

GREEN MAINTENANCE

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Executive Summary

The goal of this report is to identify environmentally friendly alternatives to the current cleaning products used on the campus of the University of Waterloo. The retrofit design of the Environmental Studies 2 building in particular should incorporate these products as an example to the rest of the campus. A previous study of this nature was conducted in the Spring of 1991. For this updated study, the group looked at the unfavourable qualities of the G.H. Woods products currently being used by custodial services, such as levels of hazardous materials and lack of biodegradability. Methodology information was gathered through a variety of sources including Material Safety Data Sheets, the Internet, distributed questionnaires and customer service representatives. No single alternative product was decided upon as the group reached the conclusion that further research must be conducted in the area of feasibility in regards to switching over to environmentally friendly cleaning products.

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- Tom Galloway, Director of Plant Operations for the University of Waterloo
- Patti Cook, WATgreen Chair and Waste Management Coordinator
- Phil Frowd, Manager, Plant Operations and Custodial Staff of ES2
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1 Introduction

In the Fall of 2004 at the University of Waterloo (UW), a group backcasting exercise was undertaken in Professor Paul Kay's Environment and Resource Studies (ERS) 250 class, Greening the Campus. Backcasting is the process of envisioning a future scenario, and then plotting a plausible history of that future. This creates a series of attainable steps that form a strategy for making the envisioned future a reality. For the ERS250 class, the goal of this exercise was to develop recommendations for the greening of the future home of the ERS department: the Environmental Studies 2 (ES2) building. The brainstormed ideas for the ideal "green" home for ES were categorized into subject areas, including environmentally friendly building maintenance, to be further investigated by smaller groups within the class. This project focuses on the expressed class preference for green maintenance of the ES2 buildings.

2 Context

2.1 WATgreen and Greening the Campus

The aforementioned recommendations were to be formulated with WATgreen objectives in mind. The ERS250 course is part of the campus WATgreen initiative, which was formed in 1990 by a group of UW staff and students. The WATgreen vision statement highlights the campus as a sustainability showcase that improves environmental quality and reduces operational costs for the University (UW website, 2004).

2.2 Environmental Studies 2 Building

The Fall 2004 ERS250 class was told that in 2005, the ERS department would be moving into the Environmental Studies (ES) 2 building, which had been vacated by the Architecture department. The class was also informed that the building was undergoing redesign to

accommodate ERS requirements. The building is adjoined to ES1 on the west side and plans for the construction of additional office space are in progress. Any student projects undertaken must take into account the structural and occupational requirements of the building.

3 Purpose

3.1 Scope of Study

The maintenance group reviewed interior and exterior maintenance practices on campus and for the purposes of this report, selected for detailed investigation nine chemical cleaning products in use for indoor maintenance in the Environmental Studies buildings. Review of these particular products, while linked to other Greening the Campus initiatives, was viewed by the group as the least likely to encroach on an area of study undertaken by another ERS 250 group. By comparison, investigation of maintenance duties such as garbage collection could be seen as an infringement on the Waste Management group initiatives. Similarly, looking at lawn maintenance practices could interfere with the intentions of the Landscaping group.

Evaluation of chemicals in use by maintenance staff was seen as likely to result in recommendations that would improve environmental quality and reduce expenditures. Therefore, cleaning products were chosen for closer examination with respect to these stated WATgreen goals. Criteria for environmentally friendly cleaning products were researched, and the feasibility of a switch to such alternatives was investigated. This paper details the information that was found, suggests topics that would benefit from further investigation, and discusses methods such as fundraising that could contribute to the feasibility of implementing the use of alternative cleaning products in the Environmental Studies buildings.

3.2 Contribution to WATgreen

The WATgreen movement on campus depends on participation by staff and students with strong environmental initiative (See Section 2.1, “WATgreen and Greening the Campus”). Many WATgreen proposals and initiatives over the course of WATgreen’s existence have resulted from student projects and research studies, particularly those generated in ERS 250, Greening the Campus. “The data collected by students in this course are used as the basis for other student work and as a baseline for measuring improvement in UW's environmental profile.” (Cook, 2004). These projects typically identify aspects of campus activity requiring improvement in order to be considered more sustainable, or build on previous studies which conclude with recommendations for further research.

This WATgreen study may loosely be considered an extension of a previous WATgreen project, “Greening Custodial Services: The Development of Environmental Criteria for the Purchasing of Cleaning Compounds” (Ermacora et al., 1991).

Similarities between the earlier project and the current one include the hypothesis that cleaning products used on campus could be more environmentally benign, and the suggestion that criteria should be used to influence purchasing decisions. Both projects also suggest that life cycle cost of cleaning products should be taken into account when making such decisions: “when considering cleaner alternatives, the total environmental equation should be examined, including raw material production, packaging, toxicity, recyclability and the current level of technical knowledge” (Ermacora et al, 1991).

Likely due to the absence in 1991 of environmental standards for cleaning products, and a relative dearth of biodegradable cleaning product brands, the Ermacora et al report does not contain a comparison on the environmental implications of a number of cleaning products.

Recommendations made in “Greening Custodial Services” suggest that further research should be conducted by the university through the implementation of trial periods using different, yet unspecified, products. In 2004, both the standards and the brand options exist and were accordingly researched and compared.

4 Objectives

4.1 Cleaning Products Currently Used

The cleaning products in use by custodial staff in the maintenance of ES2 were to be identified. Via an interview with Plant Operations Director Tom Galloway, GH Woods was identified as a major supplier of cleaning products for ES2. The list of chemical cleaning products supplied by GH Woods includes the following nine which were selected for more detailed investigation:

- Carpet Spot and Stain Remover
- Chewing Gum & Candle Wax Remover
- Germicidal Toilet Bowl Cleaner
- Multi-Purpose Spray N Wipe
- Redi-Pro Glass and Counter Cleaner
- Redi-Pro Spray Disinfectant Cleaner
- Stainless Steel Cleaner
- Spray Glo Furniture Polish
- Total (a combined cleaner and polisher)
- Vardet 383 Degreaser (biodegradable)

Details on these products is provided in Section 5.3

4.2 Cleaning Product Alternatives

Cleaning product alternatives needed to be sourced. Personal experience of group members provided some brand names for preliminary investigation. Further research to develop product comparison criteria yielded additional brand names which had been certified under Canada’s EcoLogo program. Although certain of the products known to individual project

members were not certified under the EcoLogo program, their properties were nonetheless studied, in order to assess the differences (if any) between products that claimed to be less harmful to the environment and those that had that claim substantiated by certification.

4.3 Custodial Services

The perspective of custodial staff, regarding the need (or lack thereof) for improvements to maintenance practices, was sought, in order to make recommendations inclusive of their viewpoint. The available feedback was limited; however it appeared to reflect similar opinions to those expressed in a more comprehensive survey of custodial staff during the 1991 study. In general, custodial staff opinion was neutral on the subject of environmental alternatives to standard cleaning products, with a degree of scepticism as to the efficacy of those alternatives implied. Input from custodial services is given in greater detail in Section 6.1.

5 Methodology

5.1 Information Gathering

The group held a meeting with Tom Galloway, Director of Custodial Services, Plant Operations, to determine the responsibilities of maintenance staff, thereby determining the focus for the project. Tom Galloway provided the group with a list of products used by maintenance staff to clean the interior of the university. Material Safety Data Sheets (MSDS) were obtained via the internet for cleaning products currently in use. These sheets were used to assess the safety of the people using the products, of the people using the spaces cleaned by these products and of the environment. The group agreed that the current products in use by maintenance staff could be improved upon in order to decrease the negative health implications, and negative impacts on the environment. Five alternative products were chosen based on group members'

familiarity with the product from personal use and or past retail experience. These products were to be investigated further to gather detailed information on the sustainability of their use. This information was gathered through the products' web sites and the various companies' customer service phone numbers (refer to section 5.4). After the required information was gathered on alternative products it was decided that further information needs to be obtained to make a solid recommendation for alternative cleaning products for usage in ES2. Gaps in the information collected are detailed in Section 8 Limitations.

5.2 Questionnaire

A list of questions to ask the maintenance staff regarding their current use of cleaning products was brainstormed by the group. The list of questions was refined based on comments by ERS250 Professor Paul Kay and WATgreen Chair Patty Cook. A past WATgreen project, "Greening Custodial Services: The Development of Environmental Criteria for the Purchasing of Cleaning Compounds", was also used as a reference in the production of the questionnaire. Additional revisions to increase the quality of information received were made after review of the rather uninformative staff responses to survey questions obtained in the past project. The revised questions were then split into those that required review by the Office of Research Ethics (ORE) and those that did not. Those requiring ethics review were submitted to the ORE for comments and, pending any modifications required, approval. After those questions requiring ethics review were approved, they were forwarded with the non-ethics questions and given to Patti Cook, who in turn sent them to the custodial manager Phil Frowd. The questionnaire was answered by Phil Frowd, who returned his responses to Patti Cook, who then relayed the information to the group.

5.3 Research on Cleaning Alternatives

A product supply list from G.H. Woods was obtained from Tom Galloway of Plant Operations, including all cleaning supplies purchased by the university. From this list, chemical cleaning products were looked at individually and analyzed in spreadsheet format for easy comparison with alternative products (See Appendix). Material Safety Data Sheets were obtained for each of these products, the information from which was put into the spreadsheet (See Section 6.2.2, “Physical Properties”).

The Eco-logo Certification program was researched and identified as a good basis upon which to make comparisons between different product lines. It shows that a product is an environmentally friendly choice. “A product or service may be certified because it is made or offered in a way that improves energy efficiency, reduces hazardous by-products, uses recycled materials or because the product itself can be reused” (Environment Canada, 2002). Environment Canada also provides to the consumer a list of companies that have obtained the Eco-logo certification. From this list, several additional companies were selected for research and comparison of their line of cleaning products.

Once categories for comparison were established, alternate products and suppliers could be researched. Several alternative product lines were put under investigation by the group members. Different products were brainstormed based on group members’ product use at home, via retail experience and Internet searches. Some of these product lines were obtained from the Eco-Logo certification program’s list, while others were not present on this list. Research was conducted on these companies to gain a different perspective of the types of products available, as well as determine the difference between a certified and a non-certified company. Each of these suppliers was researched in terms of environmental responsibility (See Section 6.2.1,

“Company Profile”). The products’ Material Safety Data Sheets were then obtained and in most cases, information was provided that allowed for comparison between these products and G.H. Woods’ products currently in use. These sheets were available either directly off the company’s website, or by searching separate internet databases of MSDS (Material Safety Data Sheets Online, 1999-2004). At this point, comparisons were made between products to determine the most environmentally friendly.

5.4 Research on Evaluation Methods

A spreadsheet for the comparison of product properties was developed using characteristics from Eco Logo, MSDS, and a Prism Chemicals sample product comparison sheet. EcoLogo, MSDS, and Prism Chemicals criteria were collected from various sites on the internet. The information used to fill in the comparison spread sheet was found by use of the internet. Pricing, packaging and distribution information was gathered by calling the products customer service information line.

An attempt to gather information on the life cycle of the various products was made, including an attempt to gather energy consumption data for all stages of product production. This information was looked for on the internet, but proved difficult to obtain.

6 Results

6.1 Maintenance Staff Questionnaire

An aggregate response was received from Phil Frowd on behalf of the maintenance staff at ES2. Questions were split into two separate questionnaires: one that required Ethics Clearance and one that were answered through Patti Cook.

There is a lack of awareness of WATgreen initiatives in response to issues that have risen since the last WATgreen project implementation. The training received in regards to environmentally friendly cleaning products is limited to that as prescribed by WHMIS. No one-time use products are currently being used in ES2.

Table 1: Frequency of Product Use (below) outlines the frequency that each product type is used. Products used on a daily basis include: degreaser, cleaner and polisher, toilet cleaner, glass and counter cleaner, disinfectant, and multi-purpose cleaner.

Table 1: Frequency of Product Use

Product	Daily	More than once a week	Once a week	More than once a month	Once a month or less	Never
Aerosol Spot and Stain Remover					X	
Vardet Degreaser	X					
Total Cleaner and Polish	X					
Spray Glow Furniture Polish					X	
Germicidal Powdered Cleaner	X					
Gum Remover		X				
Redi Pro Glass & Counter Cleaner	X					
Redi Pro Spray Disinfectant Cleaner	X					
Redi Pro Spray and Wipe	X					
Stainless Steel Cleaner Aerosol			X			

A neutral response was received when asked to respond to the following statement: “Some or all of the cleaning products and procedures in use are harmful to the environment.” Reasons given for the neutral response was since the exhausted cleaning products are discarded directly into the drains, the waste water treatment plant is adequate in treating the discarded chemicals.

Great care is taken when handling cleaning product including using protective gear and using chemicals as directed. No adverse effects such as eye and skin irritation have been reported.

The statement “I would be interested in seeing a demonstration as to the effectiveness of cleaning recipes containing ingredients such as baking soda and vinegar, on some sample routine cleaning tasks” received a neutral response. It is also perceived that baking soda and vinegar will not meet the disinfectant needs of the cleaning environment.

6.2 Cleaning Alternatives Investigation

In addition to the current supplier, the products of five suppliers were reviewed. Products were selected according to their function in comparison to those currently used in ES2 that are supplied by Wood Wyant. Table 2 outlines the products chosen for review from each supplier. Physical properties of each product were summarized in a spreadsheet (see Appendix B: Material Safety Data Sheet Summary)

Table 2: Cleaning Products Investigated

Supplier	Cleaner Type									
	degreaser	stainless steel	multi-purpose	disinfectant	glass and counter	gum remover	furniture	toilets	carpet cleaner	cleaner and polisher
Wood Wyant	Vardet 383	Stainless Steel Cleaner	Redi-Pro Spray 'n Wipe	Redi-Pro Spray Disinfectant	Redi-Pro Glass and Counter	Gum Remover	SprayGlo	Bowl Cleaner	Carpet Spot and Stain Remover	Total Cleaner and Polisher
Earth Sense	Degreaser Cleaner		Spray & Wipe Cleaner	Healthcare Disinfectant Neutral Cleaner	Glass and Multi-Surface Cleaner			Non-Acid Bowl & Bathroom Cleaner	Carpet Shampoo	
EcoGent			General Purpose						General Purpose	
EnviroSolutions	Alkaline Degreaser, Neutral Degreaser	Stainless Steel and Furniture Polisher	Spray and Wipe Cleaner	Disinfectant Cleaner and Odour Eliminator	Glass Cleaner		Stainless Steel and Furniture Polisher	Washroom Cleaner, Bowl and Urinal Cleaner	Stain and Spot Remover	Stainless Steel and Furniture Polisher
Seventh Generation	Cleaner and Degreaser		All-purpose Cleaner		Glass and Surface Cleaner			Toilet Bowl Cleaner, Bathroom Cleaner		
Simply Clean	Detergent/ Degreaser/ super cleaner		All-purpose Cleaner, Vinegar Plus							

6.2.1 Characteristics

Table 3 summarizes the results of the investigation on the characteristics of the cleaning products investigated, such as biodegradability, use of renewable materials, fragrances, and dyes, recyclability of packaging, and whether it was EcoLogo certified.

One of the ten Wood Wyant products investigated was found to be biodegradable. All Ecogent, Seventh Generation and Simply Clean products are biodegradable. EnviroSolutions products, with the exception of the ES78+ Stainless Steel and Furniture Cleaner/Polish, are also biodegradable.

Table 3: Product Characteristics

	Biodegradable?	Materials Renewable?	Fragrance?	Dye?	Packaging Recycled/Recyclable?	EcoLogo?
Wood Wyant (10 Products)	1 Yes	Info N/A	4 Yes	4 Yes	10 Yes	0 Yes
Earth Sense (6 Products)	Info N/A	Info N/A	Info N/A	Info N/A	6 Yes	0 Yes
Ecogent (2 Products)	2 Yes	2 Yes	0 Yes	0 Yes	2 Yes	0 Yes
EnviroSolutions (9 Products)	7 Yes	8 Yes	6 Yes, 3 N/A	6 Yes, 1 N/A	8 Yes	3 Yes
Seventh Generation (5 Products)	5 Yes	5 Yes	3 Yes	1 Yes	5 Yes	0 Yes
Simply Clean (3 Products)	3 Yes	1 Yes, 2 N/A	1 Yes	0 Yes	3 Yes	3 Yes

Information was not available on whether renewable materials were used in Wood Wyant and Earth Sense products, as well as in one Simply Clean product. With the exception of one, all EnviroSolutions products are comprised of renewable materials.

Fragrances are common in close to half of the products that were investigated with the exception of Earth Sense, for which information was not available, and Ecogent, which does not use any fragrances in their products.

Ecogent, Simply Clean and the majority of Seventh Generation products do not contain dyes.

The packaging for all Wood Wyant, Earth Sense, Ecogent, Seventh Generation and Simply Clean products either contains recyclable materials or is recyclable. Packaging for one EnviroSolutions product is neither recycled nor recyclable.

Three of the EnviroSolutions products and all of the Simply Clean products are certified by EcoLogo.

6.2.2 *Health and Safety*

Health and safety information was also investigated using Material Safety Data Sheets (see Appendix C: Material Safety Data Sheets).

Hazard ratings were provided on health, flammability, and reactivity of products from Wood Wyant and Earth Sense. EnviroSolutions provided flammability and reactivity information. The ratings for each category are as follows: 0 = insignificant, 1 = slight, 2 = moderate, 3 = high, and 4 = extreme. All products have insignificant or slight ratings in reactivity. The majority of Wood Wyant and Earth Sense and all EnviroSolutions have insignificant ratings in flammability; there is one moderate, two high, and one extreme rating, which was the Wood Wyant stainless steel cleaner. The health ratings range from slight to high for all products.

Most products tend to have a higher pH or close to neutral, with the exception of the Wood Wyant and EnviroSolutions toilet cleaner, which have a pH level of less than 1 and 2.2, respectively, and Simply Clean Vinegar Plus, which has a pH of 1-3.

Flash point is “the lowest temperature at which a liquid can form an ignitable mixture in air near the surface of the liquid” (Interactive Learning Paradigms Incorporated, 2004). All products either do not have a flash point or one that is fairly high. The Earth Sense glass and counter cleaner has a flash point of 21°C.

Volatile Organic Compounds (VOCs) are “organic chemicals that have a high vapour pressure and easily form vapours at normal temperature and pressure” (Interactive Learning Paradigms Incorporated, 2004). The portion of VOCs in the cleaning products varies greatly from less than 1% to more than 99%.

The majority of the cleaning products investigated would potentially cause eye and skin irritation.

All Wood Wyant products and Earth Sense products, except one, contain hazardous materials. All Ecogent, Seventh Generation and Simply Clean products either do not contain hazardous materials or information was not available.

All EnviroSolutions products and a few Wood Wyant and Earth Sense products either contain combustible materials or are combustible.

6.3 Cleaning Alternatives Supplier Profiles

Five companies were identified as potential suppliers of chemical cleaning products. In addition to the physical properties of the products offered, each company’s environmental benignity with respect to the University of Waterloo, was assessed by evaluation of its environmental mission statement (or equivalent), and the distance from its nearest distributor to the UW campus.

G.H. Woods, a division of Wood Wyant and a major current supplier of cleaning products for the University of Waterloo, was investigated and compared to products offered by 5 alternate suppliers.

6.3.1 G.H. Woods & Wood Wyant (Present Supplier)

G.H. Woods, a division of Wood Wyant, supplies the majority of cleaning products used on campus at the University of Waterloo. The head office is located in Laval, Québec and the

national distribution centre is in Pickering, Ontario. According to the Wood Wyant website, their chemical cleaning compounds in particular are designed to be environmentally friendly and free of chlorofluorocarbons. Also, many (but not all) products are formulated specifically to be biodegradable and eliminate phosphates. Wood Wyant's chemical blending plant is "designed to meet or exceed all federal, provincial and municipal laws and regulations" (Wood Wyant, 2001). Despite these statements, research on the nine products selected for review indicated that potential for improvements to product selection exists.

6.3.2 Ecogent

Ecogent is a division of Cogent Environmental Solutions of Caledon, Ontario. The most local distribution centre of Ecogent products is located in Cambridge, Ontario. Ecogent pledges an environmental commitment by providing its consumers with a product that is multi-purpose, instead of relying on numerous products for different applications. Their "Cleaning Without Harming" campaign focuses on simple, mild and natural formula cleaners. Ecogent's cleaner is made from 100% natural ingredients derived from renewable resources which are free of "petrochemicals, phosphates, EDTA, NTA, dyes, synthetic perfumes, preservatives or pesticides" (Cogent Environmental Solutions, 2004). They are recommended for use in educational institutions, among countless other locations, as they are suitable for commercial cleaning tasks.

However, Ecogent products are mild enough that they do not have the disinfecting properties of Wood Wyant products', which Plant Services demands. They do not offer a wide range of products, as they feel their multi-purpose cleaner suffices in all cleaning requirements.

6.3.3 *Earth Sense*

Earth Sense products are manufactured by National Chemical Laboratories. Like many other companies investigated, Earth Sense boasts an “Environmental Responsibility Mission Statement”. However, this statement emphasizes the importance of a safer, healthier work environment by minimizing the risks posed by products to custodial workers and building occupants. The natural environment is not given priority in the context of environmental responsibility. The Earth Sense main distribution centre is located in Philadelphia, Pennsylvania, although their products are available throughout North and South America (National Chemical Laboratories, 2004).

When compared to other alternative products, Earth Sense fails to impress in the categories and information provided on Material Safety Data Sheets. Their main chemical plant makes use of high pressure reactors in the refinement of raw materials for use in their products. They are neither biodegradable nor hypoallergenic, properties which work place cleaners should require in order to be considered as providing a healthier work environment, as stated in the Earth Sense mission statement.

6.3.4 *EnviroSolutions*

EnviroSolution’s mission statement asserts that their products are competitive on all levels, including environmentally-friendliness, cleaning performance and pricing when compared to other major brands of cleaners. The most local distributor of these products is Dominion Equipment and Chemical, which services the Kitchener/Waterloo/Guelph area (EnviroSolutions, 2003-2004). EnviroSolutions’ claim that their products are more environmentally sound are backed by the fact that many are rapidly biodegradable and non-toxic. They contain no hazardous materials and only minimal surfactants, which are present in most common cleaning

agents and lead to the degradation of water sources. Natural based, renewable resources are used whenever possible. EnviroSolutions offers a wide range of-task specific products, has a disinfectant and odour-eliminating cleaner, two factors which Plant Operations would take into consideration when looking at this product line.

6.3.5 Seventh Generation

Seventh Generation is a Burlington, Vermont based distributor that not only produces cleaning products and alternatives to chemical compound cleaners, but also household supplies such as bathroom and facial tissues. Seventh Generation offers a product line that demonstrates corporate commitment to environmental benignity. They achieve this by creating cleaners that are non-toxic, phosphate free and biodegradable, which are derived from renewable resources (Seventh Generation, 2002).

Several different types of cleaners are available through Seventh Generation, but no specific disinfectant. Seventh Generation products are recommended for house-hold cleaning and may not offer the industrial strength required by the University. Without a local distributor, Seventh Generation products would be costly to import and transportation implications may have negative effects on the environment.

6.3.6 Simply Clean

Simply Clean products are free of phosphates, volatile organic compounds, and hazardous materials. The terminology used to describe their products is “environmentally responsible” and they refer to their products as such because of the minimal ecological impacts they claim to have through their entire manufacturing, packaging and distributing process (Simply Clean, 2004). Product formulation relies on ingredients that are mainly vegetable-based, renewable resources. Simply Clean does not provide a lists of its ingredients as they feel

this information is proprietary. There is a limited range as far as cleaning product variety is concerned; instead the company relies on the universality of their multi-purpose cleaner.

7 Analysis of Cleaning Alternatives

7.1 Environmental Impacts

Biodegradability is very important in a cleaning product since these enter our water system in cumulative amounts which increase the burden on wastewater treatment facilities. All suppliers, except Earth Sense (for which information was not available) and Wood Wyant, offer an extensive set of products that are biodegradable. EnviroSolutions which offers the most extensive product line comparatively to Wood Wyant also offers the most biodegradable products. EnviroSolutions products therefore may provide great benefit since when properly disposed, most cleaning water that has been exhausted will be poured down indoor drains that lead directly to sewage pipes and municipal water treatment. Using renewable materials is important in developing sustainable practices and products. All products offered by Ecogent and Seventh Generation and most products by EnviroSolutions and Simply Clean are comprised of renewable materials. Eight of nine EnviroSolutions products are renewable and covered all the cleaner types with the exception of a disinfectant.

Recyclability and recycled content of packaging is important so that we can ensure we are encouraging environmental stewardship and sustainability by recycling materials. All suppliers show environmental stewardship comparatively well in terms of using recycled or recyclable packaging.

Fragrance more or less has an impact on the health and safety environment of the user, depending on individual sensitivity. In some cases, the natural oils, which provided the fragrance, are a cleaning agent of the product.

The health rating is an indication of the type of exposure a user may have with the product. The most severe rating found in the cleaning products is a three which indicates injury may occur though only through a short exposure therefore appropriate safety gear must be worn when using these products. Three Wood Wyant products contain a health rating of three. The most severe rating for Earth Sense products is a two, which indicates prolonged exposure may cause injury. The flammability rating is an indication how easily the product may ignite. The Wood Wyant Stainless Steel cleaner has a rating of four, which indicates it will evaporate very quickly which may then burn very easily. Ratings of three indicate that the product may ignite under ambient conditions, which belong to one product from each Wood Wyant and Earth Sense. The rest of the products had an one or two rating which indicates the product must be heated before it will burn. The majority of products had ratings of zero, which indicates it will not burn. All products are fairly stable.

Most products contained a basic pH level. This causes more of a hazard than acidic products since basic substances are harder to flush out of eyes upon contact than acidic substances (Interactive Learning Paradigms Incorporated). The low flash point of the Earth Sense glass and counter cleaner also poses a concern if not handled with care.

Some VOCs are hazardous to human health and should not be inhaled. However, many of the Wood Wyant and EnviroSolutions products have a high percentage of VOCs. These VOCs may be carcinogens, may be flammable, and may contribute to sick building syndrome.

Most products were eye and skin irritants. Therefore contact with eyes and prolonged contact with skin should be avoided and protective gear should be worn as a precaution when handling any cleaning product.

All Earth Sense, except one, and Wood Wyant products contained hazardous materials. Hazardous materials are controlled products under Workplace Hazardous Materials Information System (WHMIS) and must be handled by properly WHMIS trained individuals. Combustible products must also be handled with care and stored properly, which apply to less than half the products investigated.

7.2 Price

Pricing information was difficult to obtain in useful detail for the purposes of this analysis. Pricing is discussed in Section 8 Limitations and Assumptions and Section 10 Further Studies.

7.3 Rating System

Difficulties were encountered in obtaining information that would assist the group in developing a more comprehensive rating system than that compiled for this study. These issues are discussed further in Section 8 Limitations and Section 10 Further Studies.

8 Limitations and Assumptions

In general this project is limited in that a narrow selection of maintenance products is studied. Within that reduced scope additional limitation exist related to feedback from various information sources. Questionnaire response was received from manager Phil Frowd, whose factual responses can be considered accurate, however his responses to opinion questions are not necessarily representative of the maintenance staff in general. Time limited the ability of the group to obtain sufficient pricing information in order to make feasible recommendations for alternative product purchases. Response to an information request on current spending for cleaning products in ES2 is pending. Feedback on pricing information requests from suppliers is

pending. Repeated phone calls have been transferred to voice mail with no response received to date. In an attempt to assess customer service for one company in particular, a major client was contacted but again voice mail message left elicited no response.

Products studied were reviewed on the basis of MSDS data and efficacy was not tested.

Additional limitation sources included the lack of availability of energy consumption data for production of chemical cleaning products. This impaired the group's intention of developing a rating system for alternative products that would include a life cycle cost assessment.

Although the locations of distribution centres could be determined for suppliers, manufacturing locations were not identified and would have an impact on a complete life cycle cost analysis.

Finally, the number of alternatives investigated was not the list of all alternatives available. A better supplier may exist that has not been identified by the research done for this study.

9 Conclusion

This project was able to make significant improvements on the WATgreen data previously available on alternative cleaning products. Criteria have been developed since the original study was conducted, which now allows for some product comparison. In addition, the availability of product lines appears to have improved dramatically since 1991. However, a number of additional information should be gathered in order to make feasible decisions regarding alternative product selection.

9.1 Further Studies

The following list identifies several areas in which more research could be conducted in order to provide the University with a better idea of alternatives to their present cleaning products:

- Detailed pricing information should be gathered for products currently in use, and for potential alternatives.
- More alternative product lines should be sourced to determine whether better potential suppliers exist.
- Trials to determine efficacy of cost-effective biodegradable alternatives should be conducted. One course of action that could be taken to obtain more information about each product would be to contact current users of these products on the institutional level. First-hand information obtained from an actual consumer may be considered more reliable than biased companies attesting to their own products.
- Energy consumption for all aspects of the chemical cleaning products system should be researched, in order to complete a rating system that incorporates life cycle cost assessment. The development of energy consumption for all system inputs and outputs would allow importance factors to be assigned to the various types of criteria currently available.
- Further research should also be conducted in the form of interviews with custodial staff. Their cleaning product preference and reasons behind it may have an influence on the products purchased by Plant Operations.
- The feasibility of a pilot project to implement environmentally benign chemical cleaning products on campus should be investigated. The ideal duration of this pilot project

should be investigated and the potential for such a project to facilitate a campus wide switch to alternative cleaning products. This project would require the cooperation of Plant Operations, custodial staff and the Faculty of Environmental Studies. It may be a costly undertaking (See Section 10.2, “Fundraising”) but would be much more effective than asking for a universal switch in cleaning products without testing. Following up on this project would require input on the cleaner’s efficiency in comparison to those currently in use as well as the cost effectiveness.

9.2 Fundraising

The introduction of new products into the custodial practices of the University will have economic repercussions that can be addressed via fundraising. Switching suppliers costs time and money and the university has obviously remained with G.H. Woods for such a long time for economic purposes as well as its supply of effective cleaning products. Monetary resources would become caught up in the paperwork of changing companies, new equipment purchases, training of staff in new practices and, of course, the probability of an increase in the cost of the cleaning products. Additional funds would also be required for any pilot project that would be implemented or research conducted.

Environmentally friendly cleaning alternatives are typically more expensive than those currently in. This added expense would be much easier to live with if the initial cost of transition were deferred from the department of Plant Operations. The Faculty of Environmental Studies and WATgreen would most likely be given the responsibility of fundraising, particularly for a pilot project taking place in the new Environmental Studies 2 building. There are numerous options when it comes to fundraising ranging from bake sales to the sourcing of sponsorship.

One means of fundraising could be the hosting of special events. Whether contained within the faculty, open to all university students, or extending into the community of Kitchener/Waterloo, selling tickets to events would generate a profit that could be donated to this cause. However, dances, concerts and conventions are time consuming, expensive to host and require a mass of volunteers. Participants in WATgreen and students in Environmental Studies may be willing to contribute. Soliciting local businesses for donations of money or facilities would also defer the cost from the faculty. Opening invitations as a city-wide event would surely generate more profit than appealing solely to “economically challenged” University students.

Of course, the amount of fundraising required would vary depending on the chemical cleaning products being purchased and the company’s bulk supply discount. Approaching the company to ask for trial samples of their product may also be effective. This way, any future pilot project supplies could be provided free of charge by that company on the chance that their product may be chosen and a contract with the university taken out.

9.3 Recommendations

If one product were to be selected based on the limited analysis of this study, it was agreed that EnviroSolutions would be the best option. EnviroSolutions exhibited the widest variety of cleaning products and task-specific compounds that corresponded with the products currently being purchased from G.H. Woods, and while only one of G.H. Woods’ products was biodegradable, three biodegradable products are available from EnviroSolutions. In addition, one EnviroSolutions product was able to perform the function of three G.H. Woods products, reducing the number of products that would need to be purchased. EnviroSolutions also performed well in comparison to other cleaning products as far as Material Safety Data Sheet

information was concerned, which should be taken into account when considering workplace safety. EnviroSolutions provides a wealth of information to the consumer via their website and also has the capacity to supply an institution as large as the University of Waterloo. EnviroSolution's nearest distributor was also the closest in proximity to the University of Waterloo campus of all the product lines studied, reducing the need to burn fossil fuels in order to transport products to the location of use.

However, it should be possible to source a product line that is completely biodegradable, is manufactured and distributed from a nearby source, has the capacity to supply the university, and meets all the requirements of cleaning staff. In addition, repeated failed attempts to contact EnviroSolutions staff for product information did not promote confidence in its Customer Service department. Future studies should provide more satisfactory supplier choices, more valid criteria for supplier evaluation, additional budgetary information to provide feasibility information, and product efficacy information, all of which will lead to the best decision with regard to chemical cleaning products for ES2, the future home of the Environmental Studies department.

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11 List of Terms

Environment and Resource Studies

Acronym: ERS

ERS is a program within the Faculty of Environmental Studies that studies sustainable management of natural resources.

Environmental Choice Program

Alternate Reference: EcoLogo

The Environmental Choice program is "North America's leading benchmark of environmentally responsible products and services" (Environmental Choice, 2004).

Environmental Studies 2 Building

Acronym: ES2

ES2 is the University of Waterloo building that has been left vacant by the School of Architecture which lies adjacent to the Environmental Studies 1 Building.

Flash Point

Flash point is “the lowest temperature at which a liquid can form an ignitable mixture in air near the surface of the liquid” (Interactive Learning Paradigms Incorporated, 2004).

Material Safety Data Sheets

Acronym: MSDS

MSDSs are documents that are required under the Hazardous Products Act for all controlled products.

pH

The pH of a solution is “the negative logarithm of the hydrogen ion (H⁺) concentration (in moles per liter = molarity)” (Interactive Learning Paradigms Incorporated, 2004).

Volatile Organic Chemicals

Acronym: MSDS

Volatile Organic Compounds (VOCs) are “organic chemicals that have a high vapor pressure and easily form vapors at normal temperature and pressure” (Interactive Learning Paradigms Incorporated, 2004).

WATgreen

WATgreen is a project-oriented initiative at the University of Waterloo to provide use campus grounds as a showcase of sustainability.

Appendix A: Cleaning Product System Diagrams

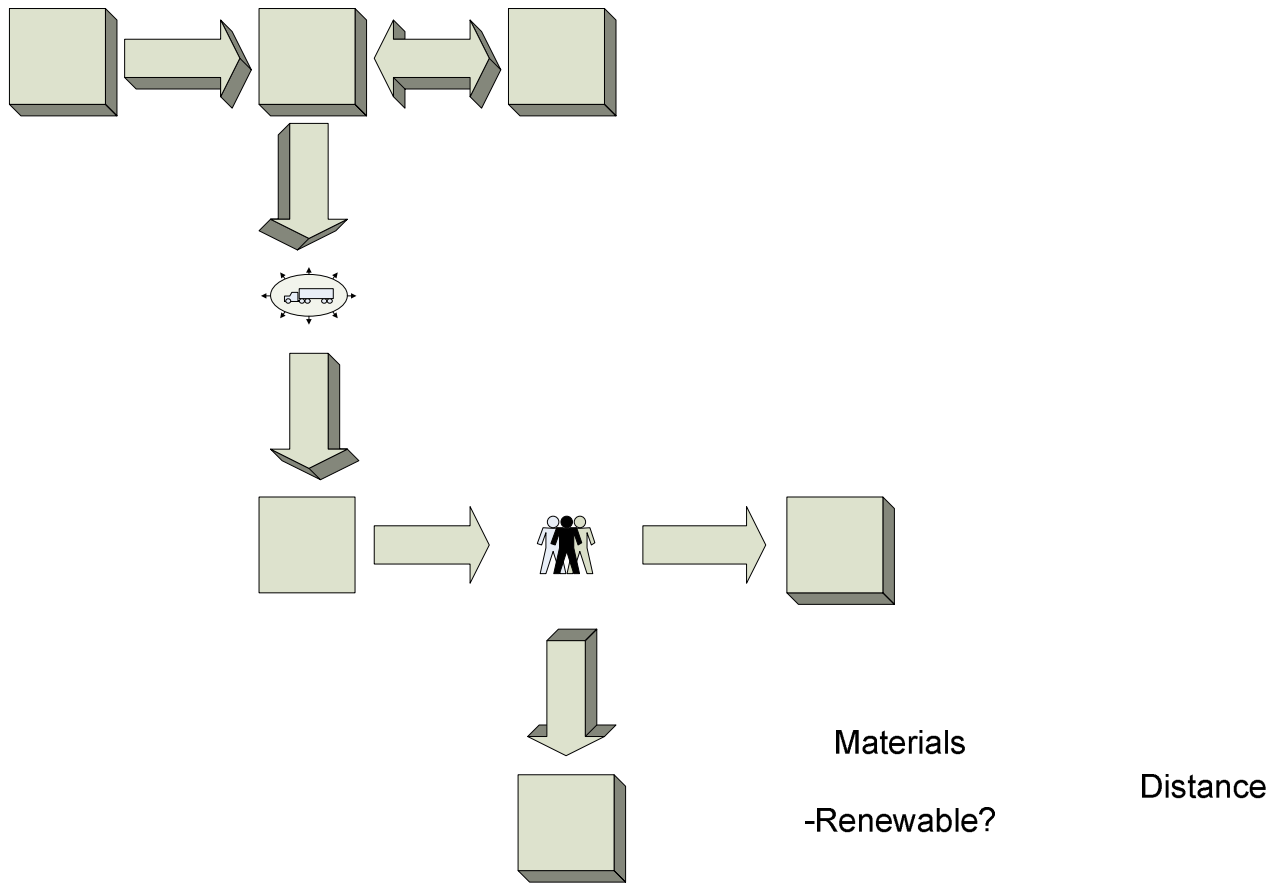


Figure 1: Life Cycle of Cleaning Products

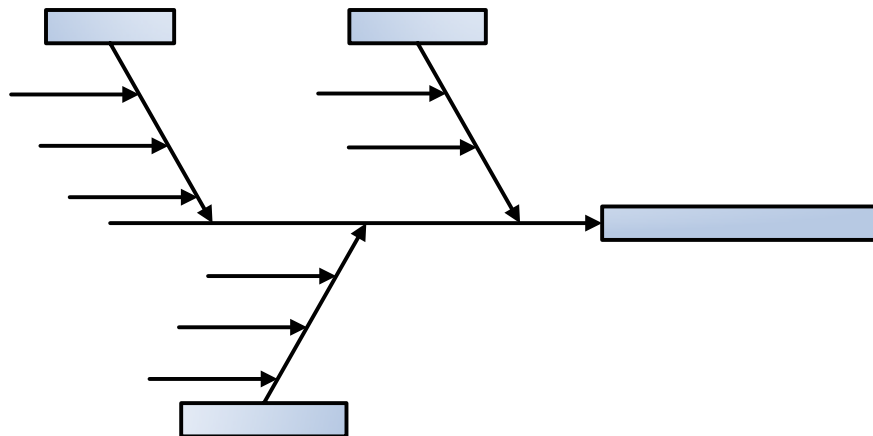


Figure 2: Social, Economical, and Environmental Needs in Green Cleaning Products

Appendix B: Material Safety Data Sheet Summary

Product Type	Product	Biodegradable?	Materials Renewable?	Fragrance?	Dye?	Packaging Recycled/Recyclable?	EcoLogo?
Carpet Cleaner	Wood Wyant Carpet Spot and Stain Remover	No		No	No	Yes	No
Gum Remover	Wood Wyant Chewing Gum & Candle Wax Remover	No		No	No	Yes	No
Toilets	Wood Wyant Germicidal Bowl Cleaner	No		No	No	Yes	No
Multi-Purpose	Wood Wyant Multi-Purpose Spray N Wipe			Yes	Yes	Yes	No
Glass and Counter	Wood Wyant Redi-Pro Glass and Counter Cleaner	No		No	Yes	Yes	No
Disinfectant	Wood Wyant Redi-Pro Spray Disinfectant Cleaner	No		Yes	Yes	Yes	No
Furniture	Wood Wyant Spray Glo Furniture Polish	No		Yes	No	Yes	No
Stainless Steel	Wood Wyant Stainless Steel Cleaner	No		Yes	No	Yes	No
Cleaner and Polisher	Wood Wyant Total	No		No	No	Yes	No
Degreaser	Wood Wyant Vardet 383	Yes		No	Yes	Yes	No
Carpet Cleaner	Earth Sense Carpet Pre-Spray & Extraction Shampoo Super Concentrate					Yes	
Degreaser	Earth Sense Degreaser Cleaner Super Concentrate					Yes	
Glass and Counter	Earth Sense Glass and Multi-Surface Cleaner Super Concentrate					Yes	
Disinfectant	Earth Sense Healthcare Disinfectant Neutral Cleaner					Yes	
Toilets	Earth Sense Non-Acid Bowl & Bathroom Cleaner Super Concentrate					Yes	
Multi-Purpose	Earth Sense Spray & Wipe Cleaner Super Concentrate					Yes	
Carpet Cleaner	Ecogent General Purpose Cleaner Concentrate	Yes	Yes	No	No	Yes	
Multi-Purpose	Ecogent General Purpose Cleaner Concentrate	Yes	Yes	No	No	Yes	
Carpet Cleaner	EnviroSolutions 88 Stain and Spot Remover	Yes	Yes	Yes		Yes/Yes	Yes
Toilets	EnviroSolutions E51 Washroom Cleaner	Yes	Yes	Yes	Yes	Yes	Yes
Toilets	EnviroSolutions E55 Bowl and Urinal Cleaner	Yes	Yes	Yes	Yes	Yes	Yes
Disinfectant	EnviroSolutions ES 25C Disinfectant Cleaner and Odor Eliminator	No	No	Yes	Yes	No	No
Furniture	EnviroSolutions ES 78+ Stainless Steel and Furniture Cleaner/Polish						
Stainless Steel	EnviroSolutions ES 78+ Stainless Steel and Furniture Cleaner/Polish						
Degreaser	EnviroSolutions ES10006-10007 Alkaline Cleaner/Degreaser	Yes	Yes		Yes	Yes	No
Degreaser	EnviroSolutions ES10008-10009 Neutral Cleaner/Degreaser	Yes	Yes		No	Yes	No
Multi-Purpose	EnviroSolutions ES74 Spray and Wipe Cleaner	Yes	Yes	Yes	Yes	Yes	No
Glass and Counter	EnviroSolutions ES77 NFP Glass Cleaner	Yes	Yes	Yes	Yes	Yes	Yes
Cleaner and Polisher	EnviroSolutions ES78+ Stainless Steel and Furniture Cleaner/Polish	No	Yes		No	Yes	No
Multi-Purpose	Seventh Generation All Purpose Cleaner	Yes	Yes	No	No	Yes	No
Toilets	Seventh Generation Bathroom Cleaner	Yes	Yes	Yes	No	Yes	No
Degreaser	Seventh Generation Cleaner and Degreaser	Yes	Yes	Yes	No	Yes	No
Glass and Counter	Seventh Generation Glass and Surface Cleaner	Yes	Yes	No	No	Yes	No
Toilets	Seventh Generation Toilet Bowl Cleaner	Yes	Yes	Yes	Yes	Yes	No
Multi-Purpose	Simply Clean All Purpose Cleaner	Yes		Yes	No	Yes	Yes
Degreaser	Simply Clean Detergent/Degreaser/super cleaner	Yes		No	No	Yes	Yes
Multi-Purpose	Simply Clean Vinegar Plus	Yes	Yes	No	No	Yes	Yes

Product Type	Product	Health	Flammability	Re-activity	pH	Flash Point	VOC %	Skin Irritant?	Eye Irritant?	Hazardous Mat'ls?	Com-bust-able?
Carpet Cleaner	Wood Wyant Carpet Spot and Stain Remover	1	0	1	10-11	None	NA	Yes	Yes	Yes	Yes
Gum Remover	Wood Wyant Chewing Gum & Candle Wax Remover	3	3	1	NA	NA	NA	No	No	Yes	Yes
Toilets	Wood Wyant Germicidal Bowl Cleaner	3	0	0	<1	NA	99	Yes	Yes	Yes	No
Multi-Purpose	Wood Wyant Multi-Purpose Spray N Wipe	1	0	0	10	None	<1	Yes	Yes	Yes	No
Glass and Counter	Wood Wyant Redi-Pro Glass and Counter Cleaner	1	0	0	7	None	<1	Yes	Yes	Yes	No
Disinfectant	Wood Wyant Redi-Pro Spray Disinfectant Cleaner	2	0	0	10.3	NA	>99	Yes	Yes	Yes	No
Furniture	Wood Wyant Spray Glo Furniture Polish	1	1	0	NA	None	25	Yes	Yes	Yes	Yes
Stainless Steel	Wood Wyant Stainless Steel Cleaner	2	4	1	10	63	NA	Yes	No	Yes	Yes
Cleaner and Polisher	Wood Wyant Total	1	0	0	9.4-9.8	None	78-80	Yes	Yes	Yes	No
Degreaser	Wood Wyant Vardet 383	3	0	0	12.5-13.5	None	93-92	Yes	No	Yes	No
Carpet Cleaner	Earth Sense Carpet Pre-Spray & Extraction Shampoo Super Concentrate	1	2	0	9.3	58	NA	Yes	Yes	Yes	Yes
Degreaser	Earth Sense Degreaser Cleaner Super Concentrate	2	0	0	12.9	None		Yes	Yes	Yes	No
Glass and Counter	Earth Sense Glass and Multi-Surface Cleaner Super Concentrate	2	3	0	11.4	21		Yes	Yes	Yes	Yes
Disinfectant	Earth Sense Healthcare Disinfectant Neutral Cleaner	2	0	0	7.2	None		Yes	Yes	No	No
Toilets	Earth Sense Non-Acid Bowl & Bathroom Cleaner Super Concentrate	1	0	0	10.6	None		Yes	Yes	Yes	No
Multi-Purpose	Earth Sense Spray & Wipe Cleaner Super Concentrate	2	2	0	11.6	82		Yes	Yes	Yes	No
Carpet Cleaner	Ecogent General Purpose Cleaner Concentrate				5	None	<0.05%	No	No	No	No
Multi-Purpose	Ecogent General Purpose Cleaner Concentrate				5	None	<0.05%	No	No	No	No
Carpet Cleaner	EnviroSolutions 88 Stain and Spot Remover	N/A	0	Stable	7	None	<50%	Mod to High	Mod to High		No
Toilets	EnviroSolutions E51 Washroom Cleaner	N/A	0	Stable	11.4	None	90.7	Yes	Yes	No	Yes
Toilets	EnviroSolutions E55 Bowl and Urinal Cleaner	N/A	0	Stable	2.2	None to boiling	96.6	Yes	Yes	No	Yes
Disinfectant	EnviroSolutions ES 25C Disinfectant Cleaner and Odor Eliminator	N/A	0	Stable	11.9	None to boiling	99.1	Yes	Yes	No	Yes
Furniture	EnviroSolutions ES 78+ Stainless Steel and Furniture Cleaner/Polish										
Stainless Steel	EnviroSolutions ES 78+ Stainless Steel and Furniture Cleaner/Polish										
Degreaser	EnviroSolutions ES10006-10007 Alkaline Cleaner/Degreaser	N/A	0	Stable	12.8	None	90.40%	Yes	Yes	No	Yes
Degreaser	EnviroSolutions ES10008-10009 Neutral Cleaner/Degreaser	N/A	0	Stable	8	None	90.80%	Yes	Yes	No	Yes
Multi-Purpose	EnviroSolutions ES74 Spray and Wipe Cleaner	N/A	Yes	Stable	11.3	55	98.5	Yes	Yes	No	Yes
Glass and Counter	EnviroSolutions ES77 NFP Glass Cleaner	N/A	0	Stable	10.2 +/- 0.5	None	99.9	Yes	Yes	No	Yes
Cleaner and Polisher	EnviroSolutions ES78+ Stainless Steel and Furniture Cleaner/Polish	N/A	0	Stable	N/A	None	N/A	Yes	Yes	No	Yes
Multi-Purpose	Seventh Generation All Purpose Cleaner	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Toilets	Seventh Generation Bathroom Cleaner	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Degreaser	Seventh Generation Cleaner and Degreaser	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Glass and Counter	Seventh Generation Glass and Surface Cleaner	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Toilets	Seventh Generation Toilet Bowl Cleaner	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Multi-Purpose	Simply Clean All Purpose Cleaner	N/A	0	0	8 to 9	None		Yes	Yes	No	No
Degreaser	Simply Clean Detergent/Degreaser/super cleaner	N/A	0	0	10.3-9.1	None	N/A	No	Yes	No	No
Multi-Purpose	Simply Clean Vinegar Plus	N/A	0	reacts with non noble metals	1-3	None	N/A	Yes	Yes	hazardous byproducts	No

Appendix C: Material Safety Data Sheets