

**It's Not Easy Cleaning Green:**  
**A Cost-Benefit Analysis Exploring Greener Cleaning**  
**Alternatives at Wellesley College**

Environmental and Resource Economics  
May 17, 2006

*Libby MacFarlane and Candace Chung*

**Summary**  
It's Not Easy Being Green:  
A Cost-Benefit Analysis Exploring Greener Cleaning Alternatives at Wellesley College  
Candace Chung and Libby MacFarlane  
May 17, 2006

This paper argues that Wellesley College should modify its practice of purchasing Speedball 2000, a widely-used all purpose cleaner, in an effort to reform the college's current purchasing habits of potentially harmful cleaning products. In this report we conduct a cost-benefit analysis exploring the possibility of replacing Speedball 2000, a costly spray-and-wash cleaner distributed by the JohnsonDiversey Company with a more ecologically-friendly, and Green Seal certified alternative. While this paper begins by explaining the health-related, environmental and moral reasons for opting for a greener alternative to Speedball 2000, an analysis of economic costs and benefits corroborates on this belief.

By working with Tom Kane, head of Wellesley College's Purchasing Department, we were able to gather pricing data for seven 'green' alternatives to Speedball 2000. We then used this data to conduct an extensive price analysis. In this synthesis, we found that each of the seven alternatives, when diluted from their concentrated form to a conventional-use form, had lower yield prices than Speedball 2000's; And of the seven alternatives, IPAX Cleanogel Green Unikleen Heavy Duty Degreaser proved to be most economical, with a yield price of \$0.336. This figure, in contrast with Butcher's Speedball 2000's yield price of \$5.11, indicates the financial allure of replacing the current cleaning product with a cheaper, comparably effective, and less harmful solution.

If IPAX were implemented at Wellesley, new diluting dispensers would have to be purchased to fit this new product, so as not to expose any custodial workers to the potent concentrated formula, and thus significant start-up costs would be incurred of approximately

\$130 per dispenser. However, if a complete replacement took place, it would only take 2.3 years for this full amount to be paid back through the savings that would be incurred by switching to the cheaper IPAX. As the data will indicate, although the startup costs for a comprehensive one-year switch are quite high, that a complete switch is far more economical than a progressive pilot project approach.

In the end, a switch to a “greener” alternative would prove to benefit Wellesley in more ways than one. Not only would the custodial staff, students, and environment most likely benefit from decreased exposure to the toxic nature of Speedball 2000, but as our data indicates, the College would save thousands of dollars each year by purchasing the more affordable IPAX Cleanogel Green Unicleen Heavy Duty Degreaser. By proving in this report that a switch from a conventional cleaner to a more environmentally conscious cleaner is not only morally, physiologically, and environmentally desirable but also financially lucrative, we hope that Speedball 2000’s replacement with IPAX Cleanogel Green Unicleen Heavy Duty Degreaser, will be only the first step to the “greenification” of Wellesley’s cleaning products which would mark a campus-wide transition to a more sustainable and environmentally friendly campus.

### **Introduction:**

Home to over 3,000 people and more than 40 buildings, Wellesley College purchases hundreds of gallons of different industrial cleaners and solvents each year, many of which are used on a daily basis across campus. Currently, very few of these industrial cleaners can claim to be environmentally-friendly, for green products represent only a small fraction of the millions of industrial cleaning products available in the market. Nonetheless, green cleaning products are proving to be more essential because conventional cleaners pose grave consequences to the earth and to human health (Elkington 1990).

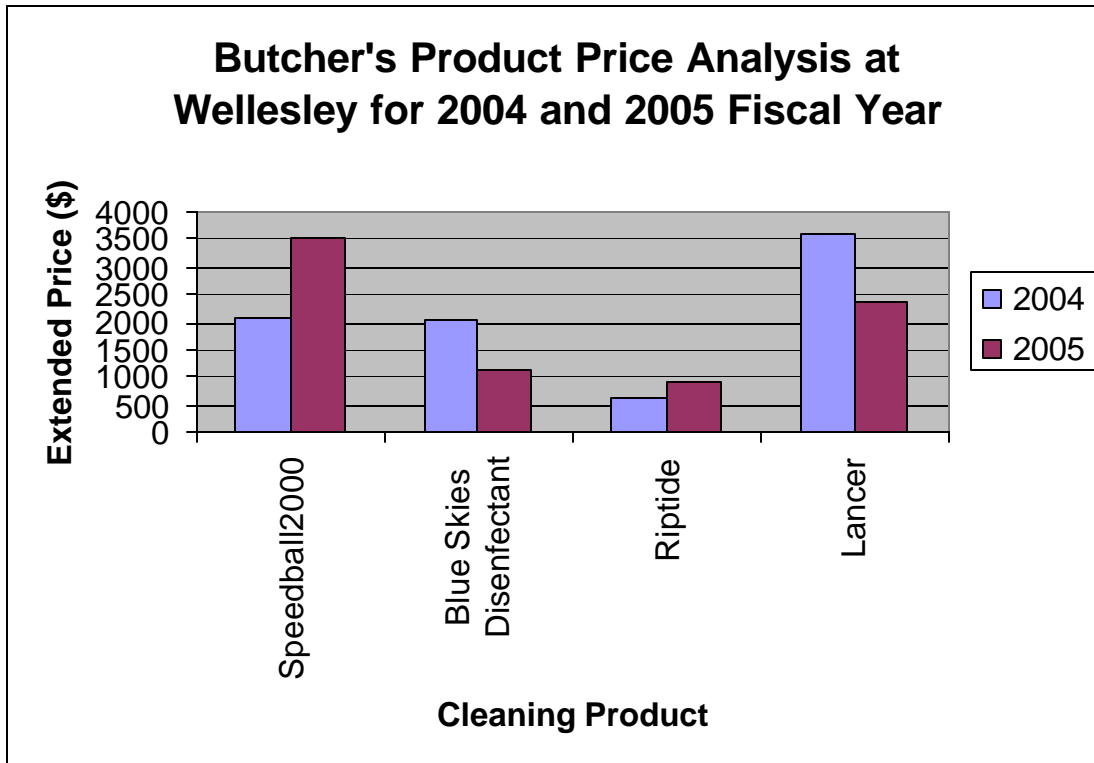
Conventional cleaners often contain harsh chemical compounds that biodegrade slowly and persist in the environment for years after they have been used. They also often contain large quantities of Volatile Organic Compounds (VOCs) that contribute to ground-level smog, thermal inversions, and ozone depletion (Elkington 1990). Harsh cleaning products have also been blamed for their adverse effects on water systems because in their liquid form, cleaners can easily enter and contaminate underground aquifers, septic tanks, and sewage systems. According to The Green Consumer, most septic tanks containing water used in households are found with “over 100 traceable chemical pollutants, mostly components from cleaning fluids...and have a tendency to migrate through soils to groundwater supplies” (Elkington 1990). Further, conventional chemical cleaners pose serious health risks for those who handle them, in both the diluting process and in their indoor application, due to the strong odors many of these products emit and the chemical potency of their concentrated solutions.

In deference to the known environmental mal effects of conventional chemical cleaners, this report argues that Wellesley College should modify its current practice of purchasing Speedball 2000, an industrial all-purpose cleaner, as part of a campus-wide movement away from harmful industrial cleaning products. We will explore the costs and benefits of “green” products, which we define as natural, 100% biodegradable, ecologically-friendly and Green Seal certified product. In order to pick the best “green” alternative to replace the use of Speedball 2000 on Wellesley’s campus we will first perform a comprehensive cost-benefit analysis. In addition to analyzing prices, this report will with factor in other unconventional costs and benefits including human health, morality, and environmental safety. This report will prove that economic benefits can also hold great improvement for the environment (and vice versa).

## **Background:**

While many cleaners are used extensively throughout the Wellesley campus, our cost-benefit analysis looks solely at Butcher's Speedball 2000, an all-purpose cleaner distributed by the JohnsonDiversey Company, used to remove tough stains from all surfaces including floors, counters, and bathrooms in all academic, residential and administrative buildings on campus. We chose to explore alternatives to Speedball 2000 because it is among the top five most prevalently used products on campus and because its yield price is greater than any of its counterparts. After being created and packaged into 1.5 gallon containers in Waxdine, Wisconsin, Speedball 2000 is sent to a distributor in Massachusetts who then sells the product to the College at \$84.44 per unit. Each concentrated unit of Speedball 2000, when properly diluted creates 16.5 gallons of ready-to-use cleaner with a yield price of \$5.11/gallon, which is individually poured into spray bottles for portability.

Our decision to analyze the \$2,111 spent on 25 units of Speedball 2000, as opposed to the \$3,583.75 spent on Lancer, a floor cleaner, also produced by the Butcher company, was also because our data indicated a possible increased reliance on Speedball 2000 from 2004/2005 fiscal year to 2005/2006 fiscal year. While budget allocation to the five most frequently used cleaning products on campus decreased from \$8,380 in the 2004/2005 fiscal year to \$7,870 in 2005/2006 fiscal year, for a net decrease of \$510 or 6%, the amount spent on Speedball 2000 actually increased from \$2,111 in 2004/2005 to \$3,509 in 2005/2006 fiscal year. This 20% increase in spending on Speedball shifted the percentage of the top five products dedicated to Speedball 2000 from 25% in 2004/2005 to 45% in the 2005/2006 fiscal year.

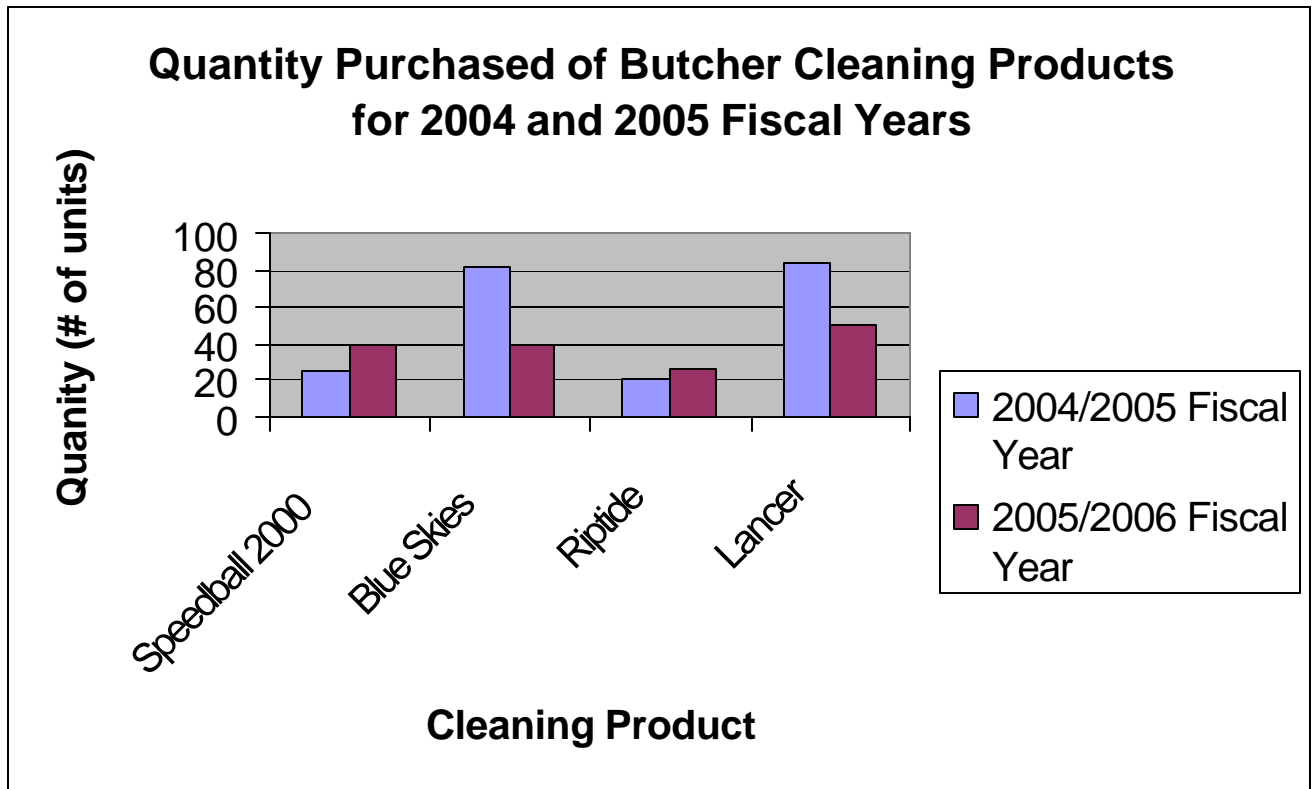


**Figure 1 Analysis**

- Overall money allocated to Butcher Products decreased from \$8,380 in 2004/2005 fiscal year to \$7,870 in 2005/6 fiscal year for a net decrease of \$510.
- Despite the decrease in products purchased from Butcher's products (even with the increase in per unit price/product), the amount spent on Speedball 2000 increased from \$2,111 in 2004/2005 to \$3,509 in 2005/2006 fiscal year, a 20% increase of Speedball 2000 relative to amount spent on Butcher Products
- The percent (%) allocated to Speed2000 went from 25% in 2004/2005 to 45% in 2005/2006 fiscal year
- The money (\$) allocated for both Blue Skies Disinfectant and Lancer decreased in the 2005/2006 fiscal year

Speedball 2000 was also the leading product used at Wellesley for the 2005/2006 fiscal year, replacing Lancer, which was most purchased in the 2004/2005 fiscal year. In 2005/2006 Fiscal year Wellesley College only purchased 50 units of Lancer, an amount significantly less than the 84 units purchased in the year at \$2,352.10. Accordingly, the quantity of Speedball 2000 purchased increased by 15 units from 2004/2005 to 2005/2006 year, and this increase was only one of two increases in unit quantity from 2004/2005 to 2005/2006. It is very important to note, while this trend in data does *hint* at the school's increased reliance for Speedball 2000 and

diminished need for other cleaners, this change in data could also be attributed to leftover stocks of cleaning solution from 2004/2005 stored for use in the next fiscal year.



**Figure 2 Analysis**

- Quantity of Speedball 2000 purchased increased by 15 units from 2004/2005 to 2005/2006 fiscal year
- Only Speedball 2000 and Riptide increased in quantity from 2004/2005 and 2005/2006 fiscal year
- Quantity of Speedball 2000 increased from 25 units in 2004/2005 to 40 units in 2005/2006 fiscal year
- Quantity of Riptide increased from 20 units in 2004/2005 to 27 units in 2005/2006 fiscal year
- Quantity Speedball 2000 increased by 60%, whereas Riptide only increased by 35%

Our exploration of Speedball 2000 also stems from the probability of its adverse on human health and nature. According to the “Emergency Overview” of Speedball 2000 on its Material Data Safety Sheet (MSDS) a federally required chemical information sheet distributed with each unit of cleaning solutions, the potent cleaner is a “Clear. Purple Liquid. Citrus Odor. May Cause Eye Burns and Skin Irritation. Harmful if Swallowed” (JohnsonDiversey).

Symptoms of eye burns can cause pain, tearing, redness, swelling, and injury and skin irritation

can cause redness, rashes and swelling (JohnsonDiversey). If inhaled as a vapor or a mist, Speedball can cause nose, throat and respiratory tract irritation and symptoms can include coughing and burning sensations (JohnsonDiversey). High concentrations of vapor can cause defects in the central nervous system as well including headaches, dizziness, and nausea (Elkington 1990). If accidentally ingested, Speedball 2000 can cause stomach burns, nausea, vomiting, diarrhea and sever stomach pain (JohnsonDiversey). These deleterious health effects can be quantified in the government's Hazardous Material Identification System rating, giving Speedball a 3 in the category of "Health" (with 1 being the least harmful, to 4 being the worst) indicating that Speedball 2000 is a Serious Hazard causing "major injury likely unless prompt action is taken and medical treatment is given" causing the destruction of ski tissues, corrosive and irreversibly destruction of eye tissue and corneal irritation (Hazardous Material Identification System). The National Fire Protection Association concurrently ranks Speedball 2000 a category-3 chemical compound that can cause serious temporary or residual injury even if prompt medical attention is given (In the NFPA rankings, a 4 can cause death while a 1 is normally combustive) (National Fire Protection Association). Further, prolonged overexposure to high concentrations of ethanolamine, a key ingredient in Speedball, has caused liver and kidney effects in laboratory animals (JohnsonDiversey). Also, prolonged overexposure to benzyl alcohol, another prominent chemical, has caused central nervous system effects in humans and laboratory animals (JohnsonDiversey).

In an effort to ameliorate the many health hazards that Speedball 2000 poses, the Custodial Department has taken great measures to adequately train all of its custodians in the preparation and use of Speedball 2000. Latex gloves are required for all custodial staff whom use the product and the school has invested in many different "Butchers Command Centers" across

campus (JohnsonDiversey). These wall-mounted machines automate the dilution process so that janitors are not forced to physically handle the concentrated liquid form of Speedball 2000 (JohnsonDiversey). Despite these efforts, however, the possible health consequences of Speedball 2000 could be avoided by switching to a better, greener product. Environmentally, Speedball 2000 does not *appear* to have disastrous consequences for the environment as it is a completely biodegradable cleaning solvent. However, Speedball 2000 *does* contain many nationally recognized toxic chemicals (JohnsonDiversey). In addition, 76% of its weight is volatile which can, as mentioned below, create a variety of disastrous natural effects (JohnsonDiversey).

In our research into alternatives to this powerful all-purposed cleaner, we examined the possibility of switching to a less toxic cleaner. “Green” products are purported to pose less risk to human health and the environment (Elkington). We soon learned, however, that many products advertise themselves as “green” without actually having to be environmentally friendly (Conversation with Tim Hoey). As a result we looked for Green Seal Certification for each of our alternative cleaners examined. In 1989, the Green Seal Association, an independent non-profit organization, established the first national rigorous certification process for all goods by separating the truly environmentally friendly goods from those alleging to be green (Green Seal). Using this certification, with this required characteristic in mind, we found the New American Dream’s Industrial Cleaning Product Recommendations List online, and with its suggestions picked seven alternatives. The seven alternatives include:

- Rochester Midland’s Enviro Care Tough Job Cleaner
- IPAX Cleanogel’s Green Unikleen Degreaser and Floor Cleaner
- Green Scene’s MSD-16 Heavy Duty Degreaser

- High Sierra's Pristine High Performance Cleaner/Degreaser
- Spartan Green Solutions All Purpose Cleaner
- AQP Corporation's SOYMAX Heavy Duty Cleaner
- EcoPure's 65 Heavy Duty Cleaner Degreaser

The following sections will look at the pricing for each of these seven alternatives and present an accurate picture of the costs and benefits that would be involved in switching from Speedball 2000 to a greener product keeping in mind that each product has a different dilution ratio.

### **Case Studies:**

#### **Rochester Midland Corporations Success at Mount Holyoke College**

As Wellesley looks to "greenify" its cleaning products, other colleges and universities can be role models in the transition process. In 2001, Mount Holyoke decided to transition to exclusively green cleaning products. A December 6, 2002, article from the *College Street Journal*, "'Green' Cleaners Protect Health, Environment, and Budget" it announced that Mount Holyoke had "recently replaced its traditional chemical cleaner, used by most large institutions, with a line of solutions that are nontoxic, non-corrosive, noncombustible and non-reactive" (Mount Holyoke). This product line, a part of the Rochester Midland Corporation's Enviro Care line, contains no hazardous ingredients. According to the *College Street Journal* article, one of the main obstacles in implementing this project was having the custodians adjust to a more natural product, as many believed that a more toxic smelling, concentrated, dark cleaner would clean better. (Mount Holyoke).

According to the article, it took time for the custodians to realize that the more natural, green and non-smelling alternatives did the same job as the former traditional cleaners (Mount

Holyoke). Despite this small adjustment period, the transition to green products was smoother and faster than expected (Mount Holyoke). The transition to green products at Mount Holyoke, has not only improved the health of the custodians, who are in direct contact with the products, but has also fostered environmental awareness within the student and administrative bodies while reducing phosphates in surrounding water supplies (Mount Holyoke). Most importantly, however, Mount Holyoke found that it saved 18 cents more/per gallon using its green general cleaner, as opposed to its original cleaner (Mount Holyoke).

Using Mount Holyoke as a role model, we also explored the Enviro Care line from Rochester Midland Corporation as an alternative to Speedball 2000, and spoke to David Williams, head of purchasing at Mount Holyoke College. In our conversations with Mr. Williams, we found that the transition occurred after a pilot program tested Rochester Midland products in one old dormitory and one new dormitory. Although initially the custodial staff was hesitant to make the switch, Mr. Williams says that, “the housekeepers were singing their praises to the other housekeepers about how nice it was not having to work with chemicals that smelled strong and irritated the skin” (Williams). After seeing the successes of this one year program, a full switch to green cleaning products in academic, administrative and residential buildings was made, and saved the College \$6M in the first year. Since 2000, Mr. Williams’ estimates that Mount Holyoke has saved \$25M on the costs of cleaning chemicals.

### **City of Seattle Search for Environmentally Friendly Cleaning Products**

Similarly, in April of 2003, the City of Seattle embarked upon a comparable quest to adopt “green cleaning” as a municipal practice. To explore the possibilities of environmentally friendly and cost-effective cleaning products, the City hired a team of city janitors to test a variety of green cleaning products in seven common municipal cleaning tasks that included:

toilet bowl cleaning, glass cleaning, general purpose cleaning, basin tub and tile cleaning, deodorizing, combination cleaning-disinfecting, and disinfecting. The intention was “to identify as many suitable products and vendors” as possible, and once having identified them, screen them for human safety and economic viability (City of Seattle).

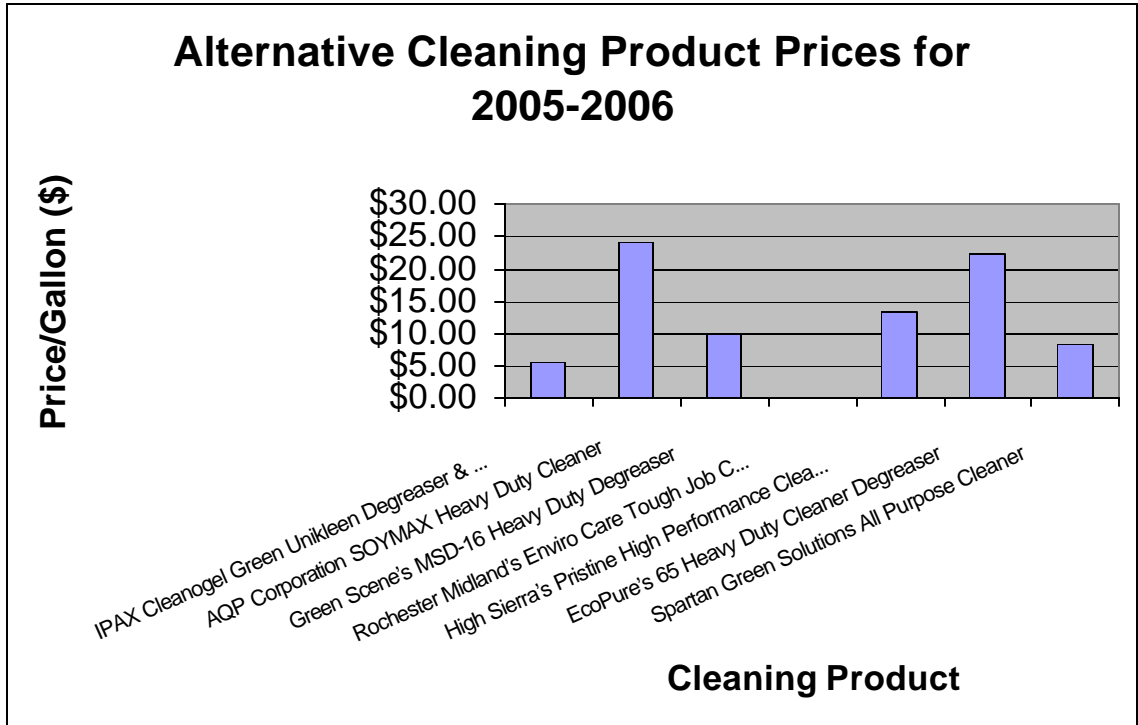
Unlike Mount Holyoke, an institution that tested a single Green Seal certified cleaning line, the City of Seattle opened up its testing to all applicant cleaning lines that desired to form contracts with the City. However, to determine the ‘green’ nature of the applicant cleaning products, the City designed its own criterion, determining “mandatory product attributes” that all potential candidates were required to have (City of Seattle). These six product attributes, prohibited certain characteristics in the cleaners that included carcinogenic, ozone-depleting compounds, and Alkylphenol Ethoxylates, a type of toxic chemical compound (City of Seattle). Once the contest was opened up, ten manufacturers submitted 49 products for approval and of these products 28 were deemed satisfactory by the 30 city custodians and laborers. Once these products were found to actually clean in a variety of venues, ranging from gymnasium showers to offices, six vendors were awarded long-term contracts with the City of Seattle.

Although Wellesley College does not have the resources to sponsor its own in-house cleaning-capability competition between different cleaning products, our study adopts many aspects from this Seattle Case Study. Although we do analyze the Rochester-Midland Corporation’s heavy-duty cleaner adopted by Mount Holyoke College in our study, Rochester Midland’s cleaner is only one of many heavy-duty cleaners we scrutinize in our cost-benefit analysis.

### Cost-Benefit Analysis:

Once we determined our seven Speedball 2000 alternatives, we submitted this list to Tom Kane, head of Wellesley College's Purchasing Department, who personally contacted vendors for accurate pricing information. Mr. Kane's assistance was essential to our study because it prevented potentially distorted pricing information from vendors who would not have taken the inquiries of two economics students very seriously. Through his dedication we were able to come up with the following information.

ALT	PRODUCT	DILUTION RATIO	YIELD	GALLON PRICE	YIELD PRICE	5 GALLON PAIL
1	IPAX Cleanogel Green Unikleen Heavy Duty Degreaser	4 oz/Gallon	17 Gallons	\$5.71	\$0.336	\$27.25
2	AQP Corporation SOYMAX Heavy Duty Cleaner	2 oz/Gallon	33 Gallons	\$23.99	\$0.727	\$107.00
3	Green Scene's MSD-16 Heavy Duty Degreaser	4 oz/Gallon	17 Gallons	\$9.99	\$0.588	N/A
4	Rochester Midland's Enviro Care Tough Job Cleaner	N/A	N/A	N/A	N/A	N/A
5	High Sierra's Pristine High Performance Cleaner/Degreaser	4 oz/Gallon	17 Gallons	\$13.56	\$0.798	N/A
6	EcoPure's 65 Heavy Duty Cleaner Degreaser	2 oz/Gallon	32 Gallons	\$22.53	\$0.683	\$101.10
7	Spartan Green Solutions All Purpose Cleaner	2 oz/Gallon	33 Gallons	\$8.31	\$0.252	N/A



As the data indicates, there is a wide range of pricing for each of the greener alternatives. Also, unfortunately, despite repeated attempts to get in touch with representatives from the Rochester Midland Company, the very company patronized by Mount Holyoke and the City of Seattle, we were unable to receive any pricing information as to their heavy-duty cleaner. This default of data automatically disqualified the Rochester Midland Corporation from our analysis.

Due to the variety of dilution ratios each condensed cleaner requires, it was not logical to simply look at the Gallon Price of each cleaner, as different cleaners, when properly diluted yielded different amounts of cleaner. As a result, we looked primarily at yield prices, the figure that is most telling of each cleaner's actual price after dilution, as calculating the yield price takes into account the price of one gallon of a given condensed formula once diluted. While the yield prices, like the gallon prices also differ significantly amongst the alternatives, it is clear from this data, that the first alternative listed, IPAX Cleanogel Green Unikleen Degreaser, has

the most inexpensive yield price, at \$0.336/diluted gallon. This yield price is significantly lower than Bucher's Speedball 2000 yield price of \$5.11.

**Preferred Alternative: IPAX Cleanogel Green Unikleen Degreaser**

Further, as indicated in previous tables, last year the College spent \$2,111 on twenty-five 1.5 gallon containers of concentrated Speedball 2000 that amounted to 412.5 gallons of diluted Speedball 2000. To create enough diluted Unikleen to match the volume of Speedball 2000 that was mixed the last year, assuming that the cleaning capability of one diluted gallon of both cleaners are comparable, the College would need to purchase only 24.26 gallons of concentrated Unikleen. In reality, however, due to the fact that IPAX sells Unikleen only in five gallon containers, the College would have to purchase five of these pails at \$27.25, equaling only \$136.25, again a fraction of the \$2,111.00 usually spent on Speedball 2000. Unfortunately, however, without preliminary tests similar to those conducted in the City of Seattle, it is impossible to gauge the cleaning power of one gallon of Unikleen. Rote numbers indicate, however, that if a complete switch to Unikleen from Speedball 2000 was to be made, savings simply on chemical costs in the first year would amount to \$1974.75.

Unfortunately, this annual cleaner cost of \$136.25 would not be the only cost the College would incur, as there would be significant startup costs in purchasing the initial capital equipment necessary for Unikleen. Like most industrial cleaners, including Speedball 2000, Unikleen arrives in highly concentrated form. As the table above indicates, one gallon of condensed Unikleen, when mixed with cold water (not hot water as hot water requires more energy) produces 17 gallons of ready-to-use Unikleen in spray bottles. To facilitate the dilution process, and prevent potential human injury due to direct chemical exposure, a particular machine must be purchased connecting the container of cleaning solution to a water source. This

dispenser automatically dilutes this concentrated formula with the perfect ratio to water.

Unfortunately since dilution control devices are created by cleaning solution manufacturers to fit the exact proportions of the bottles containing their own cleaning solutions, new dilution control machines would have to be purchased for Unikleen. Although at this time, we do not know the exact prices of Unikleen's dilution controlling devices, prices for these tools range from \$110 to \$150 (IPAX). Although there are 58 buildings on campus in total, not every building would require a dilution control mechanism; these installations would be limited to buildings that are cleaned daily and that are heavily populated, like academic buildings and residence halls. To remove heavy stains in buildings without these dispensers, Unikleen could be diluted into spray bottles in major buildings and carried over to smaller buildings for use. Assuming that there are roughly thirty-five high frequency buildings on campus, thirty-five units of these dispensers would be necessary. With an average price \$130 dollars per machine, the total cost of purchasing enough dispenser would total \$4550. Although this would be a tremendous cost, over the years, the installation would pay off in the saved moneys accumulated from switching to Unikleen. The payback period of the \$4550 for a complete switch is 2.3 years, but if the amount already *saved* from not using Speedball 2000, as in purchasing the cheaper Unikleen, was factored in the payback period would only be 1.2 years.

A synthesis of these monetary costs and benefits indicates that in the first year, the College would lose money from a complete switch to IPAX in the installation of \$4550 worth of dilution equipment and \$136.25 on actual IPAX equaling \$4686.25, the benefits would be savings of \$2,111, bringing the cumulative costs to only \$2575.25. The next year, however, assuming that the school was not forced to increase its quantity purchase of IPAX, the school would almost entirely make up for this loss with the \$1974.75 savings accumulated merely

sticking with Unicleen instead of going back to Speedball. This net benefit would bring the net cost of the first year to \$600.5, which would be more than made up for in the third year, with a net gain of \$1374.25. To shed more light on the financial lucrativeness of an immediate switch to Unicleen, the table below shows that \$12,666.000 would be spent on Speedball in 6 years, while only \$5,357.50 would be spent at the end of six years. As the last column shows, over six years, the college would save \$7,298.50 from switching to Unicleen, more than recouping the loss of \$2,575.25 in the first year. Although we would have wanted to factor in a 3-4% increase in the cost of both products every year, we decided to keep our data simple by not factoring in an inflation rate. Irregardless of lack of inflate prices, the table highlights the obvious long-term monetary benefits of switching from Speedball 2000 to IPAX's Cleanogel Green Unicleen Heavy Duty Degreaser.

<b>Time (Years)</b>	<b>Cost (Speedball)</b>	<b>Cost (Unicleen)</b>	<b>Savings</b>
<b>T1</b>	\$2,111.00	\$4,686.25	(\$2,575.25)
<b>T2</b>	\$2,111.00	\$136.25	\$1,974.75
<b>T3</b>	\$2,111.00	\$136.25	\$1,974.75
<b>T4</b>	\$2,111.00	\$136.25	\$1,974.75
<b>Total</b>	<b>\$8,444.00</b>	<b>\$5,095.00</b>	<b>\$3,349.0</b>

IPAX Cleanogel Green Unicleen Degreaser is a Green Seal certified industrial cleaner that boasts to be as “strong as wind, innocent as infancy and inexpensive as water” (IPAX). According to OSHA standards, this specially formulated cleaner is non-toxic, non-hazardous, non-corrosive, non-allergenic and free from VOCs (IPAX). It is 100% soluble in water and 100% biodegradable (IPAX). Further, unlike Speedball 2000, the HMIS and the NFPA have given Unicleen both ratings of ‘0’ indicating that Unicleen has little to no effect on human health (IPAX). The earth-friendly nature of IPAX is no indication of a cleaning weakness as Unicleen has proven to remove heavy deposits of oil and grease, and is used frequently in aircraft, mining and automotive industries (IPAX). This product is also widely used and highly regarded by many

companies including General Motors Corporation, Mercedes-Benz, and the Academy of Sciences at the Biological Institute (IPAX). According to the Facility Engineering Supervisor and Maintenance Manager of Daimler Chrysler, “Green Unikleen has proven that a cleaner can be universal, powerful, safe and easy to use without being hazardous while at the same time retain a high level of quality and performance...it brought savings, stability and control to our plants’ parts...a direct cost savings of more than 30%” (IPAX). In keeping with our focus on low environmental impacts, Unikleen is a lucrative alternative also because it is packaged in 5 gallon pails, instead of being packed in many smaller containers, like Speedball 2000. Its production in Detroit is also of significance since Detroit is closer to Wellesley than Waxdine, Wisconsin, could possibly decrease transportation costs and environmental costs derived from cross country shipping.

### **An Expensive Alternative?**

The economic benefits of Wellesley College switching to a greener alternative would be apparent even if the College were to elect the most expensive green alternative to Speedball 2000. Of our collected data, the all-purpose cleaner with the highest yield price was High Sierra’s Pristine High Performance Cleaner/Degreaser, at \$0.798/diluted gallon. Though this yield price is more than twice the yield price of the cheapest alternative, Pristine is still significantly less expensive than Speedball 2000’s unit price of more than \$5.00. Performing an analysis similar to the one conducted for the IPAX switch, Pristine’s lucrative economic nature is also obvious. One gallon of Pristine can be diluted to 17 gallons, thus to create the 412.5 gallons that were used last fiscal year, 24.26 gallons of Pristine, like Unikleen would have to be purchased. Unlike IPAX, however, because Pristine is sold in one gallon containers, only 25 gallons of Pristine would be purchased. Twenty-five gallons of Pristine would amount to

\$339.00, again assuming that the cleaning capacity of one gallon of Speedball 2000 equals that of Pristine. This amount is roughly three times, the amount that would need to be spent on Unicleen, but yet again significantly cheaper than the \$2000+ used on Speedball 2000. Pristine would also require the installation of dilution dispensing systems, but this again would be a start-up cost that, like Unicleen would more than pay for itself in a little more than three years.

### **A Progressive Switch?**

While we believe that the overall economic and social benefits of a complete switch to IPAX Cleanogel Green Unicleen Heavy Duty Degreaser more than qualify the cleaning solution as an adequate alternative for Speedball 2000, we understand the gravity of such an initial investment. As a result, we explored the possibility of a progressive pie cemeal implementation plan to slowly integrate IPAX into the Wellesley janitorial cleaning system. We attempted this switch by starting in the three buildings of the New Dorms Complex. To simulate the costs that would incur from the first year of the program's three building switch to Unicleen, we assumed that each of the 35 most populated buildings on campus required equal amounts of Speedball 2000. We then divided the total amount of diluted Speedball used on campus last year (412.5 gallons) by the number of buildings on campus that would require Speedball use (35). This calculation indicated that each building on campus used approximately 11.79 gallons of Speedball 2000 in the last fiscal year. If one gallon of Unicleen equaled the power of one gallon of Speedball, the school would have to purchase 11.79 gallons x 3 buildings for next year. This totals 35.37 gallons of diluted Unicleen, which would equal slightly more than 2 gallons of concentrated Unicleen solution. Although this two gallon price equals \$17.13 dollars (\$5.71/gallon x 3 gallons), because IPAX only sells Unicleen in 5 gallon pails, one entire pail at \$27.25 would have to be purchased. This along, with three \$130 dispensing machines would

equal a total \$417.25. This cost would replace the price of 2 unit gallons of Speedball 2000 equaling \$168.80.

Once financial gains were seen, janitorial staff were acclimated to the new product, and approval was granted to the new product, a switch after a year to all five academic buildings would ensue. In the third year of implementation, eleven of the major residence halls would be included, and in the last year sixteen buildings would be integrated. This progressive implementation would also allow for small startup costs to be incurred progressively in the purchasing of dispensing machines for few buildings, as opposed to the large lump sum a full throttle switch would have demanded. However as the data below indicates, a slow switch to Unicleen would be less cost-effective than a full switch to Unicleen for two reasons. First, while money would be saved in the purchase of Unicleen, Speedball 2000 would still have to be purchased at its expensive unit price. This reasoning also assumes that a decrease in our bulk purchase of Speedball from a distributor would not break any contracts or cause an increase in prices. Secondly, a rolling switch to Unicleen would also create more waste of cleaning solution and money in its first year because one full five gallon pail of Unicleen would have to be purchased in the first year, despite the fact that only 3 gallons of concentrated formula would be needed. The below tables show the calculations for a rolling four-year switch in its entirety.

#### I. Speedball Costs

<b>Time (Years)</b>	<b>Units Purchased (Speedball)</b>	<b>Diluted Volume (Speedball)</b>	<b>Cost (Speedball)</b>	<b>Savings from Switching Away (Speedball)</b>
<b>T0 (Before Switch)</b>	25.00	412.5	\$2,111.00	\$0.00
<b>T1 (3 Buildings)</b>	23	377.13	\$1,942.12	\$168.88
<b>T2 (5 Buildings)</b>	20	318.2	\$1,688.80	\$253.32
<b>T3 (11 Buildings)</b>	12	188.51	\$1,013.28	\$675.52
<b>T4(16 Buildings)</b>	0	0	\$0.00	\$1,013.28

#### II. Simultaneous Unicleen Costs

Time (Years)	Diluted Volume (Unikleen)	Concentrated Gallons Purchased (Unikleen)	Cumulative Concentrated Units (Unikleen)	Cumulative Units Purchased- 5 Gallon Pail (Unikleen)	Cost (Unikleen)
T0 (Before Switch)	0	0	0	0	\$0.00
T1 (3 Buildings)	35.37	3	3	1	\$27.25
T2 (5 Buildings)	58.93	4	7	2	\$54.50
T3 (11 Buildings)	129.69	8	15	3	\$81.75
T4(16 Buildings)	188.51	12	27	6	\$163.60

### III. Simultaneous Dispenser Costs

Time (Years)	Units (Dispenser)	Price (Dispenser)	Cost (Dispenser)
T0 (Before Switch)	0	\$0.00	\$0.00
T1 (3 Buildings)	3	\$130.00	\$390.00
T2 (5 Buildings)	5	\$130.00	\$650.00
T3 (11 Buildings)	11	\$130.00	\$1,430.00
T4 (16 Buildings)	16	\$130.00	\$2,080.00

### IV. Total Costs

Time (Years)	Cost (Unikleen+Dispenser)	Cost (Speedball)	Total Cost (Switch/ Unikleen + Dispenser+ Speedball)
T0 (Before Switch)	\$0.00	\$2,111.00	\$2,111.00
T1	\$417.25	\$1,942.12	\$2,359.37
T2	\$704.50	\$1,688.80	\$2,393.30
T3	\$1,511.75	\$1,013.28	\$2,525.03
T4	\$2,243.60	\$0.00	\$2,243.60
<b>Total (T1 to T4)</b>	<b>\$4,877.10</b>	<b>\$4,644.20</b>	<b>\$9,521.30</b>

This total cost of a four-year incremental change from Speedball 2000 to Unikleen would equal \$9,521.30 (not accounting for inflation). This amount is almost twice the amount it would cost for a one-year complete transition from the conventional cleaner to its counterpart. As an earlier graph indicates, the savings from a one year transition in the same four year time period would only cost \$5,095, and this cost, as also stated above would have been recouped in a little more than two years. Despite the evidence that our cost-benefit analysis presents in the more cost-effective one year switch as opposed to a four year switch, the incremental program is still

cheaper than Speedball 2000 in the long run. Further, the initial cost of the expensive dispensers in this four year program would be recouped only 6.3 years after the start of the program, considering the base cost of Speedball, while the payback period factoring the cost of Speedball would only be 5.2 years. The tables below show that in the long run, a switch away from Speedball 2000, whether in a one-year switch or a four-year switch, is economically lucrative, due to the naturally expensive price of Speedball.

Time (Years)	Cost (Speedball)	Cost (Speedball to Unikleen Progressive Switch)	Savings
T1	\$2,111.00	\$2,359.37	(\$248.37)
T2	\$2,111.00	\$2,393.30	(\$282.30)
T3	\$2,111.00	\$2,525.03	(\$414.03)
T4	\$2,111.00	\$2,243.60	(\$132.60)
<b>T5 (Switch Complete)</b>	\$2,111.00	\$136.25	\$1,974.75
T6	\$2,111.00	\$136.25	\$1,974.75
T7	\$2,111.00	\$136.25	\$1,974.75
T8	\$2,111.00	\$136.25	\$1,974.75
<b>Total</b>	<b>\$16,888.00</b>	<b>\$10,066.30</b>	<b>\$6,821.70</b>

Time (Years)	Cost (Speedball)	Cost (Unikleen)	Savings
T1	\$2,111.00	\$4,686.25	(\$2,575.25)
T2	\$2,111.00	\$136.25	\$1,974.75
T3	\$2,111.00	\$136.25	\$1,974.75
T4	\$2,111.00	\$136.25	\$1,974.75
T5	\$2,111.00	\$136.25	\$1,974.75
T6	\$2,111.00	\$136.25	\$1,974.75
<b>Total</b>	<b>\$12,666.00</b>	<b>\$5,367.50</b>	<b>\$7,298.50</b>

**Implementation at Wellesley:**

Our data proves that the best and most cost effect plan of action for the Wellesley Custodial Department would be to conduct a complete replacement of Speedball 2000 with IPAX Cleanogel Green Unikleen Degresaser in one first year. Although pilot programs have proven to be effective in other circumstance, it is clear that phasing out Speedball 2000 in a four year period is simply less cost-effective, even when expensive dispenser startup costs are

included. In addition to financial savings, entire Wellesley College Campus would very likely benefit from improved health and well-being across campus for students, faculty, staff, and wildlife alike. In addition to the financial benefits, human-health benefits, and environmental benefits, Wellesley College could really gain a lot from this first step in the greenification of the campus. Similar programs in comparable educational institutions, like Mount Holyoke, have received considerable press and many public commendations praising the environmentally aware practices of the college. This boost in public reputation would be an obvious added benefit to a first-step greenifying switch from Speedball 2000.

### **Obstacles in Implementation**

In the implementation process Wellesley will face a few, but important obstacles. One of the main concerns is how the new product is received by the custodial staff. Not only will there be initial confusion on how to use the product, but the opinions about its effectiveness is also a potential obstacle during and throughout the switch. Because there is variance in the actual cleaning power of products (greener products tend to be less potent and thus may require more product to achieve the same amount of clean as a conventional product), another possible obstacle is convincing the “decision-makers” that this more cost effective, green product actually works. Because our budget does not allow the products to be tested before we set up a contract and purchase it, it will be an obstacle to convince the decision-makers that IPAX will be just as effective (or more) than Speedball 2000.

## **Cost and Benefits: Decision Makers and Society**

In our quest to implement IPAX as an alternative to Speedball 2000, Wellesley will face both cost and benefits. Some of these costs will only be seen by the purchasers or “decision-makers” whereas others will be viewed by society.

The Decision-makers, Tom Bassange, Tim Hoey and Tom Kane, rely mainly on financial costs and benefits when deciding what products to purchase for Wellesley College. Through our cost-benefit analysis we see that switching to any of the alternatives (though we suggest IPAX) is more cost effective than continuing to purchase Speedball 2000. It is very important to note that in our cost-benefit analysis we assumed one gallon of diluted Speedball 2000 was equivalent in cleaning effectiveness of the alternatives.

Society views the cost and benefits of the switch in more broad terms. Society often includes the benefits of improved health and environment, moral standard, reputation, and environmental awareness.

### **Conclusion:**

After extensive research, a review of greener alternatives, and the construction of a thorough cost-benefit analysis, we would recommend a complete campus-wide switch to IPAX, Cleanogel Green, Unikleen Degreaser from Speedball 2000 in preparation for the 2006/2007 fiscal year. Our cost-benefit analysis clearly indicates that a one-time switch from IPAX to Speedball 2000 is more economic than a progressive piecemeal switch to total greenification. Despite the initial startup costs that will be incurred by the purchase of the dilution dispensers, our long-term data simulations indicate that these initial costs will be recouped in a very short period, resulting in great savings in the long run. Additionally, this switch to more environmentally friendly products includes many additional benefits, including improved health

for students and janitorial workers, environment friendliness, and an elevated reputation amongst competitor schools. It is our hope that this report has proven that environmentally sound cleaning alternatives can and should be explored by the school. We believe that this transition can only happen through education, awareness and a real commitment to a sustainable and conscientious campus, and it is our hope that possibly replacing Unicleen Cleanogel Green Unicleen Heavy Duty Degreaser with Speedball 2000 is only the first step of many.

## **Bibliography**

City of Seattle. 2003, <http://www.ci.seattle.wa.us/environment/Documents/JanitorialCriteria.pdf>

*College Street Journal*. 2002. Green Cleaners Protect Health, Environment, and Budget, December 6. <http://www.mtholyoke.edu/offices/comm/csj/120602/green.shtml>

Elkington, John.1990. *The Green Consumer*. New York: Penguin Books.

GreenSeal, <http://www.greenseal.org>

IPAX Cleanogel, Inc. 2006, [http://www.ipax.com/downloads/GUK%20Brochure-pdf\\_1.PDF](http://www.ipax.com/downloads/GUK%20Brochure-pdf_1.PDF)

JohnsonDiversey Inc. 2006,  
<http://msds.johnsondiversey.com/viewer/wvbutchers.asp?A=putHTM%00&RID=F%5FPDF%5C%27EN%27%5C%27NAM%27%5C%27F%2D00096001%27%5C%27MTR%27%5C%27AN03%27%5C%27Bts+%272006%2D03%2D13+14%3A06%3A10%27%7D>

Kane, Tom

Williams, David