeration load. In one test, disconnecting vending machines lights cut energy use by 35 percent. Specifying or retro-fitting light fixtures with energy efficient T-8 tubes and electronic ballasts will reduce the energy consumption.

Option: Proximity Sensing

Strategy: Substitution – Energy Efficient (SO 1, 3, 4)

Some vending machines are capable of sensing whether the area is occupied and reducing power consumption accordingly. This may mean stopping the compressor from cycling or dimming the lights in the machine. This will further reduce the amount of energy the machine consumes and thus reduce the sustainability impacts of that energy production.

Option: Choose Environmentally Friendly Refrigerants

Strategy: Substitution – Energy Efficient (SO 2)

For many years, the most common refrigerant in vending machines was chlorofluorocarbons (CFCs). Over time, scientific evidence emerged which showed that CFCs were significant contributors to ozone depletion. After extensive regulation to curb this problem, CFCs were phased out and replaced with alternatives. Today, hydrofluorocarbons (HFCs) are the refrigerant of choice. Although these do not cause ozone depletion, HFCs are still a potent greenhouse gas. More environmentally friendly refrigerants such as carbon dioxide and hydrocarbons (isobutane or propane) are poised to replace HFC's. Although carbon dioxide is still a greenhouse gas, these refrigerants have decreased ozone depletion potential and global warming impact.

Option: Reduce Plastic Components

Strategy: Substitution – Recyclable (SO 2, 3)

Choose products containing materials that have high end-of-life value with more metal and less plastic parts. These are more easily recycled and provide a value incentive for the producer to reclaim used products and incorporate recycling into its manufacturing process.

Arriving
at the currently preferred options

1. Identify the service

Vending machines provide easily accessible food and beverages at anytime during the day or night.

2. Assess the need

Vending machines are commonly used by students, staff and faculty at the University of Saskatchewan to access food and drink for convenience or when food services outlets are closed.

3. Identify the contents

Vending machines are primarily constructed from four major materials: galvanized ***steel***, polycarbonate (***plastic***), ***acrylic powder coatings***, and ***polyurethane insulation***.

The bulk of the machine is constructed from galvanized steel. Galvanized steel is very strong, yet comparatively lightweight and it is relatively flexible and corrosive resistant. It is a mined, nonrewable resource.

Polycarbonate, a tough thermoplastic, is used in the front panels of the vending machine. Polycarbonate is very difficult to break, flame retardant, relatively easy to shape, and can be treated to restrict UV rays, light, and heat transmission.

Acrylic powder coatings used to paint the surfaces of vending machines. The powder is applied in a uniform layer and baked on during the manufacturing process. Acrylic coatings withstand the rigors of weather and abuse better than paints that are applied wet. Acrylic is a petroleum-based compound. Powdered acrylic paints are comprised of three main components: ***binders*** (generally epoxy), ***pigments*** and ***fillers***.

Polyurethane (a hydrocarbon) foam provides the insulation for the inside of the vending machine. The foam is blown between the outer cabinet and internal tank of the machine, where it cures into a very tough, rigid material. The stiff foam also adds structural stability to both the cabinet and tank of the machine.

Vending machines also include ***electronic devices*** including computer control boards, refrigeration units, and lighting.

Refrigerants are used in vending machines. Traditionally these were chlorofluorocarbons (CFCs) which destroy the ozone layer. These are now generally replaced with hydrofluorocarbons, carbon dioxide and hydrocarbons (isobutane or propane).

4. Identify sustainability impacts

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

- The production, shipment and use of vending machines require fossil fuels. The consumption of ***fossil fuels*** results in increasing concentrations of carbon dioxide (CO2) and sulphur oxides (SOx) in the air. Increasing concentrations of these substances in nature can contribute to a number of negative outcomes such as climate change and acid rain as well as negative human health impacts.

continued on page 3 . . .

4. Identify sustainability impacts (con't)

- Vending machines use electricity to operate. In Saskatchewan, most electrical energy is generated from the combustion of ***coal***, a fossil fuel. Coal is a large emitter of carbon dioxide which results in negative impacts such as climate change and acid rain.
- The ***steel*** used in vending machine production is a nonrewable resource. Steel takes millions of years to accumulate and supplies are not limitless.

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

- Currently most vending machines end-up in local landfills where many parts, including large amount of ***plastics*** in the body of a vending machine, don't break down. The plastic persists in the environment after it is used and discarded. While it is true that over time and under the right conditions plastics will oxidize, fragment and disintegrate – with continued strong growth in the use and disposal of plastics, the timeline is too long to prevent their accumulation in nature.
- For many years, the ***refrigerants*** used in vending machines were chlorofluorocarbons (CFCs) which destroy the ozone layer. CFCs were replaced with hydrofluorocarbons (HFCs) which don't damage the ozone layer like CFCs do, but are a potent greenhouse gas.

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

- The production of vending machines requires the use of mined raw materials such as steel. ***Mining*** requires the removal of land and ecosystems, degradation the earth's surface. Mining a nonewable resource, such as steel, systematically degrades nature, moving us away from SO 3, unless this land is completely reclaimed.

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

- Polycarbonate is synthesized from bisphenol A and phosgene (carbonyl dichloride, $COCl_2$), and commonly found in vending machines. It has been found that bisphenol A may leach from the polycarbonate plastic into food and water sources. Bisphenol A is a suspected carcinogen and is toxic to ***human health***.
- There some human health concerns related to the combustibility of certain refrigerants such as propane.
- Climate change impacts available water and food sources within various areas of the world.

5. Envision sustainable vending machines

In the future, sustainable vending machines would be highly energy efficient. In addition, there would contain no components derived from the earth's crust (eg. petrochemicals and metals), unless they could be 100% captured and reused. Similarly, they would contain no components that are persistent in nature (eg. plastic) unless they were could be 100% captured and recycled.

The production process would:

- not contribute to the increased concentrations of substances from the earth's crust or the buildup of persistent compounds in nature,
- use only sustainable renewable energy or energy produced in a carbon-neutral manner;
- not rely on practices that systematically physically degrade land and ecosystems; and
- not rely on practices that compromise human health.

6. Identify and prioritize alternatives

To identify the best options, review the Current Options on page one and choose the most appropriate alternative 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. Vending Machine Energy Savings
   http://www.michigan.gov/documents/CIS_EO_Vending_Machine_05-0042_155715_7.pdf
2. Energy Star: Vending Machines
   http://www.energystar.gov/index.cfm?c=vending_machines.pr_proc_vendingmachines
3. University of Toronto Refrigerant Report
   http://www.daikin.com/csr/information/influence/03.html

WHISTLER

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