

**Alternatives to Automotive Consumer Products that use Volatile Organic
Compounds (VOC) and/or Chlorinated Organic Compound Solvents**

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ABSTRACT

This project involved developing, testing and demonstrating alternative near-zero VOC automotive aerosol products for engine degreasing, carburetor and fuel injection system cleaning, brake cleaning and general purpose degreasing. The products were tested with technicians in 13 auto repair facilities, one car wash, three detailers and with three consumers. Eight water-based cleaners that performed well for engine degreasing were identified and tested. The VOC content of most of these cleaners was 10%. Three alternative soy/acetone blends that performed very well for carburetor and fuel injection system cleaning were identified and tested. The VOC content of these cleaners was near-zero. Three water-based cleaners and two soy/acetone blends that performed well for brake cleaning and/or general purpose degreasing were identified and tested. The VOC content of these products ranged from zero% to 10%. Alternatives to traditional hydrocarbon propellants were investigated and carbon dioxide was found to be lower cost and it also offered the best performance. Additional work is required to ensure that carbon dioxide is compatible with water-based cleaners. The raw material cost of the alternative cleaners is somewhat higher than the raw material cost of high VOC solvent based products that are currently used. The toxicity of the alternative cleaners is lower than the toxicity of the current products.

EXECUTIVE SUMMARY

Background

The Air Resources Board (ARB) estimates that VOC emissions from automotive cleaning products amounted to 13.53 tons per day in 2005. Many of the solvents used in these products are also classified as Toxic Air Contaminants (TACs). Since 2000, the VOC content has been controlled to the 35% to 50% level. Although low-VOC non-aerosol water-based cleaners have been demonstrated for some cleaning tasks in auto repair facilities, the ARB cannot further restrict the VOC content of the aerosol products on this basis. Additional reductions would require new aerosol cleaning technologies.

The ARB contracted with the Institute for Research and Technical Assistance (IRTA), a technical nonprofit organization, to identify and test alternative water-based near-zero VOC aerosol products. The focus was on developing and testing alternative aerosol cleaners for four categories of automotive cleaning including engine degreasing, carburetor and fuel injection system cleaning, brake cleaning and general purpose degreasing.

Methods

The approach to the research was to first identify existing water-based aerosol cleaners that were used commercially. The criteria for these cleaners was that they contain at least 70% water and no more than about 27.5% VOC. IRTA identified 11 water-based aerosol cleaners that met these criteria. The second step was to identify other water-based cleaners used by automotive and industrial firms that were not currently packaged in aerosol form. IRTA identified 18 water-based cleaners in this category.

Preliminary testing of the aerosol and non-aerosol products was conducted in a laboratory setting to screen the cleaners that performed best. IRTA collected a variety of different engine, fuel injection system, brake system and general parts that contained heavy grease and oil from four auto repair facilities. The first phase of the preliminary testing involved comparing the performance of the existing aerosol water-based cleaners and the non-aerosol water-based cleaners with the performance of baseline solvent cleaners. The second phase of the preliminary testing involved packaging some of the water-based cleaners that were not in aerosol form in aerosol packages. The existing and new aerosol cleaners were tested again and compared with the baseline cleaners. Three of the existing aerosol water-based cleaners and ten of the non-aerosol water-based cleaners performed well enough in the screening tests to go on the field testing stage.

IRTA recruited 13 auto repair facilities, three automotive detailers, one car wash and three consumers to conduct the field testing of the alternative low-VOC products. Two problems arose during the preliminary testing, however, that made the field testing more complex. First, all of the water-based cleaners, including the cleaners already in aerosol form, foamed when they were put in an aerosol package. Foaming cleaners are acceptable in engine degreasing where the engine and undercarriage can be rinsed with water after they are applied. Foaming cleaners are not normally acceptable for carburetor and fuel injection system cleaning, brake cleaning or general purpose degreasing. Second, some of the auto repair facility technicians indicated they would be reluctant to test water-based cleaners for carburetor and fuel injection system cleaning because of concerns about water in the fuel system.

Eight foaming aerosol water-based cleaners were obtained for testing in engine degreasing. IRTA also developed three non-water-based cleaners based on acetone and soy for testing in the

carburetor and fuel injection system cleaning category. IRTA asked the manufacturers of the non-aerosol water-based cleaners to reformulate them so they could be packaged in aerosol form without foaming. This was a challenging assignment and only three manufacturers elected to provide four non-foaming water-based cleaners for testing in the brake cleaning/general purpose degreasing categories.

Results

Auto repair facilities do not perform engine degreasing as a rule. The eight foaming aerosol water-based cleaners were tested at three auto detailers, one car wash and with three individual consumers. Three of these cleaners are commercial products and all three contain solvent additives. The remaining five cleaners are not commercial products and they do not have solvent additives. All facilities and consumers indicated that at least one of the alternative cleaners worked as well as or better than their current cleaner. The VOC content of six of the cleaners is 10% and this contribution is from the hydrocarbon propellant that was used for all of the water-based cleaners.

Three blends of a soy based cleaner and acetone were tested for carburetor and fuel injection system cleaning at the 13 auto repair facilities participating in the project. Soy and acetone are both low in toxicity. Soy is very low in VOC content and acetone is exempt from VOC regulations. All three cleaners performed adequately in this application and two performed as well as or better than the cleaners used currently. These cleaners were packaged with a carbon dioxide propellant so the VOC content of the cleaners was near-zero.

Four non-foaming water-based cleaners were tested at the 13 auto repair facilities for brake cleaning and general purpose degreasing. Two slightly foaming water-based cleaners were also tested for these cleaning applications. Three soy/acetone blends with a carbon dioxide propellant, one soy/acetone blend with a hydrocarbon propellant and one acetone cleaner with a hydrocarbon propellant were also tested at some of the facilities. Three of the non-foaming water-based cleaners and two of the soy/acetone blends with carbon dioxide propellants performed adequately for brake cleaning and/or general purpose degreasing. The non-foaming water-based cleaners were packaged with hydrocarbon propellants and their VOC content was about 10%. The soy/acetone blends had a near-zero VOC content.

Alternative propellants were investigated for use with the water-based cleaners. The best performing alternative propellant was carbon dioxide, which is not classified as a VOC. This propellant can cause the aerosol cans to corrode when it is used in conjunction with a water-based cleaner. This limitation might be overcome with addition of a corrosion inhibitor to the water-based cleaner.

The raw materials cost of the alternative water-based and soy/acetone cleaners is somewhat higher than the raw materials cost of the currently used solvent based products. The water-based cleaners and soy/acetone blends tested with success during this project are lower in toxicity than the high-VOC solvent based cleaners used today.

Conclusions

Alternative low-VOC, low toxicity water-based and soy acetone based aerosol cleaners were tested for engine degreasing, carburetor and fuel injection system cleaning, brake cleaning and general purpose degreasing. These alternatives performed adequately and, in some cases, very well. The VOC content of the alternative cleaners ranged from zero to 10%. If carbon dioxide could be used as a propellant for the water-based cleaners, the VOC content of the alternative products would be near-zero.

I. INTRODUCTION

The Air Resources Board (ARB) estimates that about 4.5 million aerosol spray cans and spray bottles of automotive cleaning products are sold in California each year. In 2000, emissions of Volatile Organic Compounds (VOCs) from these products amounted to about 17 tons per day (tpd); emissions of chlorinated solvents from these products were estimated at 5.2 tpd. In April of 2000, the ARB adopted an Airborne Toxic Control Measure (ATCM) that prohibited the production for sale or distribution of automotive products containing chlorinated solvents that are classified as Toxic Air Contaminants (TACs) after June 30, 2001. The ATCM prohibited the use of such products after December 31, 2002.

The non-chlorinated automotive cleaning products contain a number of VOC solvents that are also classified as TACs. These include toluene, xylene, methyl ethyl ketone (MEK), methanol and hexane. When the prohibition of use of the chlorinated solvents became effective, ARB was concerned that suppliers would reformulate the cleaning products with VOC solvents that are also toxic. To prevent this outcome, ARB further regulated the VOC content of the cleaners.

Table 1-1 shows the VOC emissions from four categories of aerosol automotive products based on ARB's 2005 Consumer and Commercial Products Survey. The emissions from each category are presented in tons per day (tpd). The table also shows the VOC limits that were in effect in December, 2002 and December, 2004.

Table 1-1
Emissions and VOC Limits for Automotive Consumer Products

Consumer Product Category	VOC Emissions (tpd)	VOC Limits (Wt. %)	
	2005	12/31/2002	12/31/2004
Brake Cleaners	5.93	45	-
Carburetor and Fuel-Injection Air Intake Cleaners	5.00	45	-
Engine Degreasers	2.44	50	35
General Purpose Degreasers	0.16	50	-

The four categories of aerosol automotive cleaning products are used by auto repair facilities, car washes, detailers and do-it-yourself mechanics at home. Brake cleaners are used to remove dust, oil, grease and brake fluid from brake assemblies during repair or replacement. Carburetor cleaners are used to remove dirt, fuel deposits, oil and grease from carburetors, chokes, throttle body valves or other linkages in a fuel injection system. Engine degreasers are used to remove grease, oil and dirt from the external surfaces of engines. General purpose degreasers are used to remove dirt, oil or grease from parts of various types, generally when a repair is being made.

The U.S. EPA sponsored a project to identify, develop and test water-based cleaners as alternatives to solvent cleaners in auto repair facilities (IRTA, 1997). The South Coast Air Quality Management District later regulated the VOC content of these cleaners. The U.S. EPA also sponsored a project to identify, evaluate and implement water-based cleaning alternatives for brake cleaning. The project involved converting seven facilities to water-based cleaning equipment and formulations that were shown to be effective and lower in cost than the aerosol products (IRTA, 1999).

The California Health and Safety Code specifies that ARB determine that their regulations are technologically and commercially feasible and necessary. Although it has been demonstrated in previous work that low-VOC non-aerosol cleaners are available, ARB cannot reduce the VOC content of the aerosol products further on that basis. The Health and Safety Code provides that no regulation shall be adopted which requires the elimination of a product form.

To achieve further reductions in VOC and TAC emissions from aerosol automotive products, new technologies are required. The ARB contracted with the Institute for Research and Technical Assistance (IRTA), a technical nonprofit organization, to identify, develop and test alternative aerosol water-based cleaners that do not contain chlorinated solvents and contain only small amounts of other toxic substances and VOC solvents. This document summarizes the results of the project. The ARB will use the results of this research to assess the feasibility of achieving further VOC reductions from automotive aerosol products.

Section II of this document provides information on the approach that was used to find, test and demonstrate alternative near-zero VOC water-based cleaning aerosol automotive products. Section III describes the preliminary testing of existing water-based cleaners and other low-VOC products on automotive parts. It also identifies a technical problem encountered in packaging the water-based cleaners in aerosol form. Section IV describes the field testing of the alternative cleaners. Section V provides information on an investigation of alternative propellants which was undertaken to determine if the VOC content of the aerosols could be further reduced. Section VI presents a cost evaluation and comparison of the new low-VOC cleaners and cleaners that are used currently. It also includes a comparison of the toxicity of the low-VOC alternative cleaners and the high VOC solvent cleaners used currently. Finally, Section VI summarizes the results and conclusions of the research and provides recommendations.

II. RESEARCH APPROACH AND METHODS

In conjunction with ARB staff, IRTA assembled a technical review committee (TRC) of stakeholders that had an interest in this project. The purpose of the TRC was to give the study the benefit of technical input from industry and business interests. Another purpose of the TRC was to gain input from government agencies concerned with air emissions of VOCs and TACs, wastewater discharges, hazardous waste generation and worker exposure. Members of the TRC included aerosol industry representatives, water-based cleaning formulation companies, government agency representatives, automotive trade organizations and auto repair facility representatives. In the course of the project, TRC members provided technical assistance, advice and comments on the project direction. Three meetings of the TRC were held during the project. The TRC members provided assistance and advice at various times during the project.

The first step in the project was to identify and assess existing water-based aerosol cleaners that were already used in automotive cleaning. After investigating, IRTA identified 19 aerosol water-based cleaners of this type. IRTA and ARB staff established criteria for selecting these water-based aerosol cleaners for further testing in this project. The criteria were that the cleaner contain at least 70% water and that the cleaner contain less than 275 grams per liter or about 27.5% VOC content. Eleven of the 19 aerosol water-based cleaners met these criteria.

The second step in the project was to identify additional non-aerosol existing water-based cleaners that could be tested during the project. IRTA had assisted many auto repair and industrial facilities in converting from solvent to water-based cleaners and IRTA staff was familiar with a number of water-based cleaners that were effective in cleaning automotive and industrial parts. IRTA identified 18 cleaners that could be tested during the project.

The third step in the project was to develop a protocol for the screening testing that would be conducted before the field testing. The purpose of the screening tests was to test the 11 water-based aerosol cleaners and the 18 water-based non-aerosol cleaners to determine which of them might clean in the automotive applications of interest well enough to be field tested.

Auto repair facilities recycle their metal parts when they change them out during a repair. For the screening tests, IRTA collected a variety of used automotive parts from four auto repair facilities that were being discarded. These parts were soiled with dirt, oil and grease. They included brake parts, carburetor and fuel injection parts, engine parts and other general parts.

The screen testing protocol had two phases. Phase I involved testing the aerosol water-based cleaners and the non-aerosol water-based cleaners in pesticide bottles on the parts collected from the auto repair shops. Aerosol cleaners perform cleaning in two ways. First, they dissolve the contaminants. Second, they blow the contaminants off the parts

with the propellant and air pressure. Because some of the water-based cleaners were not in aerosol form, they would not be expected to perform as well as the aerosol cleaners. IRTA investigated traditional spray bottles and pesticide application spray bottles and found the pressure to be higher with the pesticide spray bottles. The cleaners that performed best in the Phase I screening tests were slated to go on to the Phase II screening tests.

The Phase I testing involved comparing the alternative cleaners with baseline cleaners that were commonly used by the industry. The cleaners were sprayed for a 10 second duration onto a portion of the soiled parts that were collected. The cleaning effectiveness was evaluated by inspecting the portion of the part cleaned by the cleaner and by conducting a water break free test. The water break free test has been used historically to determine if a part is clean. The theory is that if the water “sheets” off a part, it is clean. In all cases, the alternative cleaners were compared with baseline cleaners. As part of the Phase I testing, IRTA took the alternative cleaners to three auto repair facilities and conducted the testing with the technicians. IRTA relied on the facility personnel to evaluate the cleaning effectiveness of the alternatives. Of the 29 water-based cleaners tested in Phase I, four of the water-based aerosol cleaners and 14 of the non-aerosol water-based cleaners performed well enough in the Phase I screening test to move on to Phase II.

Phase II of the testing involved packaging the non-aerosol water-based cleaners in aerosol packages with hydrocarbon propellants. Members of the TRC packaged these cleaners for the project. Hydrocarbon propellants were selected for the screen testing because most solvent aerosol cleaners use them and IRTA did not want a difference in performance of the propellant to influence the cleaning capability of the cleaners. The laboratory testing in Phase II was conducted in the same manner as the Phase I laboratory testing. IRTA also tested the 18 cleaners with eight auto repair facilities for the Phase II screen testing.

Ten water-based cleaners performed well in the Phase I and Phase II screening tests in the laboratory and at the auto repair facilities. These included two commercial cleaners that are already packaged in aerosol form and eight cleaners that are not commercial aerosol products. In the screening tests, IRTA also tested two solvents in non-aerosol form in case they were needed in the field testing. One of these was acetone, which is exempt from VOC regulations and low in toxicity. It performed well in the screening tests. The other cleaner was a soy based product, which is very low in VOC content and toxicity. This cleaner did not perform very well in the screening tests.

Two significant issues emerged during the screening tests. The first issue involved foaming. The commercial water-based aerosol products were all dispensed as a foam. When the non-aerosol water-based cleaners were packaged in aerosols, they too foamed. Some of the cleaners were dispensed as a thick foam and some as a thinner foam. As discussed in more detail later, foaming is a desirable characteristic for engine degreasing but it is not desirable for the other three cleaning applications.

The second issue concerned carburetor and fuel injection system cleaners. Because these cleaners can enter the fuel system, TRC members and some of the auto repair facility personnel indicated they would be reluctant to use a water-based product in these applications.

The fourth step in the project was to conduct the field testing of the cleaners. IRTA recruited 13 auto repair facilities, one car wash, two detailers and three consumers to conduct testing of the alternatives. The auto repair shops were selected to span a range of facility types. They included dealerships, service stations that perform repairs, brake shops and general automotive repair facilities.

IRTA tested eight different foaming water-based aerosol products with the car wash, the two detailers and the three consumers to determine their effectiveness for engine degreasing. Three of the products were commercial aerosol products and all three of them contained solvent additives. The remaining five cleaners were packaged by the manufacturer of each water-based cleaner. None of these products contained solvent additives. All shops and consumers found at least one cleaner that performed as well as or better than their current cleaner.

IRTA formulated three products that were blends of acetone and soy to test in carburetor and fuel injection system cleaning applications. These cleaners were tested in the auto repair facilities participating in the project. In all cases, every technician found an alternative that performed as well as or better than their current cleaner.

Because foaming cleaners are not desirable for brake cleaning and general purpose degreasing, IRTA requested that the manufacturers of all of the water-based cleaners that performed well in the screening tests reformulate their cleaners and package them so they would not be dispensed as a foam. This turned out to be a challenging assignment. IRTA obtained six low or non-foaming water-based cleaners from three manufacturers for field testing in brake cleaning and general purpose degreasing. These cleaners were tested in the auto repair facilities participating in the field tests. Two of these cleaners performed almost as well as or as well as the commercial products used today and a third cleaner performed almost as well as the products used today. IRTA also tested non-water-based cleaners for brake cleaning and general purpose cleaning. Two of these performed well in the cleaning applications.

Section III of this document provides a detailed discussion about the Phase I and Phase II preliminary screening tests. Section IV discusses the results of the field testing in much more detail.

III. SCREENING TESTS OF ALTERNATIVE CLEANERS

IRTA began the research by investigating water-based cleaners that were low in VOC content and low in toxicity. Two categories of cleaners were examined for their applicability to automotive aerosol cleaning. The first category of cleaners is existing water-based aerosol cleaners. The second category of cleaners is non-aerosol water-based cleaners used in automotive and industrial cleaning applications. Each of these cleaner categories is discussed below.

Existing Aerosol Cleaners

IRTA used two lists to identify existing water-based aerosol automotive products. The first list was provided by CARB staff and it includes 57 companies. IRTA also used another list provided by the South Coast Air Quality Management District (SCAQMD). It is entitled “Suppliers and/or Manufacturers of Low VOC (less than 50 g/l) Cleaning Aerosol Spray Cans.” This latter list specifies nine companies. Both of these lists are provided in Appendix A.

IRTA staff also performed a search on Google Internet Search Engine and investigated certain terms and combinations of terms. These terms were:

- Aqueous
- Automotive
- Aerosol
- Water
- Clean

IRTA also requested information on other water-based aerosol automotive products from the TRC members. The members did not identify any additional cleaners.

For companies on the two lists and those identified through the Google Search Engine, IRTA first determined whether the listed companies that supply the products had a web site. If the company had a web site, IRTA staff tried to identify water-based aerosol automotive products offered by the companies for brake cleaning, carburetor and fuel injection system cleaning, engine degreasing and general purpose degreasing. In some cases, IRTA staff obtained the Material Safety Data Sheets (MSDSs) from the web sites. In other cases, IRTA staff called the companies to discuss whether they had water-based products and could provide the MSDSs. In certain instances, the companies refused to provide the MSDSs.

Using these sources, IRTA staff identified products that were obviously water-based, products that were likely to be water-based and products that were possibly water-based. When necessary, IRTA staff made phone calls to vendors to verify whether or not the products were water-based. IRTA staff eliminated products that did not contain water, were not in an aerosol package or were not for automotive use.

IRTA staff found 40 products that were possibly water-based automotive aerosol products. Of these 40 products, 12 were obviously water-based aerosol automotive products. The MSDSs of these 12 products were obtained from the manufacturers. Of the remaining products, only seven more water-based aerosol automotive products were identified. The MSDSs of these seven products were also obtained.

A list of 19 water-based automotive aerosol products were identified in the search. IRTA examined the MSDSs for all of the products to determine if they met IRTA's criteria of near-zero VOC. A cleaner met these criteria if the water content was 70% or greater or if the VOC content was less than about 275 grams per liter or 27.5%. There were 11 cleaners that met the criteria.

IRTA contacted the vendors that sell the 11 cleaners to obtain samples for the preliminary screening tests. One of the manufacturers did not send a sample of the cleaner so it could not be tested. Table 3-1 shows the cleaners that were included in the first phase of the preliminary screening and the characteristics of these cleaners.

Table 3-1
Existing Water-Based Aerosol Automotive Products
With Less Than 27.5% VOC Content Included in Preliminary Screening

<u>Manufacturer</u>	<u>Product Name</u>	<u>Water Content</u>	<u>VOC Content</u>
BioChem Systems	Bio T General Purpose Foam	50-90%	low
The Berkebile Oil Co.	Berkebile 2+2 Super Cleaner	unknown	low
Mirachem	Mirachem All Surface Safe Cleaner/ Degreaser	unknown	161 g/l
Sunshine Makers	Foaming Simple Green-Wheel Cleaner	90%	50 g/l
Sunshine Makers	Foaming Simple Green-Total Auto- motive Foaming Cleaner	90%	50 g/l
Berryman Products	All Purpose Clean-R	unknown	unknown
Berryman Products	New Engine Degreaser	30-50%	high
Radiator Specialty Co.	Foaming Wheel Cleaner	unknown	low
Drummond Amer- ican Corp.	Zonk!	70-80%	264 g/l
Radiator Specialty Co.	Foamy Engine Brite Degreaser	70-80%	low

Other Non-Aerosol Water-Based Cleaners

IRTA staff have extensive experience in the South Coast Basin working with industrial facilities in a number of different types of cleaning activities and with auto repair facilities in parts cleaning and brake cleaning. Under SCAQMD Rules 1171 and 1122, industrial and auto repair facilities are required to use cleaners with 25 grams per liter or less VOC for certain cleaning applications. Because of the low VOC content cleaner

requirements in the South Coast Basin, many vendors are supplying water-based cleaners to industrial facilities and to automotive shops.

Water-based cleaners used in these cleaning activities, which require the removal of oil based soils, are generally neutral to alkaline cleaners. Such cleaners may contain a variety of components including wetting agents and surfactants, emulsifiers, saponifiers, rust inhibitors, defoaming agents, alkalinity builders, water conditioners, sequestration agents, rinsing agents and fragrances. The actual mix of ingredients in a water-based cleaner depends on the application for which the cleaner is intended. One of the simplest cleaners might contain a surfactant for penetrating and loosening the substrate/soil bond, an alkalinity builder like sodium bicarbonate and a rust inhibitor that makes the cleaner safe for use in cleaning ferrous metals.

In the screening tests, IRTA tested a number of water-based cleaners that are not available in aerosol form currently. These cleaners are manufactured by a number of different companies. Some have been used in the automotive sector and others are used primarily in the industrial sector for cleaning. Table 3-2 summarizes the cleaners that were tested in the preliminary screening tests.

Table 3-2
Water-Based Products Not Currently in Aerosol Form
Included in Preliminary Screening

<u>Manufacturer</u>	<u>Product Name</u>
Kyzen Corp.	Metalnox 6309
	Metalnox 6319
	Metalnox 6432
	Metalnox 6410MS
Applied Cleaning Technologies	Spray Clean 12
	Scrub Tub 8
AX-IT	AX-IT Spray
	AX-IT Immersion
Brulin	GD-815
	GD-1990
Magnaflux	Daraclean 200
	Daraclean 212
	Daraclean 236
	Daraclean 238
	Daraclean 257
	Darasolv 7
Mirachem	Darasolv 11
	Mirachem 750

Other Non-Water-Based Cleaners

IRTA also screen tested two additional non-water-based cleaners, soy and acetone. One of the soy based cleaners is offered by AG Environmental Products and is sold under the trade name Soy Gold. The soy products have very low VOC content and are also low in toxicity. Acetone is available from multiple producers. Acetone is exempt from VOC regulations and is fairly low in toxicity.

Automotive Parts Collection for Screening Tests

IRTA gathered several different parts for the screening tests. These parts were collected from auto repair facilities. Auto repair shops, when they replace a part, send the discarded parts for metal recycling. IRTA collected four large containers of parts from four different facilities for the screen testing. The parts are generally contaminated with large quantities of dirt, oil and grease that would typically be encountered in an automobile.

The parts that were used for the testing fall into four categories according to the regulatory classification of different aerosol cleaner types:

Brake Parts

- Eleven disc brake rotors
- Two brake assembly parts

Carburetor/Fuel Injection System Parts

- Two carburetors
- Two fuel injectors

Engine Parts

- One long block engine assembly with head

General Parts

- One piston rod
- Three U joint bearings and U joints
- Twelve hydraulic lifters
- Two flywheels
- One torque converter
- Two emission control equipment assemblies
- One heater core
- One transmission yolk
- One trans axle casing
- Two torsion bars
- One suspension A frame
- Three water pumps
- One BMW valve cover
- One oil pan

- Two idler arms
- One strut
- One oil pump
- One belt idler
- One master cylinder
- One alternator
- One automotive transmission assembly

Preliminary Screening Tests

IRTA used a two-phase approach to screen test certain cleaners. As discussed in Section II, IRTA identified 10 existing aerosol water-based products that were screen tested. IRTA also identified 18 other non-aerosol near-zero VOC water-based cleaners that were screen tested. Two other non-water-based cleaners, acetone and soy, were also tested. Thus, a total of 30 cleaning agents were tested in the first phase of the screening tests.

In the first phase of the screening tests, the cleaning capability of the alternative products was compared with the cleaning capability of baseline solvent aerosol products. All of the products were tested at a test facility, a company called Applied Cleaning Technologies (ACT), on the automotive parts described earlier. The existing water-based aerosol cleaners were tested in aerosol form. The non-aerosol water-based cleaners were tested using pump pesticide application bottles. IRTA also tested the soy and acetone in the pesticide application bottles.

All of the products--the baseline solvent cleaners and the alternative cleaners--were sprayed for a 10 second duration onto a portion of the parts listed above. The cleaning effectiveness was evaluated by inspecting the portion of the part cleaned by the cleaner and by conducting a water break free test. The water break free test has been used historically to determine if a part is clean. The theory is that if water “sheets” off a part, it is clean and if water beads on the part, it is not clean. The water break free test may be too stringent for this application where stringent cleanliness is not required but it does serve as a guide. In all cases, the alternative cleaners were compared with the baseline solvent based aerosol cleaner in terms of cleaning effectiveness.

In the first phase of the screening tests, IRTA also took the non-aerosol water-based cleaners to three auto repair facilities and conducted the testing using the pesticide application bottles. IRTA requested that the facility personnel evaluate the cleaning effectiveness of the alternatives.

The results of the first phase of the screening tests indicated that four of the 10 low-VOC aerosol cleaners performed well enough to continue on to the Phase II testing. The cleaners that were carried on to the second phase of the screening tests were:

- Mirachem All Surface Safe Cleaner/Degreaser
- Radiator Specialty Co. Foamy Engine Brite Degreaser
- Sunshine Makers Foaming Simple Green-Wheel Cleaner
- Berryman B-33 Engine Degreaser

The 18 water-based cleaners that are not currently in aerosol form were screen tested using the pesticide applicators and they were compared with the solvent aerosol products. Of these cleaners, it was judged that 14 cleaners performed well enough to go on to the second phase of the screening testing. These included:

- Magnaflux Daraclean 200
- Magnaflux Daraclean 236
- Magnaflux Daraclean 238
- Magnaflux Daraclean 257
- Kyzen Metalnox 6432
- Kyzen Metalnox 6319
- Kyzen Metalnox 6410MS
- Brulin GD1990
- Brulin GD815
- Applied Cleaning Technologies Spray Clean 12
- Applied Cleaning Technologies ScrubTub
- AX-IT Spray
- AX-IT 3X Spray Cleaner
- Mirachem 750

Acetone and Soy Gold were tested in the first phase of the screening tests and compared with the solvent aerosol products. Acetone performed well and Soy Gold did not perform well.

In the second phase of the screening tests, three aerosol packagers agreed to package the 14 water-based cleaners that were not currently in aerosol form. The companies that did the packaging include:

- CRC Industries, Inc.
- Hydrosol, Inc.
- Radiator Specialty Company

IRTA arranged for the water-based cleaner manufacturers and distributors to provide three gallons each of the cleaner to one of the three packagers. The packagers packed the cleaners in aerosol containers that were all propelled by hydrocarbons. In the preliminary screening tests, hydrocarbon propellants were used for all the cleaners so a difference in performance of the propellant would not influence the cleaning capability of the cleaners.

IRTA again conducted the laboratory testing of the 18 water-based cleaning agents using the parts containing oil and grease collected from the auto repair facilities. This time, however, the cleaning agents were all in aerosol form so the tests could be conducted with aerosols and the cleaning capability compared with the solvent aerosol cleaners.

Table 3-3 presents the Phase II results of IRTA's laboratory testing at ACT. The table shows each of the cleaning agents that was tested in the first column. The four different cleaning applications are shown across the top of the table. For each application, the solvent baseline cleaner that was compared with the alternative water-based cleaners is

Table 3-3
Results of Laboratory Screening Tests

<div>Application (Baseline Cleaner)</div> <div>Cleaner Name</div>	Engine Degreasing (CRC Engine Degreaser)	Carburetor and Fuel Injection System Cleaning (Gumout Choke & Carb Cleaner)	Brake Cleaning (CRC Brake Parts Cleaner)	General Purpose Degreasing (CRC Engine Degreaser)
Daraclean 200	N	S	S	S
Daraclean 236	S	N	N	N
Daraclean 238	N	N	S	S
Daraclean 257	S	S	S	S
Metalnox 6432	S	N	S	N
Metalnox 6319	N	S	S	N
Metalnox 6410MS	N	S	N	N
Brulin 1990GD	N	N	N	N
Brulin 815GD	N	S	S	N
ACT Sprayclean 12	S	S	S	S
ACT ScrubTub	S	N	N	N
AX-IT Spray Cleaner	S	S	N	N
AX-IT 3X Spray Cleaner	S	N	N	N
Mirachem 750	N	N	S	N
Mirachem All Surface Safe	S	S	N	N
Foamy Engine Bright	S	S	S	S
Simple Green Wheel Cleaner	S	S	N	N
Berryman B-33 Engine Degreaser	S	S	S	N

Note: S = Same as baseline; N = Not as good as baseline

also identified in parenthesis. An entry of S in the table indicates the cleaner performed the same as the baseline cleaner and an entry of N indicates the cleaner did not perform as well as the baseline cleaner.

Also in the second phase of testing, IRTA took one can of each of the 18 water-based cleaners to eight auto repair facilities for them to test. IRTA participated in all of the testing and asked for the opinion of the technicians on the cleaning capability of the cleaners. The testing at the auto repair facilities was conducted on brakes and on parts of various types. Thus the results were meaningful only for brake cleaning and general purpose degreasing. The results did not apply to carburetor and fuel injection system cleaning or engine degreasing.

The results of the Phase II screening tests performed in the laboratory and at the auto repair facilities are presented in Table 3-4. The table lists the names of the cleaners that were tested down the side. Across the top, the locations of the testing are indicated. The first eight columns identify the results for the testing at the auto repair facilities. The ninth column summarizes the testing that IRTA conducted in a laboratory setting at ACT. The entries in the table are C, which means the cleaner was close in performance to the shop's current cleaner or the baseline cleaner selected for comparison but not quite as good; S, which is the same as or as good as the shop's current cleaner; and B, which is better than the shop's current cleaner. Blanks in the table indicate that the cleaner did not perform well. The tenth column in the table shows how many times the shops or IRTA in the laboratory testing, taken together, ranked the cleaner the same as or better than the current or baseline cleaner. The eleventh column shows how many times the shops or IRTA, taken together, ranked the cleaner the same as, better than or close to the same as the current or baseline cleaner. For the laboratory testing results in Table 3-4, IRTA entered an S if the cleaner performed the same as the baseline cleaner for both general purpose degreasing and brake cleaning in Table 3-3.

If the table showed a 0, 1 or 2 in the last two columns, the cleaner was judged to be ineffective. These cleaners were eliminated from the field testing. On this basis, there were eight cleaners that were judged to be effective enough to undergo field testing. They include:

- Daraclean 200
- Daraclean 238
- Daraclean 257
- Metalnox 6410
- Brulin 1990GD
- ACT Sprayclean 12
- AX-IT Spray Cleaner
- Foamy Engine Brite

Table 3-4
Laboratory and Field Screening Test Results for Alternative Water-Based Cleaners

Cleaner Name	ARCO Partnership	Morgan's Auto Service	Connell Chevrolet	Guaranty Chevrolet	Brake Master	Santa Monica Auto Center	German Auto Technik AG	Samo Wheel and Brake Service	ACT / IRTA	Same & Better	Same, Better & Close to Same
Daraclean 200		S	S		S		S	S	S	6	6
Daraclean 236			B	S						2	2
Daraclean 238			S	S	S	S			S	5	5
Daraclean 257	S	S	B	S		S			S	6	6
Metalnox 6432										0	0
Metalnox 6319		S		S						2	2
Metalnox 6410MS	S	S	B		S					4	4
Brulin 1990GD	S	S	S		S					4	4
Brulin 815GD								S		1	1
ACT Sprayclean 12	S	C	S				S	C	S	4	6
ACT ScrubTub							S			1	1
AX-IT Spray Cleaner		B	B	S		S		S		5	5
AX-IT 3X Spray Cleaner										0	0
Mirachem 750										0	0
Mirachem All Surface Safe	S							C		1	2
Foamy Engine Brite				S		S		C	S	3	4
Simple Green Wheel Cleaner	S						S			2	2
Berryman B-33 Engine Degreaser								C		0	1

Note: C = close in performance to current cleaner; S = same as or as good as current cleaner; B = better than current cleaner

Two additional cleaners that performed well in the Phase I screening tests were also judged to be effective enough to undergo field testing. These include:

- Metalnox 6432
- Mirachem 750

Three cleaners that did not perform well according to the information in Table 3-4 but did perform well for engine degreasing are Mirachem All Surface Safe, Simple Green Wheel Cleaner and Berryman B-33 Engine Degreaser. Except for the Mirachem cleaner, these cleaners are also commercial products used for auto parts cleaning. Mirachem and Simple Green agreed to send aerosol cleaners for the field testing so these two additional cleaners were field tested in engine degreasing.

One issue that arose during the screening tests is that all of the water-based cleaners packaged in aerosol form are foaming cleaners. These types of cleaners are used today in engine degreasing where the engine is rinsed with water after the degreaser is applied. Foaming cleaners are not commonly used in the other three applications: brake cleaning, general purpose degreasing and carburetor and fuel injection cleaning. The non-foaming solvent aerosol baseline cleaners are effective in part because of the mechanical pressure that dispensing the liquid at high pressure imparts. The auto repair technicians simply spray the cleaner until the cleaner and the mechanical action dislodge the contaminants. The same procedure does not work with foaming cleaners. In some cases, the foam is thick and it remains on the surface for a period; in other cases, the foam drips off fairly quickly. In the case where the foam remains on the surface, it has some time to solubilize the contaminants. In both cases, however, there is virtually no mechanical action that aids in the contaminant removal. In instances where foam is left on the part, the technician would have to rinse it for inspection. IRTA concluded it was essential to have the brake and general purpose cleaners packaged as non-foaming cleaners for the field testing.

Another issue that arose during the screening tests is that many auto repair technicians indicated they were reluctant to test water-based cleaners for carburetor and fuel injection system cleaning activities. They were concerned that the water would enter the fuel system. Based on these concerns, IRTA decided not to field test the water-based cleaners for this cleaning category.

IRTA prepared a report that described the selection of cleaners for testing and the protocol for the screening and field tests. The reference for this report is IRTA, 2002. IRTA also prepared an interim report that describes the screening tests and the results of those tests in more detail. The reference for this report is IRTA, 2003.

IV. FIELD TESTS OF ALTERNATIVE LOW-VOC CLEANERS

Two issues were identified in the screening tests described in Section III. First, it is difficult to find water-based cleaners that do not foam when they are packaged in aerosol form. There are a number of water-based cleaners used today in industrial cleaning that are designed to not foam. They are used in spray cabinets and conveyor systems. These cleaners, however, are all used at higher temperature and they are not sprayed with air or propellant. They are forced with pressure through spray nozzles. Even cleaners designed to not foam in industrial applications will likely foam when they are packaged and dispensed in an air and propellant stream. Finding and packaging water-based cleaners that did not foam in an aerosol package was very challenging. A few of the water-based cleaning formulators that participated in the TRC were able to find such cleaners. It required knowledge and art in finding the right cleaner and packaging it properly so it did not foam. IRTA solicited non-foaming cleaners from all the TRC members and other members of the water cleaning industry.

Second, many of the auto repair technicians were uncomfortable using water-based cleaners for carburetor and fuel injection system cleaning. As a consequence, IRTA made the decision to not test water-based cleaners for this application.

Approach to Field Testing

IRTA recruited 13 auto repair facilities to assist in testing the alternative low-VOC cleaners. These facilities included dealerships, brake shops, service stations that also do repairs and general automotive repair shops. IRTA also recruited three automotive detailers, one car wash and three consumers to assist in the field testing. A list of all of these shops and consumers is provided in Appendix B.

IRTA originally planned to provide each of the facilities participating in the field testing a one-week supply of each of the alternative cleaners. In practice, however, this presented problems. First, some of the facilities did not have as many jobs as anticipated so the cleaners could not be tested so quickly. Second, when the facility personnel thought the cleaner did not work well, they were understandably reluctant to test it extensively. Third, in some cases, the shop owners did not communicate to the technicians that they should test the alternative cleaners.

IRTA revised the testing strategy to accommodate these problems. IRTA visited the facilities often, at least once a week, when the testing was underway. This was beneficial because the IRTA staff could also work with the technicians during this time to observe the performance and advantages or disadvantages of the cleaners firsthand.

IRTA developed a questionnaire, with input and review by the TRC members, for the technicians and consumers to use in the field testing. IRTA generally filled out the questionnaire when the technician or consumer finished using the alternative cleaner by asking the opinions of the person conducting the testing. At some of the facilities, IRTA

worked with more than one technician so there were multiple completed questionnaires. At one of the facilities, one technician filled out one of the questionnaires himself. A sample of the questionnaire is shown in Appendix C.

The balance of this section focuses on the three categories of automotive aerosol cleaning. The applications and the cleaning tasks differ significantly. IRTA treated engine degreasing and carburetor and fuel injection system cleaning separately but combined brake cleaning and general purpose degreasing.

Engine Degreasing

IRTA did not perform engine degreasing with the 13 auto repair facilities participating in the project since they do not perform engine degreasing. IRTA decided to recruit detailers, car washes and consumers to assist in evaluating the alternative water-based aerosol engine degreasers. Although detailers and car washes do not use aerosol products, they do know about degreasing engines. IRTA believed the personnel in car washes and detailing companies would have expertise in evaluating the capability of the water-based cleaners for degreasing the engine. IRTA also believed they would have expertise in comparing the cleaning capability of the alternative water-based cleaners to the bulk cleaners they commonly use. IRTA also identified three consumers who work on their cars and routinely perform engine degreasing to evaluate and compare the alternative water-based engine degreasers with the solvent engine degreasers they commonly use.

Detailers and car washes do not use aerosol engine degreasers to degrease the engines. Rather, they purchase and use bulk cleaners in high-pressure sprayers. Virtually all detailers and car washes already use water-based cleaners for degreasing engines. The bulk water-based cleaners may contain small amounts of solvent additives but these are generally very small. The VOC content of these cleaners is very low, close to zero. The detailers and car washes use the bulk cleaners because they are much less costly than aerosol products. Consumers do use aerosol engine degreasers.

The bulk concentrate of the water-based cleaner used by detailers and car washes is most often diluted with water and is applied with a high pressure sprayer. The cleaner solubilizes the contaminants and, more important perhaps, the pressure blasts the contaminants from the engine, the engine compartment or the under carriage of the vehicle. The engine is then rinsed with plain ambient temperature or heated water in a pressurized spray applicator. Figures 4-1, 4-2 and 4-3 show a detailer detailing a car. Figures 4-1 and 4-2 show the detailer applying the water-based cleaner and the water rinse respectively. Figure 4-3 shows the detailer cleaning the undercarriage of the car with the same water-based cleaner.

Consumers use aerosol engine degreasers to clean their engines. They apply the cleaners and then rinse the contaminants and the cleaner from the engine, generally with a hose. The solvent aerosol degreasers do not foam whereas all of the commercial aerosol water-

based cleaners on the market do foam. The foaming cleaners sit on the engine for a period and solubilize the contaminants. They can then be rinsed off with plain water.



Figure 4-1. Detailer Applying Water-Based Cleaner to Engine



Figure 4-2. Detailer Rinsing Engine



Figure 4-3. Detailer Cleaning Undercarriage of Truck

IRTA tested a total of eight water-based engine degreasers with the car wash, the detailers and the consumers. As discussed earlier, IRTA screened commercial products and identified four commercial water-based aerosol products that could be tested. These cleaners met the criteria of containing at least 70% water and a VOC content of about 27.5%. All of these products contained solvents. Three of the manufacturers provided large quantities of the products for testing. These products include:

- Foamy Engine Brite Degreaser
- Simple Green Wheel Cleaner
- Mirachem All Surface Safe Cleaner/Degreaser

IRTA tested five additional water-based cleaners that were not previously in aerosol form. Each of the manufacturers arranged to have the cleaners packaged in aerosol form. These cleaners, like the three commercial aerosol products, foamed and this was appropriate for the engine degreasing cleaning task. The additional five cleaners include:

- AX-IT L-7768
- L-7820 ScrubTub
- Kyzen Aerosol Cleaner
- Kyzen Aerosol Degreaser 11
- Kyzen Engine Degreaser 2

MSDSs for the eight products that were tested in engine degreasing are shown in Appendix D. The cleaners are neutral to alkaline cleaners with a pH ranging from 8.7 to 13. All eight of the cleaners use hydrocarbon propellants. Note that all three of the commercial aerosol water-based cleaners contain solvent additives and that all five of the alternative water-based cleaners contain no solvent additives. The VOC content of the five new alternative water-based cleaners ranges from five to 15% and is due only to the hydrocarbon propellant.

Tables 4-1 and 4-2 show the results of the engine degreasing tests. In both tables, the facilities participating in the testing are listed in the first column. The cleaners that were tested are shown across the top. Table 4-1 presents the adequacy of the cleaners which is simply a measure of whether the cleaner cleaned or did not clean. A zero in the table indicates the cleaner did not work; a one indicates the cleaner did work. As noted in the table, it was not possible to test all of the cleaners with all of the facilities or consumers because of scheduling difficulties. L-7820 ScrubTub and Kyzen Aerosol Degreaser 11, for example, were not tested by all facilities and consumers. The raw data questionnaire sheets filled out by IRTA after the tests were conducted with each cleaner at each of the facilities are provided in a separate addendum to this document.

Table 4-2 ranks the alternative water-based cleaners in comparison to the bulk water-based cleaner routinely used by each of the facilities. The feedback from the consumers was not included in Table 4-2 because the consumers indicated they do not use the same engine degreaser every time they degrease the engine. They use the product that is low cost and available when they need to perform the cleaning task. The ranking values in Table 4-2 range from zero to 3. A zero indicates that the cleaner performance was poor. A 0.5 indicates that the cleaner performed marginally well. A 1 indicates that the cleaner

was almost as good as the current cleaner. A 1.5 indicates that the cleaner was nearly as good as the current cleaner. “Nearly as good” is better than “almost as good.” A 2 indicates that the cleaner performed as well as the current cleaner. A 2.5 indicates that the cleaner performed somewhat better than the current cleaner and a 3 indicates that the cleaner performed better than the current cleaner.

Table 4-1
Alternative Engine Degreasers – Adequacy of Cleaning

Facility	Foamy Engine Brite	Simple Green	Mirachem All Surface	AX-IT L-7768	L-7820 ScrubTub	Kyzen Aerosol Cleaner	Kyzen Aerosol Degreaser 11	Kyzen Engine Degreaser 2
Triple Shine Detail	1	1	1	1	1	0		0
VREJ Detail	1	1	1	1		0	1	1
New Image	1	1	1	1	1	1	0	1
California Car Wash	1	0	1	1	1	1		1
Consumer 1	1	1	1	1		1	1	1
Consumer 2	1	1	0	1	1	1	1	1
Consumer 3	1	0	0	1		0	1	1

Key: 0 = Did not clean; 1 = Cleaned

Table 4-2
Alternative Engine Degreasers – Ranking

Facility	Foamy Engine Brite	Simple Green	Mirachem All Surface	AX-IT L-7768	L-7820 ScrubTub	Kyzen Aerosol Cleaner	Kyzen Aerosol Degreaser 11	Kyzen Engine Degreaser 2
Triple Shine Detail	1	2	1	1	2	0		0
VREJ Detail	2	2.5	2	1		0	2.5	2.5
New Image	1	1	1	1	2	2.5	0.5	2.5
California Car Wash	1	0.5	1	1	2	2		1
Consumer 1								
Consumer 2								
Consumer 3								

Performance Key: 0 = Poor; 0.5 = Marginal; 1 = Almost as good as current cleaner; 1.5 = Nearly as good as current cleaner; 2 = As good as current cleaner; 2.5 = Somewhat better than current cleaner

The values of Table 4-1 show that most of the facilities and consumers participating in the project thought that all of the alternative cleaners performed acceptably. Foamy Engine Brite, a commercial product, and AX-IT L-7768 were tested by all participants and all indicated they cleaned. L-7820 ScrubTub was tested by only four participants but all agreed it cleaned. All of the remaining cleaners cleaned adequately according to a majority of the participants.

Table 4-2 shows that several of the alternative cleaners received rankings that indicate the cleaner was almost as good or as good as the current cleaner. Four of the cleaners were ranked somewhat better than the current cleaner by at least one of the facilities that evaluated them. Only two cleaners were judged to be poor by one or two of the facilities that evaluated them.

In general, Table 4-2 shows that alternative water-based cleaners are acceptable when compared with the current cleaners used by the detailers and the car wash that participated in the project. Table 4-1 shows that the consumers who conducted testing in the project also found that most of the alternatives worked. An interesting point that was noted by IRTA staff during the testing is that the younger technicians and consumers appeared to prefer the alternative cleaners with no solvent additives over the commercial product water-based cleaners which did have solvent additives. In contrast, the older technicians and consumers preferred the cleaners containing solvents. One consumer said “if it doesn’t smell bad like a solvent, it won’t work.” All of the products foamed and the consumers indicated they liked a foaming cleaner. In contrast, the technicians indicated they preferred non-foaming cleaners, perhaps because the non-aerosol cleaners they use currently do not foam.

Carburetor and Fuel Injection System Cleaning

Virtually all auto repair facilities purchase two cleaners. First, they purchase a brake cleaner or general purpose cleaner that is used for performing brake jobs and for some general purpose cleaning. The technicians view brake cleaners and general purpose degreasers as interchangeable. Second, they purchase a carburetor cleaner which they consider faster evaporating. This cleaner is used for cleaning throttle body valves and for preparing gaskets, which are sealed using a gasket sealer for bonding with metal parts.

Most new automobiles sold today have fuel injection systems rather than carburetors. Some older cars on the road still have carburetors. A picture of a carburetor cleaned during the project is shown in Figure 4-4. Most of the carburetor cleaner used today is used for cleaning throttle body valves. Nearly all auto repair facilities use a different type of cleaning method for flushing fuel injection systems. This system uses two different materials. The first is a blend of high-VOC solvents provided with a dispenser system that can be hooked up to the fuel injection system. This cleaner is flushed through the system with the engine running. As a consequence, the ingredients in the cleaner are combusted and the VOC solvents are not emitted. The second material is an additive that is poured into the fuel tank. This material is not a solvent and it is not emitted; again, it is

combusted when the fuel is burned. IRTA did not attempt to find alternatives for the additives flushed through the fuel injection system. IRTA did try to find alternatives to the cleaner labeled carburetor cleaner that facilities purchase and use for various activities.



Figure 4-4. Carburetor Cleaned With Alternative Cleaners

The aerosol industry TRC members raised an issue about the legality of testing alternative carburetor cleaners before the field testing began. They indicated that there was a federal regulation that required registration with U.S. EPA before new cleaners could be tested. IRTA investigated this issue which is described in Title 40 Part 79 of the Code of Federal Regulations. The statute states that any designated additive, which includes so-called aftermarket aerosol additives, in a research, development or test status and not offered for commercial sale is exempt from the registration requirement.

As mentioned earlier, many of the participating auto repair technicians were reluctant to test water-based cleaners as an alternative to the carburetor cleaner they use today. IRTA decided to formulate three different cleaners for testing in this application. IRTA blended three different compositions of acetone, a VOC exempt solvent, with a soy based cleaner. Acetone has a very high vapor pressure and evaporates quickly; the solvent is also low in toxicity compared with other solvents used by this industry today. IRTA has tested soy products extensively in other projects and it is a very effective ink and carbon cleaner. The SCAQMD has tested the VOC content of several soy formulations and has found them to have less than about 25 grams per liter VOC content. This translates into 2.5% VOC. The soy cleaners are low in toxicity but they are oily and have a low vapor pressure making them slow evaporating.

IRTA decided to test three alternative soy/acetone cleaners. Because of the slow evaporation rate of the soy, all three cleaners had at least 50% acetone. The first cleaner was a 50%/50% soy/acetone blend. The second cleaner was composed of 65% acetone and 35% soy. The third cleaner was composed of 75% acetone and 25% soy. One packager used a hydrocarbon propellant, but IRTA did not test these cleaners for

carburetor and fuel injection system cleaning. A second packager was willing to package the cleaners with a carbon dioxide propellant and IRTA tested these formulations for carburetor and fuel injection system cleaning. All three cleaners have close to zero VOC content.

The 50% soy product was tested by 11 technicians at nine auto repair facilities. The 35% soy product was tested by 13 technicians at ten auto repair facilities. The 25% soy product was tested by 12 technicians at eight auto repair facilities. The technicians tested the cleaners on carburetors if they had vehicles with carburetors and for intake and throttle body valve cleaning if they had vehicles with fuel injection systems. One water-based cleaner, a brake cleaner provided by Kyzen called Cyber Solv 11, was tested by one mechanic at one facility. He did not know it was a water-based cleaner and he was testing it in other applications as well. MSDSs for the soy based cleaner used in the blends and acetone are shown in Appendix E. An MSDS for the Cyber Solv 11 product is also shown in the appendix.

Tables 4-3 and 4-4 show the test results for the alternative low-VOC carburetor and fuel injection system cleaners at each of the participating auto repair facilities. The facilities are listed in the first column of both tables. In some cases, more than one technician at a facility tested the cleaners. The first name of the technician is shown after the name of the facility. The raw data questionnaires filled out by IRTA staff at the completion of the testing are presented in a separate addendum to this document.

Table 4-3 illustrates the adequacy of the three soy/acetone cleaners and the one water-based cleaner. A zero indicates that the cleaner did not clean and a 1 indicates that the cleaner cleaned adequately. A blank in the table means that the cleaner was not tested at the facility. The values show that only one mechanic at one facility stated that one of the soy/acetone blends was not adequate. All other technicians stated that the cleaners were adequate. The technician that tested the water-based cleaner also thought it was adequate.

Table 4-4 ranks the alternative low-VOC cleaners in comparison to the carburetor cleaner used by each facility today. A zero indicates the cleaner performed poorly. A 0.5 indicates the cleaner performed marginally well. A 1 indicates the cleaner performed almost as well as the current cleaner. A 1.5 indicates the cleaner performed nearly as well as the current cleaner. “Nearly as well” is better than “almost as well.” A 2 indicates the cleaner performed as well as the current cleaner. A 2.5 indicates the cleaner performed somewhat better than the current cleaner. Finally, a 3 indicates the cleaner performed better than the current cleaner.

The results indicate that all of the cleaners were ranked at least almost as good as the current cleaner. The 35% soy/acetone blend was ranked better than the current cleaner by four of the 13 technicians that tested it. Three other technicians ranked the cleaner somewhat better than the current cleaner. The remaining six technicians indicated the cleaner performed as well as the current cleaner. The 25% soy/acetone blend was ranked slightly lower. Only two technicians ranked it almost as good as the current cleaner and

one technician ranked it nearly as good as the current cleaner. The remaining nine technicians ranked it as good as or somewhat better than the current cleaner. The 50% soy/acetone blend was tested by 11 technicians. One of them ranked it as performing marginally well, three of them ranked it as almost as good as the current cleaner, four of them ranked it as good as the current cleaner and three ranked it as somewhat better than the current cleaner. The water-based cleaner tested by one technician was ranked as good as the current cleaner.

Table 4-3
Alternative Carburetor and Fuel Injection System Cleaners – Adequacy of Cleaning

Facility	50% Soy/ Acetone	35% Soy/ Acetone	25% Soy/ Acetone	CyberSolv Degreaser 11
ARCO	1	1	1	
Shell (Santa Monica)		1	1	
Samo Tire				
Morgan's Auto Service	1	1	1	
S.M. Auto Center – Aljerome			1	
S.M. Auto Center – Rene	1	1	1	
S.M. Auto Center – Catarino		1	1	
S.M. Auto Center – Esmet	1			
Big Blue Bus	1		1	
Brake Master		1		
German Auto Technik	1	1		
Mercedes Benz	1	1	1	1
Connell Chevrolet - Tony	0	1		
Connell Chevrolet – Joe		1		
Ira Newman Automotive - Scott	1		1	
Ira Newman Automotive - Norm	1	1	1	
Shell (Rose) – Luis			1	
Shell (Rose) – Avelino			1	
Shell (Rose) – Jesus	1			
Guaranty Chevrolet - Mechanic 1		1		
Guaranty Chevrolet - Mechanic 2		1		

Key: 0 = Did not clean; 1 = Cleaned

Qualitative comments by the technicians indicated that the 25% soy/acetone blend and the 35% soy/acetone blend performed better than the 50% soy/acetone blend because the latter blend evaporated too slowly. The technicians currently use fast evaporating cleaners and they like that feature. Many technicians also mentioned the smell of the soy/acetone products. They also stated that it was not objectionable, just noticeable.

One issue that arose during the testing concerned the fact that technicians use the carburetor cleaner for preparing gaskets for bonding to metal surfaces with a gasket sealer. A few of the technicians stated that the soy/acetone blends left an oily residue. If the surface of the gasket has a residue, the sealant will not stick. The mechanics tried wiping the residue with a wipecloth and said that the surface of the gasket could accept the sealant after the wiping. Another alternative that could be used for the gasket preparation is a very high acetone content aerosol product. Such products are already on the market in Southern California.

Table 4-4
Alternative Carburetor and Fuel Injection System Cleaners – Ranking

Facility	50% Soy/ Acetone	35% Soy/ Acetone	25% Soy/ Acetone	CyberSolv Degreaser 11
ARCO	1	2	2.5	
Shell (Santa Monica)		3	2.5	
Samo Tire				
Morgan's Auto Service	1	2	1	
S.M. Auto Center – Aljerome			2	
S.M. Auto Center – Rene	2	2.5	2	
S.M. Auto Center – Catarino		2.5	2	
S.M. Auto Center – Esmet	2			
Big Blue Bus	2		1	
Brake Master		2		
German Auto Technik	2	2		
Mercedes Benz	2.5	3	2.5	2
Connell Chevrolet - Tony	0.5	2		
Connell Chevrolet - Joe		2		
Ira Newman Automotive - Scott	1		2	
Ira Newman Automotive - Norm	2.5	3	1.5	
Shell (Rose) - Luis			2	
Shell (Rose) - Avelino			2	
Shell (Rose) - Jesus	2.5			
Guaranty Chevrolet - Mechanic 1		2.5		
Guaranty Chevrolet - Mechanic 2		3		

Performance Key: 0 = Poor; 0.5 = Marginal; 1 = Almost as good as current cleaner; 1.5 = Nearly as good as current cleaner; 2 = As good as current cleaner; 2.5 = Somewhat better than current cleaner; 3 = Better than Current Cleaner

In general, the alternative carburetor and fuel injection system cleaners performed as well as or better than the current carburetor cleaners purchased by auto repair facilities. The 25% and 35% blends were preferred by the technicians over the 50% soy cleaner because they evaporated more quickly.

Brake Cleaning and General Purpose Degreasing

As discussed earlier, most auto repair shops purchase two types of cleaners. One of these cleaners is a fast evaporating carburetor cleaner and the other is a brake cleaner or general purpose degreaser. The shops perform their brake cleaning and general purpose degreasing generally with the same cleaner. Some technicians and shops have a preference for a particular cleaner but many purchase the cleaner that is the lowest cost when they need additional cleaner.

General purpose degreasing is performed when a part needs to be replaced or repaired. Technicians often spray the part with an aerosol cleaner to remove any dirt, grease or oil so they can examine the part and replace or repair it as necessary. Figure 4-5 shows a technician performing general purpose degreasing.

Older vehicles manufactured in the 1980s and before have drum brakes on both the front and the back. Before about 1995, vehicles were manufactured with disc brakes on the front and drum brakes on the back. In the last 10 years, vehicles are often manufactured with disc brakes on both the front and the back. Figure 4-6 shows a picture of a vehicle with the tire removed and the drum brakes exposed. Figure 4-7 shows a closer view of the drum brake assembly.



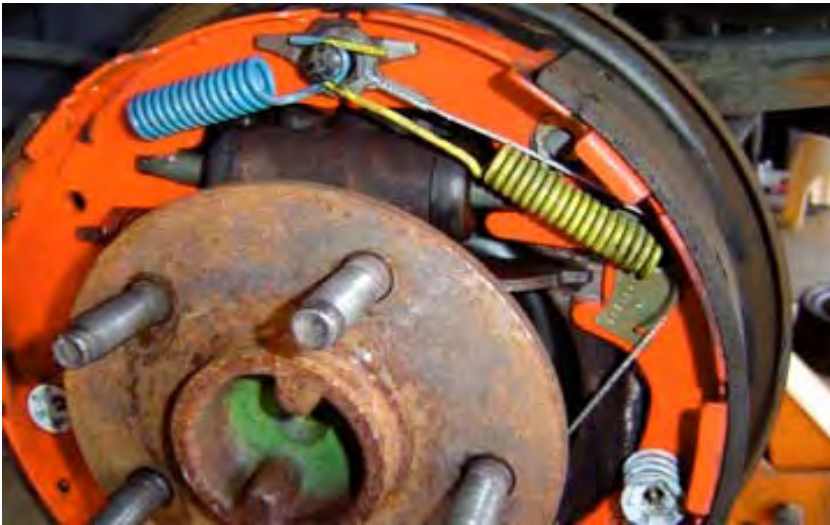
Figure 4-5. Technician Performing General Purpose Degreasing

Drum brakes are cleaned when the technician repairs or replaces parts like brake pads or brake cylinders. The major contaminant that is removed is dust. When technicians inspect or adjust the brakes, they often do not clean them. Disc brakes include a caliper, which is the brake mechanism, and a rotor, which is the steel disc. Technicians clean the caliper when a repair is necessary. Contaminants can include dust and, if there is a leaky

seal, brake fluid. The rotor is always cleaned. Some technicians remove the rotor and clean it with soap and water in a sink. If the rotor needs to be machined, the technician will clean the particulate contaminants before reinstalling it. Other technicians use a brake cleaner to remove dust, oil or fingerprints. When the rotor is replaced, it is packed in a corrosion inhibitor and technicians also clean this material when they install the new rotor.



Figure 4-6. Vehicle With Brakes Exposed



4-7. Closer View of Brake Assembly

In Southern California, many auto repair shops use water and/or water-based cleaners in small brake cleaning equipment. Some of these shops do not use solvent aerosol brake cleaners at all and others use solvent aerosol brake cleaners to augment the water-based systems. Both disc brakes and drum brakes can be cleaned with these water-based brake cleaning systems. Most of the time, estimated at 90% by auto repair technicians, only dust or fingerprints are removed during a brake job. The remaining 10% of the time, oil or grease needs to be removed during a brake job.

Because auto repair technicians generally consider brake cleaners and general purpose degreasers to be interchangeable, IRTA requested that the facilities test all of the water-based cleaners for both purposes. As discussed earlier, IRTA needed non-foaming cleaners to test in these applications. Some of the formulators agreed to reformulate their foaming cleaners to non-foaming cleaners and have them packaged. One of the cleaners, Kyzen Aerosol Degreaser 11, foamed only slightly and it was tested without reformulation. The water-based cleaners that were tested for brake cleaning and general purpose degreasing include:

- AX-IT L-7769
- Mirachem Automotive Cleaner
- Kyzen Cyber Solv 11
- Kyzen Cyber Solv
- Kyzen Aerosol Cleaner
- Kyzen Aerosol Degreaser 11

Because the soy/acetone blends formulated for testing as carburetor cleaners performed well, IRTA decided to test some of them for brake cleaning and general purpose degreasing. IRTA tested the three soy/acetone cleaners packaged in carbon dioxide propellant and also tested one soy/acetone blend packaged in a hydrocarbon propellant to see if the propellant made a difference in cleaning capability. IRTA also decided to test an acetone cleaner packaged in a hydrocarbon propellant to determine if acetone alone could function as a cleaner in this sector. The non-water-based cleaners that were tested include:

- 50% soy/50% acetone with carbon dioxide propellant
- 35% soy/65% acetone with carbon dioxide propellant
- 25% soy/75% acetone with carbon dioxide propellant
- 35% soy/65% acetone with hydrocarbon propellant
- acetone with hydrocarbon propellant

A total of six water-based cleaners and five low-VOC non-water-based cleaners were tested for brake cleaning and general purpose degreasing. MSDSs for these products are shown in Appendix F. The water-based cleaners are neutral to alkaline cleaners with a pH ranging from 8.7 to 13. All six water-based products were packaged with a hydrocarbon propellant. The VOC content of the water-based cleaners ranges from five to 15% and the VOC contribution is due solely to the hydrocarbon propellant. Not all the cleaners were tested at all of the participating facilities but the water-based cleaners were all tested by at least eight of the facilities. The raw data questionnaires for the testing in these cleaning activities are shown in a separate addendum to this document.

Table 4-5 and 4-6 summarize the results of the general purpose degreasing tests. The shops and particular mechanics that performed the testing are shown in the first column. The first table focuses on the adequacy of the product. A zero indicates the product did not work and a 1 indicates the product was adequate. Blanks in the table indicate the product was not tested. Table 4-6 shows the cleaner ranking compared with the shop's current cleaner. A zero indicates the cleaner performed poorly. A 0.5 indicates the

Table 4-5
Alternative General Purpose Degreasers – Adequacy of Cleaning

Facility	AX-IT L-7769	Mirachem Automotive Cleaner	Kyzen CyberSolv 11	Kyzen CyberSolv	Kyzen Aerosol Cleaner	Kyzen Aerosol Degreaser 11	50 % Soy/Acetone (Carbon Dioxide)	35% Soy/Acetone (Carbon Dioxide)	25% Soy/Acetone (Carbon Dioxide)	L-7752 35% Soy/Acetone (Hydrocarbon)	L-7750 Acetone (Hydrocarbon)
ARCO – Mechanic 1	0	0			0	0		1	1	1	
ARCO – Mechanic 2			1	1							
Shell (Santa Monica)	0	0						1	1	0	
Samo Tire			1	1	0	0	1				
Morgan's Auto Service	0	0	1	1	0	0				1	
S.M. Auto Center – Eduardo					0						
S.M. Auto Center – Julio						1					
S.M. Auto Center – Aljerome			1						1		
S.M. Auto Center – Rene	1	0							1	1	
S.M. Auto Center – Catarino								1	1	1	
S.M. Auto Center – Esmet			1	1							
Big Blue Bus - Mechanic 1		0	1	1	0	0		1	1		
Big Blue Bus - Mechanic 2			1		0	1			1		
Big Blue Bus - Mechanic 3					0						
Big Blue Bus - Mechanic 4					0						
Big Blue Bus - Mechanic 5			1	0							0
Big Blue Bus - Mechanic 6			1								
Big Blue Bus - Mechanic 7			1	1							
Brake Master					0	0					
German Auto - Mechanic 1	0	1	1	1	0	0				1	
German Auto - Mechanic 2			1	1	0						
Mercedes Benz – Ken		0	1	1				1	1		1
Mercedes Benz – Francisco			1	1							
Connell Chevrolet – Joe	0		0	0	0	0			0		
Connell Chevrolet – Bruce					0	0					
Connell Chevrolet – John						0					
Ira Newman Auto – Scott	0	0		0	0	0		1			
Ira Newman Auto – Norm			1								
Shell (Rose) – Nick	0				0	0					
Shell (Rose) – Jesus			1	1							
Shell (Rose) – Luis			1						1		
Guaranty Chevrolet	0				0	0					

Key: 0 = Did not Clean; 1 = Cleaned

Table 4-6
Alternative General Purpose Degreasers – Ranking

Facility	AX-IT L-7769	Mirachem Automotive Cleaner	Kyzen CyberSolv 11	Kyzen CyberSolv	Kyzen Aerosol Cleaner	Kyzen Aerosol Degreaser 11	50 % Soy/Acetone (Carbon Dioxide)	35% Soy/Acetone (Carbon Dioxide)	25% Soy/Acetone (Carbon Dioxide)	L-7752 35% Soy/Acetone (Hydrocarbon)	L-7750 Acetone (Hydrocarbon)
ARCO – Mechanic 1	0	0			0	0		2	2	0	
ARCO – Mechanic 2			1	1							
Shell (Santa Monica)	0	0						2	2	0.5	
Samo Tire			1	0.5	0	1	1				
Morgan's Auto Service	0	0	1.5	1.5	0	0				1	
S.M. Auto Center - Eduardo					0						
S.M. Auto Center - Julio						0.5					
S.M. Auto Center - Aljerome			1						2		
S.M. Auto Center - Rene	1	0							2	1	
S.M. Auto Center - Catarino								1	2	1	
S.M. Auto Center - Esmet			2	1							
Big Blue Bus - Mechanic 1		0	2	2	0	0		2.5	2		
Big Blue Bus - Mechanic 2			2		0	2			2		
Big Blue Bus - Mechanic 3					0						
Big Blue Bus - Mechanic 4					0						
Big Blue Bus - Mechanic 5			0.5	0							0
Big Blue Bus - Mechanic 6			0.5								
Big Blue Bus - Mechanic 7			1	1							
Brake Master					0	0					
German Auto - Mechanic 1	0	1	1	1	0	0				0.5	
German Auto - Mechanic 2			1	0.5	0						
Mercedes Benz - Ken		0	2	1				2	2.5		0.5
Mercedes Benz - Francisco			1	1							
Connell Chevrolet - Joe	0		0	0	0	0			0		
Connell Chevrolet - Bruce					0	1					
Connell Chevrolet - John						1					
Ira Newman Auto - Scott	0	0		0	0	0		2			
Ira Newman Auto - Norm			1.5								
Shell (Rose) - Nick	0				0	0					
Shell (Rose) - Jesus			1	1							
Shell (Rose) - Luis			0						0		
Guaranty Chevrolet	0				0	0					

Key: 0 = Poor; 0.5 = Marginal; 1 = Almost as good as current cleaner; 1.5 = nearly as good as current cleaner; 2 = As good as current cleaner; 2.5 = Somewhat better than current cleaner; 3 = Better than current cleaner

cleaner performed marginally well. A 1 indicates the cleaner performed almost as well as the current cleaner. A 1.5 indicates the cleaner performed nearly as well as the current cleaner. “Nearly as well” is better than “almost as well.” A 2 indicates the cleaner performed as well as the current cleaner. A 2.5 indicates the cleaner performed somewhat better than the current cleaner. Finally, a 3 indicates the cleaner performed better than the current cleaner.

The tables show that two of the soy acetone cleaners with the carbon dioxide propellant were judged adequate by nearly all mechanics who tested them and they were generally ranked at least as good as the current product. The Kyzen Cyber Solv products were judged adequate by most facilities.

Tables 4-7 and 4-8 show the results for brake cleaning. According to Table 4-7, a majority of the shops found the AX-IT L-7769 cleaner and the Mirachem cleaner adequate. All of the shops found the Kyzen Cyber Solv 11 adequate and a large majority of the shops found the Kyzen Cyber Solv adequate. Most shops that tested the soy/acetone blends with the carbon dioxide propellant and the acetone cleaner found them adequate.

The AX-IT L-7769 cleaner was tested by nine mechanics at nine facilities for general purpose degreasing. This cleaner did not perform well in this application. It worked better if it sat on the part for 20 or 30 seconds and was handwiped or if it was applied multiple times. The cleaner was tested by 17 mechanics at 11 facilities for brake cleaning. The majority of mechanics found it adequate for general brake cleaning and cleaning of brake dust but not for cleaning oil or grease.

The Mirachem automotive cleaner was tested by eight mechanics at eight facilities for general purpose degreasing. The product did not cut grease and oil without additional wipe cleaning. The cleaner was tested by 13 mechanics at 10 facilities for brake cleaning. The majority of technicians indicated it was adequate for general brake cleaning and cleaning of brake dust but inadequate for removing oil and grease without additional handwiping.

The Kyzen Cyber Solv 11 was tested by 18 mechanics at 10 facilities for general purpose degreasing. Sixteen of the 18 mechanics found the cleaner adequate and one found it inadequate for this purpose. Some mechanics noted that it worked better when the aerosol cans were shaken well. One mechanic did not like the smell and another indicated it left a residue. The cleaner was tested by 15 mechanics at 10 facilities for brake cleaning. The majority of mechanics found it to be adequate for general brake cleaning, cleaning of brake dust, oil, grease and contaminants. Some mechanics indicated they would prefer a faster drying time.

The Kyzen Cyber Solv was tested by 14 mechanics at 10 auto repair facilities for general purpose degreasing. The majority of mechanics found the product adequate but several indicated they preferred the Cyber Solv 11 product. Three mechanics found the product inadequate for general purpose degreasing. Again, some of the technicians found the

Table 4-7
Alternative Brake Cleaners – Adequacy of Cleaning

Facility	AX-IT L-7769	Mirachem Automotive Cleaner	Kyzen CyberSolv 11	Kyzen CyberSolv	Kyzen Aerosol Cleaner	Kyzen Aerosol Degreaser 11	35% Soy / Acetone (Carbon Dioxide)	25% Soy / Acetone (Carbon Dioxide)	L-7752 35% Soy/Acetone (Hydrocarbon)	L-7750 Acetone (Hydrocarbon)
ARCO – Mechanic 1	1	0				0				
ARCO – Mechanic 2			1	1						
Shell (Santa Monica)	0	1								
Samo Tire	1	0	1	1	0	0	0	0	0	
Morgan's Auto Service	1	1	1	1	0				0	
S.M. Auto Center – Eduardo					1					
S.M. Auto Center – Julio						0				
S.M. Auto Center – Aljerome	1	1	1	1						
S.M. Auto Center – Rene	1		1	1						
S.M. Auto Center – Catarino		1								
S.M. Auto Center – Esmet			1	1						
Big Blue Bus - Mechanic 1	1	1	1	0		1	1	1		
Big Blue Bus - Mechanic 2	0	0					1			
Big Blue Bus - Mechanic 3	1	1								
Big Blue Bus - Mechanic 4	0									
Big Blue Bus - Mechanic 5	0									
Big Blue Bus - Mechanic 6	0									
Big Blue Bus - Mechanic 7			1	1						
Brake Master	1	0	1	1	1	0			0	1
German Auto - Mechanic 1			1	1						
German Auto - Mechanic 2			1	1						
Mercedes Benz – Ken			1	1	0					
Mercedes Benz – Francisco		0								
Connell Chevrolet – Joe					0					1
Connell Chevrolet – Bruce	1	0	1	0	0	0			0	
Connell Chevrolet – Brian			1	0				1		
Ira Newman Auto – Scott						0				
Ira Newman Auto – Ira Sr.	0	1	1	1			1		1	
Shell (Rose) – Nick	1				0	1				
Guaranty Chevrolet	1					0				

Key: 0 = Did not Clean; 1 = Cleaned

**Table 4-8
Alternative Brake Cleaners – Ranking**

Facility	AX-IT L-7769	Mirachem Automotive Cleaner	Kyzen CyberSolv 11	Kyzen CyberSolv	Kyzen Aerosol Cleaner	Kyzen Aerosol Degreaser 11	35% Soy / Acetone (Carbon Dioxide)	25% Soy / Acetone (Carbon Dioxide)	L-7752 35% Soy/Acetone (Hydrocarbon)	L-7750 Acetone (Hydrocarbon)
ARCO – Mechanic 1	1	0.5				0				
ARCO – Mechanic 2			1	1						
Shell (Santa Monica)	0	1								
Samo Tire	1	0	1	0.5	0	1	0	0	0	
Morgan's Auto Service	2	2	1	1	0				1	
S.M. Auto Center – Eduardo					0					
S.M. Auto Center – Julio						0.5				
S.M. Auto Center – Aljerome	2	2	3	2						
S.M. Auto Center – Rene	1		1	1						
S.M. Auto Center – Catarino		1								
S.M. Auto Center – Esmet			2	2						
Big Blue Bus - Mechanic 1	1	1	1	0		0	2	2		
Big Blue Bus - Mechanic 2	0	0					2			
Big Blue Bus - Mechanic 3	1	1								
Big Blue Bus - Mechanic 4	0									
Big Blue Bus - Mechanic 5	1									
Big Blue Bus - Mechanic 6	1									
Big Blue Bus - Mechanic 7			1	1						
Brake Master	0	0	2	2	0	0			0	2
German Auto - Mechanic 1			0.5	0.5						
German Auto - Mechanic 2			0.5	0.5						
Mercedes Benz – Ken			2	1	0					
Mercedes Benz – Francisco		0								2
Connell Chevrolet – Joe					0					
Connell Chevrolet – Bruce	1	0	1	0	0	0			0	
Connell Chevrolet – Brian			1	0				1		
Ira Newman Auto – Scott						0				
Ira Newman Auto – Ira Sr.	0	1	2	2			1		1	
Shell (Rose) – Nick	0				0	1				
Guaranty Chevrolet	1					0				

Key: 0 = Poor; 0.5 = Marginal; 1 = Almost as good as current cleaner; 1.5 = nearly as good as current cleaner; 2 = As good as current cleaner; 2.5 = Somewhat better than current cleaner; 3 = Better than current cleaner

product better when it was well shaken. For brake cleaning, the product was tested by 15 mechanics at 10 facilities. The majority of the mechanics found it adequate for general brake cleaning, cleaning of brake dust, oil, grease and other contaminants. Most of the technicians indicated they would prefer a faster drying time.

The Kyzen Aerosol Cleaner was tested by 16 mechanics at 11 facilities for general purpose degreasing. All mechanics found it inadequate for this purpose even with handwiping. This cleaner and the Kyzen Aerosol Degreaser 11 discussed below were packaged by a different packager than the Cyber Solv products discussed above. As a consequence, they foamed slightly and this definitely detracted from the cleaning capability. For brake cleaning, this cleaner was tested by eight mechanics at seven auto repair facilities. The majority of mechanics found it inadequate for this purpose.

The Kyzen Aerosol Degreaser 11 was tested by 14 mechanics at 11 auto repair facilities for general purpose degreasing and it was tested by nine mechanics at nine facilities for brake cleaning. The majority of mechanics found the cleaning inadequate for both cleaning tasks. Two mechanics did rate the cleaner as almost as good as their current cleaner for brake cleaning. Again, the slight foaming was a problem.

Because the soy acetone blends with the carbon dioxide propellant performed well for carburetor and fuel injection system cleaning, IRTA worked with several mechanics to test them for general purpose degreasing and brake cleaning. None of the project participants tested the 50% soy/acetone blend for brake cleaning. One technician tested the product for general purpose degreasing and he indicated it performed almost as well as his current cleaner. The 35% soy/acetone blend with the carbon dioxide propellant was tested by six mechanics at six facilities for general purpose cleaning and by four mechanics at three facilities for brake cleaning. For general purpose degreasing, all six mechanics indicated the product worked as well as or better than their current product. For brake cleaning, three mechanics indicated it was adequate. Some mechanics indicated it left an oily residue. The 25% soy/acetone blend was tested by 10 mechanics at seven facilities for general purpose cleaning and by three mechanics at three facilities for brake cleaning. Eight mechanics indicated it worked as well as the product they currently use for general purpose degreasing. Two mechanics indicated the product left an oily residue, which they could easily wipe off with a rag. Two mechanics indicated it was adequate for brake cleaning and one thought the cleaning was inadequate. They mentioned that the product left an oily residue.

The 35% soy/acetone blend with a hydrocarbon propellant was tested by six mechanics at five facilities for general purpose degreasing and by five mechanics at five facilities for brake cleaning. Five mechanics indicated it performed acceptably for general purpose cleaning. The majority of mechanics found it inadequate for general drum brake cleaning and the cleaner did not perform well for cleaning grease and oil. Most mechanics complained of a bad smell; the product had an over-spray mist that remained in the air for a period.

IRTA tested the acetone product with a hydrocarbon propellant with two mechanics in two facilities. The mechanics indicated that the cleaner was not very effective for general purpose degreasing but performed acceptably as a brake cleaner.

V. ALTERNATIVE PROPELLANT TESTS

Although it was not originally part of the project plan, IRTA decided to investigate alternative propellants for two reasons. First, hydrocarbon propellants are the most commonly used propellants in automotive aerosol cleaning products. These propellants are VOCs and contribute to smog. Most of the water-based cleaners tested during this project had no solvent additives so they are low in VOC content. The major contributor to the VOC content of these products would be the propellant. Second, alternative propellants were investigated because they could improve the delivery of the alternative products. In particular, the soy/acetone products for carburetor and fuel injection system cleaning were packaged with both hydrocarbon and carbon dioxide propellants and IRTA found that the carbon dioxide propelled products had a better delivery and cleaned better.

The alternative propellants that were investigated are shown in Table 5-1. The table also shows the approximate cost of the propellants. The cost of a typical hydrocarbon propellant, called NIP-46, is also shown in the table. The cost of the nitrogen propellant is listed as negligible because so little is required.

Table 5-1
Typical Hydrocarbon and Alternative Propellants

Propellant	Cost Per Pound
NIP-46	\$0.29
Dimethyl Ether (DME)	\$0.60
HFC-152a	\$1.85
Carbon Dioxide	\$0.15
Nitrogen	negligible

DME is classified as a VOC. Even so, IRTA decided to test it because it is soluble in water-based cleaners and one packager indicated that it might be possible to use less DME than the hydrocarbon propellant. A lower DME percentage in the package would lead to a lower VOC for the cleaner. The figures in Table 5-1 indicate that DME is about twice as costly as the hydrocarbon propellant on a per pound basis.

HFC-152a is a hydrofluorocarbon. It is exempt from VOC regulations. The HFC has a relatively long atmospheric lifetime but it contains no chlorine or bromine so it does not contribute to stratospheric ozone depletion. It does, however, contribute to global warming. Because its atmospheric lifetime is lower than other HFCs, it contributes less to global warming. A disadvantage of the HFC is that it is much more costly than the hydrocarbon propellant.

As mentioned above, IRTA was impressed with the performance of the carbon dioxide propellant. Carbon dioxide is not classified as a VOC and, as the values of Table 5-1 show, it is lower cost than the hydrocarbon propellant. Generally, because it is a higher pressure propellant, less of it is required than the hydrocarbon propellant. On balance, it

is much less costly to use than the hydrocarbon propellant. The major disadvantage of carbon dioxide arises when it is used with highly alkaline water-based cleaners. It can react with the alkaline components, forming carbonic acid, which can lead to corrosion of the can.

Nitrogen is also an attractive propellant because it is not classified as a VOC and it is very low cost. There are two problems that have been observed with nitrogen propellants. First, some packagers claim it loses pressure as the product is expelled from the aerosol. Second, other packagers claim that it has lower pressure on a continuous basis as the product is expelled.

Propellant Tests

IRTA thought it would be useful to have one of the water-based cleaners packaged in all the alternative propellants. An Australian company indicated they had packaged water-based materials used for other purposes with nitrogen propellants for many years and that the delivery was very good. IRTA asked the company to package a few cans in nitrogen propellant and the company agreed to perform the packaging. IRTA shipped the Australian company the Kyzen Cyber Solv, the product that worked best in the brake cleaning/general purpose cleaning field tests. IRTA contacted the company several times but could not get a response. IRTA staff identified another packager in the U.S. that was willing to package the cleaner with all of the alternative propellants.

All of the cans packaged with the alternative propellants contained 340 grams of product and propellant combined. Table 5-2 shows the proportion of product and propellant in the six products that were packaged.

Table 5-2
Alternative Product and Propellant Weight

Propellant Type	Product Weight (grams)	Propellant Weight (grams)	Propellant Percent (by weight)
NIP-46	272	68	20
DME1	272	68	20
DME2	289	51	18
HFC-152a	272	68	20
Carbon Dioxide	332	8	2
Nitrogen	338	< 2 (95 psig)	<0.1

Two DME formulations were packaged to investigate whether less DME than hydrocarbon propellant could be used. Note that more product and less propellant was also used in the carbon dioxide propelled package. Less than two grams of the nitrogen propellant was used. The packager used about 95 psig pressure nitrogen after filling the can with about 338 grams of product.

Results of the Tests

IRTA first tested the alternative propellant packages in a laboratory setting. Motor oil was applied to a metal surface and each of the aerosols was sprayed for a 10 second duration onto the oil. The results of the testing indicated that three of the aerosols worked well. These included the hydrocarbon propelled package, the DME package at higher DME concentration and the HFC-152a propelled package. The carbon dioxide propelled packaged worked better than these three in terms of cleaning capability and delivery. The package containing DME at lower concentration did not work well. The nitrogen-propelled package did not deliver enough pressure for effective cleaning and delivery. IRTA did not observe a decline in pressure as the product was expelled but rather noted a lower delivery pressure throughout.

IRTA invited members of the TRC to one of the auto repair facilities that participated in the testing of the alternative products. The purpose of this field visit was to demonstrate the cleaners that performed best for brake cleaning/general purpose degreasing and carburetor and fuel injection system cleaning. Another purpose of the field visit was to demonstrate the testing of the water-based cleaner packaged in the alternative propellants. The technicians at the auto repair facility tested the aerosol cans containing the alternative propellants on engine parts. The results of this testing were virtually the same as the laboratory tests conducted by IRTA.

The extensive field testing with the soy/acetone blends that utilized a carbon dioxide propellant and the comparative tests of the alternative propellants convinced IRTA that it would be very desirable to use a carbon dioxide propellant in the water-based cleaning products both for a better delivery and a lower VOC content. With this in mind, IRTA opened one of the cans containing the Cyber Solv with the carbon dioxide propellant three months after receiving the packages. The bottom and sides of the cans were rusted. The packager also placed a can packaged with carbon dioxide propellant in an oven at 120 degrees F for 30 days. After removal, he observed that the product had de-tinned the can in the liquid phase and that there was vapor phase corrosion.

Carbon dioxide is a very good propellant. It is low cost and it provides a very good delivery. One packager who packages a number of water-based cleaners for many applications indicates that the rusting problem could be solved with the addition of a corrosion inhibitor to the water-based cleaner. Although the cleaner contains a corrosion inhibitor to make the cleaner safe for cleaning certain metals, it would require the addition of another corrosion inhibitor to prevent corrosion of the can.

VI. COST AND TOXICITY COMPARISON OF CURRENT AND ALTERNATIVE PRODUCTS

VOC Content of Alternative Cleaners

Table 6-1 shows the products that worked effectively in each of the application areas and their VOC content. The table also shows the VOC content limit of the product category that is effective on December 31, 2004. The VOC content of the cleaners was estimated from the MSDSs for the products. The midpoint of the VOC content was selected in all cases.

**Table 6-1
Alternative Products and VOC Content**

Category of Cleaning	VOC Content Requirement	Alternative Product	VOC Content of Product
Engine Degreasing	35%	Foamy Engine Brite	23.5%
		Simple Green	10%
		Mirachem All Surface Safe Cleaner	16.1%
		AX-IT L-7768	10%
		L-7820 ScrubTub	10%
		Kyzen Engine Degreaser 2	10%
		Kyzen Aerosol Degreaser 11	10%
		Kyzen Aerosol Cleaner	10%
Carburetor and Fuel Injection System Cleaning	45%	50% Soy/50% Acetone	0%
		35% Soy/65% Acetone	0%
		25% Soy/75% Acetone	0%
Brake Cleaning/General Purpose Degreasing	45%/50%	AX-IT L-7769	10%
		Kyzen Cyber Solv	10%
		Kyzen Cyber Solv 11	10%
		35% Soy/65% Acetone	0%
		25% Soy/65% Acetone	0%

Eight alternative engine degreasers are shown in Table 6-1. These include all of the engine degreasers tested in the project. Three of these cleaners, Foamy Engine Brite, Foaming Simple Green and Mirachem All Surface Safe Cleaner are commercial aerosol products. All three of these products have solvent additives. The other five products were packaged in aerosol form for the testing and none of them has a solvent additive. Six of the eight cleaners tested in the engine degreasing category have a VOC content of

10%. For five of these cleaners, the only VOC contribution is the hydrocarbon propellant. More research on carbon dioxide propellants could reduce the VOC content of these cleaners to near zero.

The three alternative cleaners that were tested for carburetor and fuel injection system cleaning all have a VOC content of zero%. In these cases, a carbon dioxide propellant rather than a hydrocarbon propellant was used.

The table shows five cleaners for the combined category of brake cleaning/general purpose degreasing. These were the cleaners that performed adequately in brake cleaning and/or general purpose degreasing. Three of the cleaners are water-based; they were packaged with a hydrocarbon propellant and the propellant is the only contribution to the VOC content. Again, as was the case for engine degreasers, more investigation of carbon dioxide propellants with water-based cleaners could result in a VOC content for the alternative products of near zero%. The other two cleaners that performed well in this category are two soy/acetone blends packaged with a carbon dioxide propellant. These cleaners have a VOC content of zero%.

Cost Analysis and Comparison

During the project field testing, some of the facility personnel tested the alternative cleaners exclusively for a short period and some did not. The alternative cleaners were not tested for a sustained and lengthy period. As a result, it is not possible to draw conclusions from the field test information on whether more or less of the alternative cleaner would be required to perform the same cleaning tasks as each facility's current cleaner. The facilities participating in the project used a variety of different cleaners; often they purchased different cleaners from one month to the next based on the lowest cost product.

For the cost analysis presented here, IRTA made several assumptions. First, IRTA used one commercial product in each of the three cleaning categories as the baseline cleaner. Second, IRTA assumed that the type of can, valve and other packaging materials was the same for all cleaners. In effect, IRTA used the raw materials cost of each product for the cost comparison. It was not possible to compare the price of the products themselves since most of the alternative products are not commercial and they do not have a price. Furthermore, according to one industry source, there is no rule of thumb for the percent of the product price accounted for by the raw materials cost. Thus, the approach used here avoids estimation of the markup, profits and other disparate considerations of the individual companies selling the products. Third, IRTA included the propellant cost in the analysis because IRTA wanted to examine the cost impacts of alternative propellants. Fourth, the raw material costs for the cleaners are presented as ranges rather than as specific values to protect the confidential nature of the information.

Table 6-2 shows the raw material cost of the baseline and alternative cleaners for the engine degreasing category. The baseline cleaner, Engine Brite Heavy Duty Engine Degreaser, is a solvent based cleaner. It is a Low Vapor Pressure (LVP) cleaner with a

VOC content of about 15 percent. The raw material cost of the baseline cleaner is 20 to 40 cents per pound. The raw material cost of Foamy Engine Brite is lower than the raw material cost of the baseline cleaner. The raw material cost of the other alternative cleaners is slightly higher than the cost of the baseline cleaner

Table 6-2
Raw Material Costs of Baseline and Alternative Engine Degreasers

Cleaner	Raw Material Cost Including Propellant (cents per pound)
Engine Brite Heavy Duty Engine Degreaser--Baseline	20 to 40
Foamy Engine Brite	15 to 30
Foaming Simple Green	35 to 45
Mirachem All Surface Safe Cleaner	40 to 50
Scrub Tub	40 to 50
Kyzen Engine Degreaser 2	35 to 45
Kyzen Cyber Solv Experimental Degreaser 11	35 to 45
Kyzen Aerosol Cleaner	35 to 45
AX-IT L-7768	35 to 45

Table 6-3 shows the raw material costs of the carburetor and fuel injection system cleaners. The baseline cleaner, in this case, is a MOC product called Throttle-Body & Air-Intake Cleaner. The raw material cost of the two cleaners that performed best in these applications, the 35% soy product and the 25% soy product, is slightly more expensive on a pound-for-pound basis than the raw material cost of the baseline cleaner.

Table 6-3
**Raw Material Costs of Baseline and Alternative Carburetor and Fuel Injection
System Cleaners**

Cleaner	Raw Material Cost Including Propellant (cents per pound)
MOC Throttle-Body & Air-Intake Cleaner--Baseline	30 to 40
50% Soy/50% Acetone	45 to 55
35% Soy/65% Acetone	40 to 50
25% Soy/ 75% Acetone	40 to 50

Table 6-4 shows the raw material costs of the baseline and alternative brake cleaners/general purpose degreasers. In this case, the baseline cleaner is CRC Brakleen Brake Parts Cleaner--Non-Chlorinated. The raw material cost of the alternatives is slightly higher than the raw material cost of the baseline cleaner.

Table 6-4
Raw Material Costs of Baseline and
Alternative Brake Cleaners/General Purpose Degreasers

Cleaner	Raw Material Cost Including Propellant (cents per pound)
CRC Brakleen Brake Parts Cleaner	30 to 40
Baseline	
AX-IT L-7769	35 to 45
Kyzen Cyber Solv	35 to 45
Kyzen Cyber Solv Experimental	35 to 45
Degreaser 11	
35% Soy/65% Acetone	40 to 50
25% Soy/75% Acetone	40 to 50

As mentioned earlier, the field tests did not provide sufficient information to determine whether more or less of the alternative cleaners would be required to substitute for the high VOC cleaners used currently. The values of Tables 6-2 through 6-4 allow a sensitivity analysis. If twice as much of the alternative cleaners was required, the cost of the alternatives would be more than twice the cost of the current cleaners. If half as much of the alternative cleaners was required, the cost of the alternatives would be somewhat more than half the cost of the current cleaners.

The price of raw materials that are petroleum based has increased substantially over the last few months because of increasing energy costs and because of high overseas demand. If this increase were sustained or continued, prices of the baseline cleaners and the soy/acetone cleaners would increase further. The prices of the water-based cleaners would be affected less because most of these cleaners contain at least 50 percent water. Thus further increases in raw material costs would reduce the cost of the water-based cleaners tested in engine degreasing and brake cleaning/general purpose degreasing relative to the baseline cleaners.

Toxicity Comparison

IRTA performed a toxicity comparison of the low-VOC alternative cleaners tested during this project with the baseline solvent based cleaners used in the cost comparison. IRTA received assistance in this investigation from the California Department of Health Services Hazard Evaluation System & Information Service (HESIS). HESIS staff evaluated the toxicity of the baseline and alternative cleaners based on the components listed on the MSDSs. The MSDSs for the baseline cleaners are provided in Appendix G.

The baseline cleaner for engine degreasing is Engine Brite Heavy Duty Engine Degreaser. The VOC content of this cleaner, because it is classified as a Low Vapor Pressure (LVP) material under the consumer product regulations, is 15%. The MSDS for this cleaner lists “petroleum distillate, aliphatic,” “petroleum naphtha” and “2-butoxy ethanol.” The CAS number for “petroleum distillate, aliphatic” indicates that it is diesel

fuel, No. 2. Diesel Fuel, No. 2 is listed as an A3 carcinogen by the American Conference of Governmental Industrial Hygienists (ACGIH). It is absorbed through intact skin and it has a Threshold Limit Value of 100 milligrams per meter cubed to protect against irritation. Diesel Fuel, No. 2 is not on any toxics lists. The “petroleum naphtha” CAS number indicates it is the same as heavy aromatic solvent naphtha (petroleum), the EPA Registry Name. Toxicity data were not available for review but the 25 submissions under EPA Toxic Substances Control Act (TSCA) Section 8E for heavy aromatic solvent naphtha (petroleum) indicate adverse effects on health and/or the environment. Consistent with other organic solvents, heavy aromatic solvent naphtha (petroleum) is probably a central nervous system depressant and a mucous membrane irritant. It is not on any toxics lists and no occupational health limits for the chemical have been developed. “2-Butoxy ethanol” can damage red blood cells and cause anemia. It also is a central nervous system depressant. The chemical was recently removed from EPA’s Hazardous Air Pollutants (HAP) list but is still listed on California’s AB2588 list. “2-Butoxy ethanol” is a VOC. The baseline cleaner also contains ethoxylated nonyl phenol, a known endocrine disruptor.

The baseline cleaner in the carburetor and fuel injection system and brake cleaner/general purpose degreaser categories are called MOC Throttle-Body & Air-Intake Cln and CRC Brakleen Brake Parts Cleaner--Non-Chlorinated respectively. Both of these cleaners contain the solvents acetone, toluene and methyl alcohol, which are nervous system toxicants and respiratory irritants. In addition to general solvent toxicity, exposure to methyl alcohol has been associated with visual disturbances and neuropathy, and exposure to toluene during pregnancy can damage the developing fetus. Methyl alcohol and toluene are on EPA’s HAP list. Toluene is included on California’s Proposition 65 list as known to the State to cause developmental toxicity. As indicated by its relatively higher Permissible Exposure Limit in California of 500 ppm, acetone is considered to be low in toxicity compared to most other industrial solvents.

HESIS staff examined the MSDSs for the water-based cleaners tested during the project and indicated that they appeared to be relatively low in toxicity. Two of the alternative low-VOC water-based cleaners tested in engine degreasing have solvent additives listed on the MSDSs. One of these, Foamy Engine Brite, lists 2-butoxy ethanol, aliphatic petroleum distillate and aromatic petroleum distillate. The toxicity of these chemicals is discussed above. They are present in small quantities, however, and are not likely to pose a high toxic risk. One of the other cleaners, Foaming Simple Green, also lists 2-butoxy ethanol, again in a very low concentration.

Three alternative low-VOC soy/acetone blends were tested for carburetor and fuel injection system cleaning. HESIS staff evaluated the soy cleaners and indicated they were very low in toxicity. They also indicated that acetone is lower in toxicity than most other organic solvents.

Based on the HESIS evaluation of the chemicals listed on the MSDSs, the low-VOC alternative cleaners are of low toxicity and pose significantly less risks of health hazards than the high-VOC baseline solvents. Although a few of the water-based cleaners

contain solvent additives, the concentrations of the additives are low. The alternative cleaners that contain soy/acetone blends are also of low toxicity when compared with other solvent based baseline cleaners.

Cross-Media Analysis

IRTA examined whether or not there would be an impact on hazardous waste generation or sewer discharge if auto repair facilities were to adopt alternative water-based cleaners and soy/acetone aerosol cleaners in place of the solvent based cleaners used today. In terms of waste generation, the aerosol cans would not be handled any differently than they are today. With regard to sewer discharge, auto repair facilities should not currently discharge solvent aerosol cleaners to the sewer and should handle them with their hazardous waste. Facilities that adopted the alternative low-VOC cleaners should handle them the same way they handle the traditional solvent aerosol cleaners. IRTA's conclusion is that there would be no change in cross-media handling procedures if auto repair facilities switched to the alternative cleaners.

VII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Emissions of VOCs from consumer product aerosol automotive cleaners were estimated at about 17 tons per day in 2000. ARB has implemented regulations on these products that reduce the VOC content to 35% to 50% depending on the cleaning application. Additional reductions in the VOC limits require new alternative products.

This project involved developing, testing and demonstrating low-VOC, low toxicity water-based and soy/acetone based cleaners as potential alternatives in four automotive cleaning activities including engine degreasing, carburetor and fuel injection system cleaning and brake cleaning/general purpose degreasing.

Eight water-based cleaners were tested in engine degreasing. Three of these cleaners are commercial aerosol products and all three contain solvent additives. The remaining five cleaners are non-aerosol cleaners that were packaged in aerosols for testing during this project. All five of these cleaners have no solvent additives. The eight cleaners tested in engine degreasing all had hydrocarbon propellants; they were tested with three automotive detailers, one car wash and three consumers. The automotive detailers and the car wash do not use aerosol engine degreasers. They degrease engines with bulk water-based cleaners, which are less costly. IRTA believed that the automotive detailer and car wash personnel could judge whether the aerosol engine degreasers performed well. The consumers use aerosol degreasers and they could readily judge whether the cleaners worked effectively. Some of the participants liked certain cleaners better than others but, on balance, all of the eight cleaners performed adequately. The VOC content of six of the eight cleaners was 10%.

Several of the technicians at the 13 auto repair facilities that participated in the project indicated they were reluctant to test water-based cleaners for carburetor and fuel injection system cleaning because the water could enter the fuel system. IRTA developed three cleaners that are blends of soy and acetone for testing in this cleaning area. All three of the cleaners were packaged with carbon dioxide propellant. Two of the cleaners, a blend of 35% soy and 65% acetone and a blend of 25% soy and 75% acetone, performed very well. The third cleaner, a blend of 50% soy and 50% acetone, did not perform as well as the two other cleaners. For the cleaners that were tested and found to be effective in this cleaning category, the VOC content is near zero.

An issue that arose during the preliminary screening tests of the cleaners was that all of the water-based cleaners, when put in an aerosol package, foamed. This is a desirable characteristic for engine degreasing but is not acceptable for brake cleaning and general purpose degreasing. Three of the water-based cleaner suppliers elected to reformulate and repackage their cleaners so they would not foam. The resulting four non-foaming water-based cleaners were tested for brake cleaning/general purpose degreasing. Two slightly foaming cleaners were also tested in this cleaning application. Because the soy/acetone blends performed well for carburetor and fuel injection system cleaning, some of them were also tested with some of the auto repair facilities. Three of the non-

foaming water-based cleaners and two of the soy/acetone blends performed adequately for brake cleaning and/or general purpose degreasing. The water-based cleaners have a VOC content of 10% because they are packaged with a hydrocarbon propellant. The soy/acetone cleaners have a VOC content of near zero.

Alternative propellants were investigated and tested in a limited way. One of the non-foaming water-based cleaners was packaged using several alternative propellants including hydrocarbon, DME, HFC-152a, carbon dioxide and nitrogen. The hydrocarbon, DME, HFC-152a all performed fairly well. The hydrocarbons and DME are VOCs so the VOC content of cleaners using these propellants is higher. HFC-152a is exempt from VOC regulations but it is expensive and it does contribute to global warming. The carbon dioxide propellant performed very well; it is not a VOC and it is low cost. When water-based cleaners are packaged with carbon dioxide propellants, the aerosol can may rust. It is possible that this rusting could be prevented by adding a corrosion inhibitor to the water-based cleaners. If carbon dioxide could be used as the propellant for the water-based cleaners, the VOC content of the aerosol cleaners tested in this project would be near zero. More work needs to be done in this area to investigate how carbon dioxide propellant could be used for water-based cleaning aerosol packages.

The raw material cost of the alternative low-VOC cleaners was compared to the raw material costs of baseline solvent cleaners used today in the automotive cleaning sectors. The raw material cost of the alternative cleaners on a pound-for-pound basis was higher than the raw material cost of the baseline cleaners.

The toxicity of the alternative cleaners tested during this project is generally lower than the toxicity of the traditional solvent based baseline cleaners. Most of the water-based cleaners that were tested had no solvent additives. Soy is low in toxicity and acetone is lower in toxicity than almost all traditional organic solvents.

Based on the results of the testing, further investigation of using carbon dioxide propellants with water-based cleaners in aerosol packages should be undertaken. If it is found that hydrocarbon propellants must be used with water-based cleaners, the VOC limit for aerosol cleaners used in engine degreasing and brake cleaning/general purpose degreasing could be set at 10%. If carbon dioxide propellants could be used with aerosol water-based cleaners, then the VOC limit for engine degreasing and brake cleaning/general purpose degreasing could be set at some nominal limit, perhaps 2%. Carbon dioxide propellants were used for the alternative soy/acetone cleaners tested in carburetor and fuel injection system cleaning. The project results indicate that the VOC content limit for this cleaning category could be set at the same nominal limit.

VIII. REFERENCES

- Mike Morris and Katy Wolf, “Parts Cleaning in Auto Repair Facilities, The Conversion to Water,” Institute for Research and Technical Assistance, prepared in partnership with the City of Los Angeles Bureau of Sanitation, Cal/EPA’s Department of Toxic Substances Control and the South Coast Air Quality Management District for U.S. EPA, April 1997. (IRTA, 1997)
- Mike Morris and Katy Wolf, “Brake Cleaning in Auto Repair Facilities: The Conversion to Water,” Institute for Research and Technical Assistance, Prepared for U.S. EPA, September 1999. (IRTA, 1999)
- Mike Morris and Katy Wolf, “Alternatives to Automotive Consumer Products that use Volatile Organic Compounds (VOC) and/or Chlorinated Organic Compound Solvents, Task 1 Plan,” Institute for Research and Technical Assistance, prepared for the State of California Air Resources Research Division, September 30, 2002. (IRTA, 2002)
- Mike Morris, Katy Wolf and Jon Zavadil, “Alternatives to Automotive Consumer Products that use Volatile Organic Compounds (VOC) and/or Chlorinated Organic Compound Solvents, Task 3 Interim Report,” Institute for Research and Technical Assistance, prepared for the State of California Air Resources Research Division, September 15, 2003. (IRTA, 2003)

Appendix A
Lists of Companies Contacted for Existing Water-Based Aerosol Cleaners

CARB List of Automotive Aerosol Suppliers

COMPANY	ADDRESS	CITY	STATE	ZIP	ZIP4
3M COMPANY	3M CENTER BLDG 250-3E-02	ST PAUL	MN	55144	1000
AEROSOL MAINTENANCE PRODUCTS	9150 VALLEY VIEW ROAD	MACEDONIA	OH	44056	
AEROSOL SERVICES	425 SOUTH NINTH AVE	CITY OF INDUSTRY	CA	91746	
AERVOE PACIFIC COMPANY	1198 SAWMILL ROAD	GARDNERVILLE	NV	89410	6120
AMREP INTERNATIONAL INC	990 INDUSTRIAL PARK DRIVE	MARJETTA	GA	30062	2433
ARCO CHEMICAL	3801 WEST CHESTER PIKE	NEWTOWN SQUARE	PA	19073	
BALKAMP INC	2601 SOUTH HOLT ROAD	INDIANAPOLIS	IN	46241	
BERKEBILE OIL COMPANY INC	PO BOX 715	SOMERSET	PA	15501	0715
BERRYMAN PRODUCTS, INC.	3800 EAST RANDOL MILL ROAD	ARLINGTON	TX	76011	
BIG PRODUCTS, INC.	7015 SOUTH WICHITA	WICHITA	KS	67213	
CERTIFIED LABORATORIES (NCH)	PO BOX 2493	FORT WORTH	TX	76113	2493
CHEMICAL PACKAGING	PO BOX 9947	FORT LAUDERDALE	FL	33310	
CHEMWAY SYSTEMS, INC.	PO BOX 1625	BAY CITY	TX	77404	
CLAIRE MANUFACTURING COMPANY	500 VISTA AVENUE	ADDISON	IL	60101	4423
CRC INDUSTRIES INC	PO BOX 5000	WARMINSTER	PA	18974	0586
CURTIS INDUSTRIES	6140 PARKLAND BLVD	MAYFIELD HEIGHTS	OH	44124	
CYCLO INDUSTRIES LLC	10190 RIVERSIDE DRIVE	PALM BEACH GARDENS	FL	33410	4881
DEL REY CHEMICAL COMPANY	1170 CENTRE DRIVE BLDG H	CITY OF INDUSTRY	CA	91789	
DIVERSIFIED BRANDS	31500 SOLON ROAD	SOLON	OH	44139	
DRUMMOND AMERICAN CORP	600 CORPORATE WOODS PKWY	VERNON HILLS	IL	60061	
EIS BRAKE PARTS STANDARD	PO BOX 1315	BERLIN	CT	06037	
EXXON CHEMICAL	13501 KATY FREEWAY	HOUSTON	TX	77079	
EZON PRODUCTS, INC	1900 EXETER ROAD	GERMANTOWN	TN	38	
FIRST BRANDS CORPORATION	83 WOOSTER HEIGHTS ROAD	DANBURY	CT	06813	1911
HYDROSOL	8407 SOUTH 77TH AVENUE	BRIDGEVIEW	IL	60455	
IG-LO INC (Under VALVOLINE)	PO BOX 14000	LEXINGTON	KY	40512	
IMPERIAL INC	PO BOX 11008	GREEN BAY	WI	54307	1008
JUSTICE BROTHERS INC	2736 HUNTINGTON DRIVE	DUARTE	CA	91010	
KAR PRODUCTS	461 NORTH THIRD AVENUE	DES PLAINES	IL	60016	
KEM MANUFACTURING (NCH)	PO BOX 152170	IRVING	TX	75015	2170
KENT INDUSTRIES (PREMIER FARNELL)	4500 EUCLID AVENUE	CLEVELAND	OH	44103	
LAWSON PRODUCTS INC	1666 EAST TOUHY AVENUE	DES PLAINES	IL	60018	3683
LILLY/GUARDSMAN	4999 36TH	GRAND RAPIDS	MI	49512	
LOCTITE CORPORATION	1001 TROUT BROOK CROSSING	ROCKY HILL	CT	06067	
LPS LABORATORIES INC	PO BOX 105052	TUCKER	GA	30085	5052
MAC'S INC (Under VALVOLINE)	PO BOX 14000	LEXINGTON	KY	40512	
MANTEK (Under NCH)					
MOC PRODUCTS, INC	12306 MONTAGUE STREET	PACOIMA	CA	91331	
NATIONAL CHEMSEARCH	PO BOX 152170	IRVING	TX	75015	2170
OSBORN MANUFACTURING	5401 HAMILTON AVENUE	CLEVELAND	OH	44114	3997
PENNZOIL PRODUCTS CO	PO BOX 2967	HOUSTON	TX	77252	
PENRAY COMPANIES	440 DENNISTON COURT	WHEELING	IL	60090	
PREMIER (FARNELL) AUTOWARE CO	4500 EUCLID AVE (BOX 94884)	CLEVELAND	OH	44101	4884
QUEST CHEMICAL CORP	12255 FM 529	HOUSTON	TX	77041	
RADIATOR SPECIALTY COMPANY	PO BOX 159	INDIAN TRAIL	NC	28079	
RAWN COMPANY INC	PO BOX 9	SPOONER	WI	54801	
SEYMOUR OF SYCAMORE INC	917 CROSBY AVENUE	SYCAMORE	IL	60178	
SNAP PRODUCTS	501 BASINGER RD (BOX 269)	PANDORA	OH	45877	
SPRAY PRODUCTS CORPORATION	PO BOX 737	NORRISTOWN	PA	19404	
TAYLOR MADE PRODUCTS CO (AMP)	9100 VALLEY VIEW ROAD	MACEDONIA	OH	44056	

CARB List of Automotive Aerosol Suppliers

TECHNICAL CHEMICAL COMPANY	PO BOX 540095	DALLAS	TX	75354
THE CHARLES MACHINE WORKS	PO BOX 66	PERRY	OK	73077
TRANSTAR AUTOBODY TECHNOLOGY	2040 HEISEMAN DRIVE	BRIGHTON	MI	48114
WARREN DISTRIBUTION	727 SOUTH 13TH STREET	OMAHA	NE	68102 3204
WINZER CORPORATION	10560 MARKISON ROAD	DALLAS	TX	75238
WYNN OIL COMPANY	1050 WEST FIFTH STREET	AZUSA	CA	91702 6510
X LABORATORIES INC (Under PENRAY)	440 T DENNISTON COURT	WHEELING	IL	60090
ZEP MANUFACTURING	1420 Seaboard Industrial Ave	ATLANTA	GA	30318

Suppliers and/or Manufacturers of Low VOC (less than 50 g/l) Cleaning Aerosol Spray Cans

COMPANY NAME	TELEPHONE #
ARROW ENVIRONMENTAL SOLUTIONS INC.	(213) 689-1516
CYCLO INDUSTRIES, INC.	(800) 843-7813
GRANITIZE PRODUCTS COMPANY, INC.	(562) 923-5438
MARK V PRODUCTS, INC.	(800) 877-6282
MOC PRODUCTS COMPANY, INC.	(818) 896-2258
NED HELEY CO.	(714) 848-2251
TECH SPRAY, L.P.	(800) 858-4043
WESTERN CHEMICAL COMPANY	(714) 538-3053
ZEP MANUFACTURING COMPANY	(877) 428-9937

Appendix B
Companies and Consumers That Participated in the
Field Testing of Low-VOC Cleaners

Auto Repair Facilities

- ARCO
Santa Monica, CA
- Big Blue Bus
Santa Monica, CA
- Brake Master
Santa Monica, CA
- Connell Chevrolet
Costa Mesa, CA
- German Auto Technik AG
Santa Monica, CA
- Guaranty Chevrolet
Santa Ana, CA
- Ira Newman Automotive
Anaheim, CA
- Morgan's Auto Service
Santa Monica, CA
- Mercedes Benz
Santa Monica, CA
- Samo Wheel and Brake Service
Santa Monica, CA
- Santa Monica Auto Center
Los Angeles, CA
- Shell
Placentia, CA
- Shell
Santa Monica, CA

Automotive Detailers

- New Image
Santa Ana, CA
- Triple Shine Detail
Glendale, CA
- VREJ Detail
Glendale, CA

Car Wash

- California Car Wash
Glendale, CA

Consumers

- Paul Dehloff
Corona, CA
- Brett Balz
Corona, CA
- Steve Poole
Brea, CA

Appendix C
Example of Questionnaire Used in the Field Testing

Automotive Aerosol Field Testing Interview

Date	User	Owner / Manager	Interviewer	Product I.D.

Type of Cleaning Performed (Circle One Only)			
General Purpose Degreasing	Brake Cleaning	Engine Degreasing	Carburetor & Fuel Injection System Cleaning

Current Product	Current Weekly Usage	No. Mech. Using Product	Test Product Weekly Usage

Question	User's Response
Did it clean sufficiently	
Did you like the delivery rate	
Did you like the delivery pattern	
Did it dry sufficiently	
Did it adversely effect substrates (metals, plastics, painted surfaces, etc)	
Did the product have a smell	
Did it have an objectionable odor	
Did it leave an unacceptable residue	
Did it have too much foam	
Cleaning versus current product. (Terrible, almost as good, as good, better)	
Did you use more volume than your current cleaner	
Did it take longer to clean	
Did you like the product	
Would you buy the test product	
Would you buy the test product for home or personal use	
Would you buy your current product for home or personal use	
Would you switch to the test product (if less expensive , if more expensive)	
Could you clean adequately if you had only the test product	

User Comments

Manager Comments

Appendix D
MSDSs for Alternative Engine Degreasers

MATERIAL SAFETY DATA SHEET

Radiator Specialty Company

1900 WILKINSON BLVD. CHARLOTTE, NC 28208 (704) 377-6555

POISON INFORMATION & EMERGENCY: 303-623-5716

MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.1200. Standard must be consulted for specific requirements.

US DEPARTMENT OF LABOR

Occupational Safety and Health Administration.
(Non-Mandatory Form) Form Approved OMB No. 1218-0072

SECTION I GENERAL INFORMATION

PRODUCT NAME	FOAMY ENGINE BRITE® DEGREASER (AEROSOL)
PART NUMBER	FEB 1

NOTE: Blank spaces are not permitted. If any item is not applicable or no information is available, the space must be marked to indicate that.

SECTION II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

COMPONENT	WT%	C.A.S. NO.	TLV (ACGIH-----OSHA-----)
2-Butoxy-1 Ethanol *	4-5	111-76-2	25 ppm (Skin)
Aliphatic Petroleum Distillate	5-6	8008-20-6	100 ppm (Air)
Aromatic Petroleum * Distillate	5-6	64742-95-6	100 ppm (Air)
Isobutane/Propane	7-9	NDA	1000 ppm

NOTE: THESE CHEMICALS ARE SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313, SARA TITLE III

Comments:

Components not identified are non-hazardous according to 29 CFR 1910.1200

SECTION III PHYSICAL/CHEMICAL CHARACTERISTICS

Specific Gravity (H ₂ O=1)	0.97-0.98	pH	9-10
Solubility in Water	Emulsifies	Solubility in Solvent	Partially soluble
Flash Point (Method) - F°	15°	% Volatiles By Wt.	98%
Melting Point - F°	N/A	Boiling Point - F°	N/A
Vapor Pressure (mm Hg)	Not Determined	Vapor Density (Air=1)	1.1
Evaporation Rate (Butyl Acetate=1)	.75		
Appearance and Odor	Hazy cream with sweet, aromatic-like odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

EXTINGUISHING MEDIA:

Water Fog	Foam	X	CO ₂	X	Dry Chemical	X
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SPECIAL FIRE FIGHTING PROCEDURES. Wear self-contained, positive pressure breathing apparatus and protective clothes. Cool containers with water spray. Use shield to protect from venting or bursting cans.

UNUSUAL FIRE AND EXPLOSION HAZARDS Contents under pressure. At elevated temperatures, containers may vent or burst violently.

FEB/AERO

SECTION V REACTIVITY DATA

Stable	X	Unstable		Corrosive	NO	Hazardous Polymerization?	Yes	No	X
Incompatibilities Oxidizing agents and acids. Keep away from high temperatures or open flames.									
Hazardous Decomposition or Byproducts Fire: normal products of combustion, carbon monoxide, carbon dioxide and Nitrogen oxides.									

SECTION VI HEALTH HAZARD INFORMATION

Recommended TLV of Product		25 ppm (skin)	
EYE CONTACT		SKIN CONTACT	
Irritant. Prolonged contact may cause conjunctivitis.		Irritant. Defatting of tissue, dermatitis may occur.	
INHALATION		INGESTION	
Irritant to mucous membranes.		HARMFUL OR FATAL IF SWALLOWED!	
Repeated exposure may cause narcosis.		May cause burns to mouth, throat & stomach.	
OTHER Absorption of high concentration may lead to kidney and liver damage.			

SECTION VII EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT	Flush with water thoroughly for 15 minutes while lifting eyelids. Consult a physician immediately.		
SKIN CONTACT	Wash with soap and water thoroughly. If adverse effects persist, consult a physician immediately.		
INHALATION	Remove to fresh air immediately. If adverse effects persist, consult a physician immediately.		
INGESTION	DO NOT INDUCE VOMITING! DO NOT ADMINISTER ADRENALINE OR EPINEPHRINE! Get medical attention immediately.		

SECTION VIII SPECIAL PROTECTION INFORMATION

CONSUMER		BULK HANDLING (Prolonged Exposure)
RESPIRATORY PROTECTION	N/A	If TLV is exceeded, wear NIOSH approved respirator.
VENTILATION	Use with adequate ventilation.	General
EYE PROTECTION	N/A	Goggles or full face shield.
PROTECTIVE CLOTHING	N/A	Wear neoprene gloves and apron.

SECTION IX PRECAUTIONS FOR SAFE HANDLING AND USE

SPILL OR LEAK PROCEDURE	Observing health hazards described above, ventilate area, remove ignition sources. Confine spill, add dry absorbent and shovel into waste drum for proper disposal.		
WASTE DISPOSAL METHOD	Dispose of in accordance with all applicable government laws and regulations.		
STORAGE AND HANDLING PRECAUTIONS	Caution: Contents under pressure. Store in cool place away from oxidizers.		
OTHER PRECAUTIONS	KEEP AWAY FROM CHILDREN AND ANIMALS! WEARING CONTACT LENSES IS INADVISABLE! DO NOT PUNCTURE OR INCINERATE CONTAINERS!		

HAZARD INFORMATION LABEL DATA

HAZARD CODE FLAMMABILITY 2 REACTIVITY 1

HEALTH 2

*pr SPECIAL

4- Extreme
3- High
2- Moderate
1- Slight
0- Negligible
*pr=pressure

Supersedes JANUARY 1999

OSHA Revised JUNE 1999

Title R. GEER - CHEMIST

While Radetec Specialty Company believes this data is accurate as of the revision date, we make no warranty with respect to the data and we expressly disclaim all liability for reliance thereon. The data is offered solely for information, investigation, and verification.

MATERIAL SAFETY DATA SHEET: FOAMING SIMPLE GREEN®: WHEEL CLEANER

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: FOAMING SIMPLE GREEN® – WHEEL CLEANER
OTHER NAME: FOAMING SIMPLE GREEN®

Page 1 of 4
Version No. 6004
Issue Date: January, 2002

COMPANY NAME: SUNSHINE MAKERS, INC.
15922 Pacific Coast Highway
Huntington Harbour, CA 92649 USA
Telephone: 800-228-0709 • 562-795-6000
Fax: 562-592-3034
Website: www.simplegreen.com

For 24-hour emergency, call Chem-Tel, Inc.: 800-255-3924

II. INGREDIENT INFORMATION

REPORTABLE COMPONENTS	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP		WEIGHT PERCENT
*2-Butoxyethanol, Glycol Ether EB OSHA PEL: 25 ppm, ACGIH TLV: 25 ppm, (SKIN)	111-75-2	.6	68	<5
Butane OSHA PEL: 800 ppm, ACGIH TLV: 800 ppm	106-97-8	1640	68	4
Propane OSHA PEL: 1000 ppm, ACGIH TLV: ASPHYXIANT	74-98-6	8350	68	1

*Note, that the 2-butoxyethanol is only one of the raw material ingredients that undergoes processing and dilution during the manufacture of Foaming Simple Green®. Upon completion of the manufacturing process, Foaming Simple Green® does not possess the occupational health risks associated with exposure to undiluted Butyl Cellosolve. Verification of this is contained in the independent test results detailed under "Toxicological Information."

The Butyl Cellosolve in Foaming Simple Green® is part of a chemical category (glycol ethers) regulated by the Emergency Planning and Community Right-to-Know Act (SARA, Title III, section 313); therefore, a reporting requirement exists in the U.S.A. Based upon chemical analysis Foaming Simple Green® contains no known EPA priority pollutants, heavy metals, or chemicals listed under RCRA, CERCLA, or CWA. Analysis by TCLP (Toxicity Characteristic Leaching Procedure) according to RCRA revealed no toxic organic or inorganic constituents.

III. HAZARDS IDENTIFICATION

NFPA: Level 1 (Aerosol)
HMS: Health = 1, Reactivity = 0, Flammability = 4

Foaming Simple Green® is non-mutagenic and non-carcinogenic. None of the ingredients in Foaming Simple Green® are regulated or listed as potential cancer agents by Federal OSHA, NTP, or IARC.

IV. FIRST AID MEASURES

SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT

- Eye contact:** Reddening may develop. Immediately rinse the eye with large quantities of cool water; continue 10-15 minutes or until the material has been removed; be sure to remove contact lenses, if present, and to lift upper and lower lids during rinsing. Get medical attention if irritation persists.
- Skin contact:** Minimal effects, if any; rinse skin with water, rinse shoes and launder clothing before reuse. Reversible reddening may occur in some dermal-sensitive users; thoroughly rinse area and get medical attention if reaction persists.
- Swallowing:** Essentially non-toxic. Give several glasses of water to dilute; do not induce vomiting. If stomach upset occurs, consult physician.
- Inhalation:** Intentional concentration of propellant could cause respiratory irritation, headache, nausea, fatigue, drowsiness, impaired coordination. Remove to fresh air. Administer oxygen if needed. Apply artificial respiration if breathing has stopped. Get medical attention.

V. FIRE FIGHTING MEASURES

Extinguishing medium as appropriate for combustibles in area.

Special fire fighting procedures: Foaming Simple Green® contains a flammable propellant and firefighters should wear self-contained breathing apparatus when fighting fires containing or around this product. Shut off all sources of ignition if possible. Keep containers cool with water spray to prevent rupture. Ventilate area. Contain spill and dike if possible. For leaks and spills that have not ignited, water spray can be used to disperse the flammable vapor and protect personnel attempting to stop the leak. Do not use direct stream of water because the flammable portion will float and can be reignited.

Unusual fire and explosion hazards: Firefighters should wear SCBA's in a positive pressure mode with full-face shield. The flammable components are heavier than air and may travel long distances and accumulate in low areas or spread along ground from handling site. Eliminate all sources of ignition as vapor may ignite. Carbon oxides may be formed.

NOTE: Per the DDT Flame Extension Test, Foaming Simple Green® did not produce a flame projection or flashback.

VI. ACCIDENTAL RELEASE MEASURES

Recover usable material by convenient method; residual may be removed by wipe or wet mop. Ventilate area especially low places where heavy vapors might collect. Extinguish all ignition sources.

VII. HANDLING, STORAGE & TRANSPORT INFORMATION

Store in tightly sealed containers. Keep away from heat, sparks, open flame and out of direct sunlight. Store below 120 °F. Do not puncture or incinerate (burn) cans. Do not stick pin, nail or any other sharp object into opening on top of can.

MODE	BASIC DESCRIPTION	ADDITIONAL DESCRIPTIVE	PKG. INSTRUCTION	ER INFO.
IATA	Consumer Commodity (Less than 17 fl. oz. (500 ml))	9, ID6000	810	ERG 171
	Aerosols, flammable (17 fl. oz. (500 ml) or greater)	2.1, UN1950	Y203, LTD QTY	ERG 126
IMDG	Aerosols (For all sizes)	2, UN1950		ERG 126 EmS 2-13 MFAG 620
DOT (40 CFR)	Consumer Commodity (For all sizes)	ORM-D		ERG 171
UPS Air	Consumer Commodity (For all sizes)	ORM-D-AIR		ERG 171

VIII. EXPOSURE CONTROLS

Exposure Limits: The Foaming Simple Green® formulation presents no health hazards to the user, other than mild eye irritation.

Ventilation: No special ventilation is required during normal use.

Human Health Effects or Risks from Exposure: Adverse effects on human health are not expected from Foaming Simple Green®. Foaming Simple Green® is a mild eye irritant; mucous membranes may become irritated by concentrate-mist. Foaming Simple Green® is not likely to irritate the skin in the majority of users. Repeated daily application to the skin without rinsing, or continuous contact of Foaming Simple Green® on the skin may lead to temporary, but reversible, irritation.

Medical Conditions Aggravated by Exposure: No aggravation of existing medical conditions is expected; some dermal-sensitive users may react to dermal contact by Foaming Simple Green®.

IX. PERSONAL PROTECTION

Precautionary Measures: No special requirements under normal use conditions.

Eye Protection: Caution, including reasonable eye protection, should always be used to avoid eye contact.

Skin Protection: No special precautions required; rinse completely from skin after contact.

Respiratory Protection: No special precautions required.

Work and Hygienic Practices: Wash or rinse hands before touching eyes or contact lenses.
Follow standard hygienic practices for handling cleaning agents.

X. PHYSICAL AND CHEMICAL PROPERTIES

Appearance/odor: White foam, mild soap odor
Boiling Range: 100.6 °C
Specific Gravity: 1.020
pH: 9.35
Vapor Pressure: 18 mm Hg @ 20 °C; 23.5 mm Hg @ 26 °C
Water Solubility: Completely soluble in water.
Volatile Organic Compounds: 50 g/L
Detection: Foaming Simple Green® has a characteristic odor that is not indicative of any hazardous situation.

XI. STABILITY AND REACTIVITY INFORMATION

Nonreactive. Foaming Simple Green® is stable, and will not react with water or oxidizers.
Hazardous polymerization will not occur.

XII. TOXICOLOGICAL INFORMATION

Nonhuman Toxicity (data for Simple Green®)

Acute Mortality Studies:

Oral LD₅₀ (rat): >5.0 g/kg body weight

//

Dermal LD₅₀ (rabbit): >2.0 g/kg body weight

Dermal Irritation: Only mild, but reversible, irritation was found in a standard 72-hr test on rabbits. A value of 0.2 (non-irritating) was found on a scale of 8.

Eye Irritation: With or without rinsing with water, the irritation scores in rabbits at 24 hours did not exceed 15 (mild irritant) on a scale of 110.

Subchronic dermal effects: No adverse effects, except reversible dermal irritation, were found in rabbits exposed to Simple Green (up to 2.0 g/kg/day for 13 weeks) applied to the skin of 25 males and 25 females. Only female body weight gain was affected. Detailed microscopic examination of all major tissues showed no adverse changes.

Fertility Assessment by Continuous Breeding: The Simple Green® formulation had no adverse effect on fertility and reproduction in CD-1 mice with continuous administration for 18 weeks, and had no adverse effect on the reproductive performance of their offspring.

XIII. BIODEGRADABILITY AND ENVIRONMENTAL TOXICITY INFORMATION

Biodegradability:

Like Simple Green®, Foaming Simple Green® is readily decomposed by naturally occurring microorganisms. The biological oxygen demand (BOD), as a percentage of the chemical oxygen demand (COD), will approximate 60% after 11 days.

In a standard biodegradation test with soils from three different countries, Butyl Cellosolve reached 50% degradation in six to 23 days, depending upon soil type, and exceeded the rate of degradation for glucose, which was used as a control for comparison.

Environmental Toxicity Information:

Foaming Simple Green® is considered practically non-toxic per EPA's aquatic toxicity scale.

XIV. DISPOSAL CONSIDERATIONS

Foaming Simple Green® is fully water soluble and biodegradable and will not harm sewage-treatment microorganisms if disposal by sewer or drain is necessary. Dispose of in accordance with all applicable local, state, and federal laws.

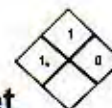
Containers: Do not throw empty containers in trash compactor or into fire. Do not store in direct sun.

XV. OTHER INFORMATION

Contact Point: Sunshine Makers, Inc., Research and Development Division: 562-795-6000.

*** NOTICE ***

All information appearing herein is based upon data obtained by the manufacturer and recognized technical sources. Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of this information, Sunshine Makers, Inc. or its distributors extends no warranties, makes no representations and assumes no responsibility as to the suitability of such information for application to purchaser's intended purposes or for consequences of its use.

MIRACHEM®**Material Safety Data Sheet****Mirachem All Surface Safe Cleaner/Degreaser (Aerosol)**

(Formulation No. 2502)

Section I - General

Manufacturer Name:	The Mirachem Corporation P.O. Box 27608 Tempe, Arizona 85285-7608	Date Prepared:	11/9/95
		Revision Date:	02/05/01
Emergency Phone:	1-(800) 847-3527		

Section II - Hazardous Ingredients/Identity Information

Hazardous Component (CAS #)	OSHA PEL	ACGIH TLV	Other Limits	% (Optional)
Propane (CAS #74-98-6)				1.5
Isobutane (CAS #75-28-5)				1.5

Section III - Hazards Identification

Emergency Overview:	Non-flammable, water based aerosol cleaner with a flammable propellant. Do not puncture, incinerate or store above 120°F. Keep out of reach of children.
Potential Health Effects:	This product mixture has not been tested on animals or on humans. The following acute and chronic health effects are based on the main hazards of the products components and non-animal <i>in vitro</i> toxicity testing of the final product.
Eye Contact:	May cause mild temporary irritation.
Skin Contact:	Prolonged or repeated exposure not likely to cause significant irritation.
Inhalation:	No adverse effects expected.
Ingestion:	No adverse health effects are anticipated to occur as a result of acute ingestion. Chronic effects are not known.
Carcinogenicity:	None of the components in this material are listed by IARC, NTP, OSHA, or ACGIH as a carcinogen.
Signs/Symptoms of Overexposure:	Prolonged contact may cause mild irritation or dryness to sensitive skin.
Medical Conditions Generally Aggravated by Exposure:	None known.

Section IV - First Aid Measures

Eyes:	Immediately flush with clean water. Consult physician if necessary.
Skin:	Rinse with water.
Ingestion:	If swallowed, treat symptomatically and supportively. Do not induce vomiting. If victim conscious and alert, give two glasses of water or milk to drink. If vomiting occurs, keep head below hips to prevent aspiration. Contact Physician.
Inhalation:	No adverse effects anticipated.

Section V - Fire and Explosion Hazard

Flash Point (Method Used):	>212°F (TCC)	Explosive Limits:	N.E.
Special Fire Fighting Procedures:	NONE	Unusual Fire Fighting and Explosion Hazards:	NONE

Section VI - Accidental Release

Steps to be taken in the event the material is released or spilled: Eliminate all ignition sources. Absorb spilled liquid with Oil-Dri or similar inert material. Sweep or scrap up and containerize. Rinse affected area thoroughly with water.

Section VII - Handling & Storage

Handling & Storage: Wear protective goggles or face shield if splashing or spraying liquid. Protect from freezing.
Precautions:
Other Precautions: Do not puncture, incinerate or store above 120°F. Keep out of reach of children.

Section VIII - Exposure Controls, Personal Protection

Respiratory Protection: No respiratory protection should be necessary.
Ventilation: Good general ventilation should be sufficient.
Protective Clothing: When prolonged skin contact is expected, wear protective gloves.
Eye Protection: Wear safety glasses.
Work/Hygienic Practices: Use good personal hygiene practices, wash hands before eating, drinking, smoking, or using toilet facilities.

Section IX - Physical/Chemical Characteristics

Boiling Point:	>210°F (liquid phase)	Specific Gravity (H ₂ O = 1):	0.997
Vapor Pressure (mm Hg.) @ 20°C	Composite = 1.256	pH:	8.7-9.5
Vapor Density (AIR = 1):	> 1	Evaporation Rate (Butyl Acetate = 1):	> 1 (liquid phase)
Solubility in Water:	Complete	Melting Point:	N/A
Appearance and Odor:	Clear liquid with a mild citrus odor		
N/A = Not Applicable	N.E. = Not Established		

Section X - Stability & Reactivity

Stability:	Unstable Stable	X	Incompatibility (Materials to Avoid): Hazardous Decomposition or By-products:	None N/A
Hazardous Polymerization:	May Occur		Will Not Occur	X

Section XI - Toxicological Information (Liquid Phase)

Acute Oral:	LD ₅₀ > 13.0 g/kg
Acute Dermal:	LD ₅₀ > 5.0 g/kg
Primary Eye Irritation	No evidence of corrosion. All corneal involvement or irritation cleared within 72 hours.
Primary Skin Irritation	Primary Irritation Index (PII) = 2.6 based on erythema and edema. No corrosion was found.

Section XII - Ecological Information (Liquid Phase)

Aerobic Aquatic Biodegradation (EPA Method 796.3100)	The percentage biodegradation in 28 days was 85.8%.
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Section XIII - Disposal Considerations

Waste Disposal: (Unused Material)	Do not puncture or incinerate. Use-up contents of package or give to someone who can. If possible, recycle empty aerosol can at nearest recycling center.
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Section XIV - Transportation Information

D.O.T Shipping Name:	ORMD	D.O.T Hazard Class:	None
UN Shipping Name:	N/A	UN/NA Number:	N/A
UN Class or Division	N/A	UN Packing Group:	None
NMFC Freight Class	Compound, Cleaning Fluid, NOI 48580 Sub 3		
Warehousing (Factory Mutual):	Level 1		

Section XV - US Regulatory Information

Notice: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state, and local laws. The following specific information is made for the purpose of complying with numerous federal, state, and local laws and regulations.

Federal Regulations:

Workplace Classification	This product is considered non-hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200)
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SARA Title III

Section 311/312	This product is not a hazardous chemical under 29CFR 1910.1200, and therefore is not covered by Title III of SARA.
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Section 313	This product does not contain a chemical, which is listed in Section 313 at or <u>above de minimis</u> concentrations.
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CERCLA Information (40CFR 302.4)	Releases of this product to air, land, or water are not reportable to the National Response Center under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or to state and local emergency planning committees under the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304.
----------------------------------	--

Waste Classification	When a decision is made to discard unused portions of this product, it does not meet RCRA's characteristic definition of ignitability, corrosivity, or reactivity, and none of the materials used in this product are listed in 40 CFR 261.33. The toxicity characteristic (TC), however, has not been evaluated by the Toxicity Characteristic Leaching Procedure (TCLP). Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, State and local waste disposal requirements may be more restrictive or otherwise different from Federal laws and regulations.
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TSCA	All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act.
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NFPA Ratings	Health = 1	Flammability = 1	Reactivity = 0	Special = 0
NPCA-HMIS Ratings	Health = 1	Flammability = 1	Reactivity = 0	Protective Equipment = None

State Regulations:

California

California Safe Drinking Water and Toxic Enforcement - Prop. 65	This product does not contain any materials currently listed by California as chemicals known to cause cancer or known to have reproductive toxicity under Proposition 65.
Volatile Organic Compounds (VOC)	Percent Volatile Organic Compounds by weight equals 3.0%.
SQAQMD	This product has a VOC content of 161 g/l or 1.34 lbs./gal. and is not considered photochemically reactive as defined in Rule 102 of the rules and regulations of the South Coast Air Quality Management District (SQAQMD).

ATTN: FORMAL

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**** DRAFT COPY -- FOR EVALUATION USE ONLY ****

PRODUCT NAME : L-7768 STANDARD WATER CLEANER
IDENTIFICATION NUMBER: SFCL07768 DATE PRINTED: 10/08/03
PRODUCT USE/CLASS :

SUPPLIER:
Camie-Campbell
9225 Watson Industrial Park
St. Louis, MO 63126

MANUFACTURER:
Camie-Campbell
9225 Watson Industrial Park
St. Louis, MO 63126

EMERGENCY TELEPHONE: 800-424-9300
24 HOUR EMERGENCY PHONE

EMERGENCY TELEPHONE: 800-424-9300
24 HOUR EMERGENCY PHONE

PREPARER: JLM, PHONE: 314/968-3222, PREPARE DATE: 10/08/03
REPLACES DATE: 10/08/03

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	PROPRIETARY DETERGENT	NOT AVAILABLE	95.0 %
02	ISOBUTANE	75-28-5	5.0 %
03	PROPANE	74-98-6	5.0 %

ITEM	EXPOSURE LIMITS						SKIN
	TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	PEL-CEILING	COMPANY TLV-TWA		
01	5 mg/m3	N.E.	5 mg/m3	N.E.	N.E.		NO
02	N.E.	N.E.	N.E.	N.E.	1000 ppm		NO
03	2500 PPM	N.E.	1000 ppm	N.E.	N.E.		NO

(See Section 16 for abbreviation legend)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: CORROSIVE: This material is a clear colorless liquid. It can cause severe irritation or burns to the eyes, skin, gastrointestinal tract, and respiratory system. This product may produce corrosive damage to the gastrointestinal tract if it is swallowed. Keep from reach of children. Do not puncture, incinerate, or place aerosol product containers in compactors. Containers of this material may be hazardous when emptied since containers retain product residues (vapor, liquid, and/or solid). All hazardprecautions given must be observed. Do

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

not flame cut, braze or use welding torch. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Due to product's high PH, direct eye contact with vapors or liquid can cause pain and severe eye burns. The degree of injury depends on the concentration and duration of contact. Signs and symptoms include swelling, reddening, blurred vision, corneal opacity and iritis.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: This material will probably induce chemical burns on human skin. Dermatitis and skin sensitization can develop after repeated and/or prolonged contact with human skin.

EFFECTS OF OVEREXPOSURE - INHALATION: Inhalation of vapors or mists of the product can be severely irritating to the respiratory system. Excessive inhalation of vapors can cause nasal and respiratory irritation, dizziness, weakness, fatigue, nausea, headache, possible unconsciousness, and even asphyxiation.

EFFECTS OF OVEREXPOSURE - INGESTION: This product may produce corrosive damage to the gastrointestinal tract if it is swallowed. Irritation of the mouth, pharynx, esophagus, and stomach can develop following ingestion.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: No Information.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT INHALATION INGESTION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Flush with large amounts of water, lifting upper and lower lids occasionally, get medical attention.

FIRST AID - SKIN CONTACT: Thoroughly wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before re-use. Get medical attention if irritation persists.

FIRST AID - INHALATION: Remove individual to fresh air. If breathing is difficult, administer oxygen. Give artificial respiration if breathing has stopped. Keep person warm and quiet. Get medical attention.

FIRST AID - INGESTION: Do not induce vomiting. Give two glasses of water if conscious. Never give anything by mouth to an unconscious person. Get immediate medical attention.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -156 F
(PENSKEY-MARTENS C.C.)

LOWER EXPLOSIVE LIMIT: 1.9 %
UPPER EXPLOSIVE LIMIT: 9.5 %

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: CO2 DRY CHEMICAL WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and travel along the ground or may be moved by ventilation and ignited by ignition sources at locations distant from material handling point. For aerosol products - exposure to temperatures over 130°F may cause containers to burst releasing highly flammable gas.

SPECIAL FIREFIGHTING PROCEDURES: Wear self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode when fighting fires. Keep fire exposed containers cool with water fog.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate sources of ignition & ventilate area. Persons not properly equipped should be excluded from area. Stop spill at source - prevent spreading. Avoid inhalation of vapors. Avoid skin contact with liquid. Soak up on absorbent material and place into proper container for disposal. Use non-sparking scoops for flammable materials. Clean walking surfaces thoroughly to reduce slipping hazard.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Containers of this material may be hazardous when emptied, since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch on containers. Intentional misuse by deliberately concentrating and inhaling the vapors from this product may be harmful or fatal.

STORAGE: Do not store above 120°F. Do not store in direct sunlight. Keep away from heat sources, open flame, pilot lights, sparks, and other sources of ignition. Do not store above 120°F. Do not store in direct sunlight. Store at temperatures of 34 to 120 degrees F, in order to preserve product stability

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide sufficient mechanical ventilation (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

RESPIRATORY PROTECTION: If work place exposure limits of product or any component is exceeded, use a NIOSH/MSHA approved respirator. Consult your safety equipment supplier for recommendations.

(Continued on Page 4)

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

SKIN PROTECTION: Wear impervious gloves if method of use involves skin contact with product. Consult your safety supply vendor for glove recommendations.

EYE PROTECTION: Wear safety glasses at minimum, more extensive protection may be necessary depending on how the product is to be used.

OTHER PROTECTIVE EQUIPMENT: Wear impervious clothing if bodily exposure is anticipated. Consult your safety supply vendor for recommendations.

HYGIENIC PRACTICES: Wash hands before eating or smoking. Smoke in designated areas only. Remove and launder clothing if contaminated.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -44 - 11 F	VAPOR DENSITY	: Is heavier than air
ODOR	: DETERGENT	ODOR THRESHOLD	: N.D.
APPEARANCE	: WHITE FOAM	EVAPORATION RATE:	Is faster than Butyl Acetate
SOLUBILITY IN H2O	: SOLUBLE	SPECIFIC GRAVITY:	0.9913
FREEZE POINT	: N.D.	pH @ 0.0 %	: 13
VAPOR PRESSURE	: N.D.	VISCOSITY	: N.D.
PHYSICAL STATE	: LIQUID		
COEFFICIENT OF WATER/OIL DISTRIBUTION:	N.D.		

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, sparks, welding arcs, open flame, pilot lights, static electricity or other source of ignition.

INCOMPATIBILITY: strong oxidizers, Very strong acid, caustic or oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: carbon monoxide and carbon dioxide, various hydrocarbons,

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

No product or component toxicological information is available.

(Continued on Page 5)

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal regulations.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Aerosols

DOT TECHNICAL NAME:

DOT HAZARD CLASS: 2.1

HAZARD SUBCLASS: 8 PG III

DOT UN/NA NUMBER: UN1950

PACKING GROUP: NONE

RESP. GUIDE PAGE: 126

ADDITIONAL INFORMATION:: For domestic ground and air shipment this product may be shipped as a Consumer Commodity ORM-D. Outer cartons must have the ORM-D or ORM-D AIR designation. (our original cartons are preprinted with the ORM-D designation for ground shipment)

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD FIRE HAZARD PRESSURIZED GAS HAZARD

SARA SECTION 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

----- CHEMICAL NAME ----- CAS NUMBER WT/WT % IS LESS THAN
No SARA Section 313 components exist in this product.

TOXIC SUBSTANCES CONTROL ACT:

(Continued on Page 6)

SECTION 15 - REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

----- CHEMICAL NAME -----	CAS NUMBER
No information is available.	

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

:

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 3 FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 10/08/03

REASON FOR REVISION: NEW FORMULA

VOC CONTENT: 6.2 % BY WEIGHT, 61 GRAMS/LITER TOTAL PRODUCT,
61 GRAMS/LITER LESS WATER AND EXEMPT, 0.03 LBS/CAN

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

:

The information contained on this MSDS is been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations. The environmental information and hazardous materials identification system have been included by Camie-Campbell Inc. in order to provide additional health and hazard classification information. The ratings recommend are based upon the criteria supplied by the developers of these rating systems, together with Camie-Campbell Inc.'s interpretation of the available data. Proper personal protective equipment varies widely with conditions of use and anticipated exposure. We recommend that a supervisor or other qualified person determine proper PPE for intended use.

<END OF MSDS>

M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**** DRAFT COPY -- FOR EVALUATION USE ONLY ****

PRODUCT NAME : L-7820 SCRUBTUB WATER CLEANER
 IDENTIFICATION NUMBER: SFCL07820 DATE PRINTED: 03/05/04
 PRODUCT USE/CLASS :

SUPPLIER: MANUFACTURER:
 Camie-Campbell Camie-Campbell
 9225 Watson Industrial Park 9225 Watson Industrial Park
 St. Louis, MO 63126 St. Louis, MO 63126

EMERGENCY TELEPHONE: 800-424-9300 EMERGENCY TELEPHONE: 800-424-9300
 24 HOUR EMERGENCY PHONE 24 HOUR EMERGENCY PHONE

PREPARER: JLM, PHONE: 314/968-3222, PREPARE DATE: 03/05/04
 REPLACES DATE: 03/05/04 *Jan 2/5/04*

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	PROPRIETARY DETERGENT	NOT AVAILABLE	95.0 %
02	ISOBUTANE	75-28-5	5.0 %
03	PROPANE	74-98-6	5.0 %

ITEM	EXPOSURE LIMITS					SKIN
	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA PEL-CEILING	COMPANY TLV-TWA	
01	N.E.	N.E.	N.E.	N.E.	N.E.	NO
02	N.E.	N.E.	N.E.	N.E.	1000 ppm	NO
03	2500 PPM	N.E.	1000 ppm	N.E.	N.E.	NO

(See Section 16 for abbreviation legend)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: Keep from reach of children. Do not puncture, incinerate, or place aerosol product containers in compactors. Containers of this material may be hazardous when emptied since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal.

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes severe eye irritation and may possibly cause corrosive burns.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Human experience has demonstrated severe dermatitis upon prolonged or repeated contact. Symptoms include blisters, cracking, edema, and redness.

EFFECTS OF OVEREXPOSURE - INHALATION: Excessive inhalation of vapors can cause nasal and respiratory irritation, dizziness, weakness, fatigue, nausea, headache, possible unconsciousness, and even asphyxiation.

EFFECTS OF OVEREXPOSURE - INGESTION: No Information.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: No Information.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT INHALATION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Flush with large amounts of water, lifting upper and lower lids occasionally, get medical attention.

FIRST AID - SKIN CONTACT: Thoroughly wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before re-use. Get medical attention if irritation persists.

FIRST AID - INHALATION: Remove individual to fresh air. If breathing is difficult, administer oxygen. Give artificial respiration if breathing has stopped. Keep person warm and quiet. Get medical attention.

FIRST AID - INGESTION: Do not induce vomiting. Give two glasses of water if conscious. Never give anything by mouth to an unconscious person. Get immediate medical attention.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -156 F
(PENSKY-MARTENS C.C.)

LOWER EXPLOSIVE LIMIT: 1.8 %
UPPER EXPLOSIVE LIMIT: 9.5 %

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: CO2 DRY CHEMICAL WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and travel along the ground or may be moved by ventilation and ignited by ignition sources at locations distant from material handling point. For aerosol products - exposure to temperatures over 130F may cause containers to burst releasing highly flammable gas.

SPECIAL FIREFIGHTING PROCEDURES: Wear self-contained breathing apparatus

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

with a full facepiece operated in pressure-demand or other positive pressure mode when fighting fires. Keep fire exposed containers cool with water fog.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate sources of ignition & ventilate area. Persons not properly equipped should be excluded from area. Stop spill at source - prevent spreading. Avoid inhalation of vapors. Avoid skin contact with liquid. Soak up on absorbent material and place into proper container for disposal. Use non-sparking scoops for flammable materials. Clean walking surfaces thoroughly to reduce slipping hazard.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Containers of this material may be hazardous when emptied, since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch on containers. Intentional misuse by deliberately concentrating and inhaling the vapors from this product may be harmful or fatal.

STORAGE: Do not store above 120F. Do not store in direct sunlight. Keep away from heat sources, open flame, pilot lights, sparks, and other sources of ignition. Do not store above 120F. Do not store in direct sunlight.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide sufficient mechanical ventilation (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

RESPIRATORY PROTECTION: If work place exposure limits of product or any component is exceeded, use a NIOSH/MSHA approved respirator. Consult your safety equipment supplier for recommendations.

SKIN PROTECTION: Wear impervious gloves if method of use involves skin contact with product. Consult your safety supply vendor for glove recommendations.

EYE PROTECTION: Wear safety glasses at minimum, more extensive protection may be necessary depending on how the product is to be used.

OTHER PROTECTIVE EQUIPMENT: Wear impervious clothing if bodily exposure is anticipated. Consult your safety supply vendor for recommendations.

HYGIENIC PRACTICES: Wash hands before eating or smoking. Smoke in designated areas only. Remove and launder clothing if contaminated.

(Continued on Page 4)

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -44 - 212 F	VAPOR DENSITY	: Is heavier than air
ODOR	: MILD	ODOR THRESHOLD	: N.D.
APPEARANCE	: WHITE FOAM	EVAPORATION RATE	: Is faster than Butyl Acetate
SOLUBILITY IN H2O	: SOLUBLE	SPECIFIC GRAVITY	: 0.9652
FREEZE POINT	: N.D.	pH @ 0.1 %	: N.D.
VAPOR PRESSURE	: N.D.	VISCOSITY	: N.D.
PHYSICAL STATE	: LIQUID		
COEFFICIENT OF WATER/OIL DISTRIBUTION	: N.D.		

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, sparks, welding arcs, open flame, pilot lights, static electricity or other source of ignition.

INCOMPATIBILITY: strong oxidizers,

HAZARDOUS DECOMPOSITION PRODUCTS: carbon monoxide and carbon dioxide,

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

No product or component toxicological information is available.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal regulations.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Aerosols

DOT TECHNICAL NAME:

DOT HAZARD CLASS: 2.1

HAZARD SUBCLASS: NONE

(Continued on Page 5)

SECTION 14 - TRANSPORTATION INFORMATION

DOT LN/NA NUMBER: UN1950 PACKING GROUP: NONE RESP. GUIDE PAGE: 126

ADDITIONAL INFORMATION:: For domestic ground and air shipment this product may be shipped as a Consumer Commodity ORM-D. Outer cartons must have the ORM-D or ORM-D AIR designation. (our original cartons are preprinted with the ORM-D designation for ground shipment)

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD FIRE HAZARD PRESSURIZED GAS HAZARD

SARA SECTION 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

----- CHEMICAL NAME ----- CAS NUMBER WT/WT % IS LESS THAN
No SARA Section 313 components exist in this product.

TOXIC SUBSTANCES CONTROL ACT:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

----- CHEMICAL NAME ----- CAS NUMBER
No information is available.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

:

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2 FLAMMABILITY: 4 REACTIVITY: 0

(Continued on Page 6)

SECTION 16 - OTHER INFORMATION

PREVIOUS MSDS REVISION DATE: 03/05/04

REASON FOR REVISION: NEW FORMULA

VOC CONTENT: 6.2 % BY WEIGHT, 60 GRAMS/LITER TOTAL PRODUCT,
219 GRAMS/LITER LESS WATER AND EXEMPT, 0.03 LBS/CAN

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

1

The information contained on this MSDS is been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations. The environmental information and hazardous materials identification system have been included by Camie-Campbell Inc. in order to provide additional health and hazard classification information. The ratings recommend are based upon the criteria supplied by the developers of these rating systems, together with Camie-Campbell Inc.'s interpretation of the available data. Proper personal protective equipment varies widely with conditions of use and anticipated exposure. We recommend that a supervisor or other qualified person determine proper PPE for intended use.

<END OF MSDS>



MATERIAL SAFETY DATA SHEET

KYZEN® Aerosol Cleaner (Aerosol Can)

1. COMPANY NAME AND ADDRESS:

www.kyzen.com

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0888

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

Effective: November 3, 2003
Supersedes: October 13, 2003

2. INGREDIENTS:

Hazardous Components	CAS Number	Approximate %
Liquefied Petroleum Gas	68476-68-8	5-15

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be mildly irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause mild irritation.
Skin: Prolonged exposure to the skin may cause mild irritation.
Ingestion: May be harmful if ingested.
Inhalation: Prolonged exposure is not likely to cause adverse effects.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability Per Flame Projection Test:	Non-flammable.
Extinguisher Media:	Standard methods including dry chemical, carbon dioxide, foam and water fog.
Special Fire Fighting Procedures:	Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode. Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause container to burst.
Combustion Products:	Oxides of carbon, ammonia, and nitrogen.
Other:	Do not add nitrates due to possible formation of nitrosamines.

6. ACCIDENTAL RELEASE MEASURES:

Small Spill: Use proper personal protective equipment. Dike area to contain spill. Pick up spill on absorbent, non-combustible material. Place into a chemical waste container. Don't flush into sewers or natural waterways. Wipe area with water to remove last traces.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Wear proper eye protection. Follow proper handling procedures.
Storage: Store in cool (60-80°F) ventilated area. Keep separate from strong acids, bases and oxidizers and away from heat, sparks and open flame.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Exposure Guidelines:

	OSHA Hazardous Component	Exposure Limits	
		OSHA PEL, ppm	ACGIH TLV, ppm
	Liquefied Petroleum Gas	1000	
Respiratory Protection:	Not normally needed. In closed environments use NIOSH approved organic vapor air purifying respirator.		
Ventilation:	Use in well-ventilated area with local exhaust.		
Protective Gloves:	Standard impervious chemical, etc.		
Eye Protection:	Glasses, goggles or face shield, etc.		
Other Protective Equipment:	Eye fountain, safety shower, etc.		
Work Hygiene Practices:	Do not eat, drink, or smoke when handling industrial materials.		

9. PHYSICAL AND CHEMICAL PROPERTIES:

Boiling Point	100°C	Specific Gravity	1.03 typical
Vapor Pressure	Not determined	pH 100%	9.5-10.5
Vapor Density	Not determined	Appearance	Clear colorless coarse spray
Volatile Organic Compound (VOC):		Odor	Mild
EPA Method 24:	74.3 g/L (plus propellant)	Solubility in water	Complete
Vapor Pressure, VOC Components:	0.09 mmHg @ 20°C		

10. STABILITY AND REACTIVITY:

Stability:	Stable.
Hazardous Polymerization:	Will not occur.
Incompatibility:	Strong acids, oxidizers.
Hazardous Decomposition:	Oxides of carbon, ammonia, and nitrogen.
Other:	Do not add nitrates due to possible formation of nitrosoamines.

11. TOXICOLOGICAL INFORMATION:

Acute Toxicology:	No data is available on product as a whole.
Chronic Toxicology:	Not established on product as a whole.
Carcinogenicity:	Contains no known or suspected carcinogens.

12. ECOLOGICAL INFORMATION:

Environmental Fate and Effects:	
Ecotoxicity:	Not established.
Mobility:	Not established.
Persistence and Degradability:	Not established.
Bioaccumulative Potential:	Not established.

13. DISPOSAL INFORMATION:

Disposal of Material: Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.

Empty Containers: Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause container to burst. Do not reuse empty containers.

14. TRANSPORTATION:

ORM-D

US DOT: 49CFR172.101

Proper shipping name: AEROSOL-Consumer Commodity or Petroleum gases, liquefied

Hazard class or division: 2.1

Identification No.: UN1075

Packing Group: NA

LABEL: ORM-D

Placard: ORM-D

15. REGULATORY INFORMATION:

29CFR 1910.1200:	Liquefied Petroleum Gas	68476-66-8
States Right to Know:	None	
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA 302:	No	
SARA 311/312:	Health Acute	
SARA TITLE III, Section 313:	None	
California Proposition 65	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION: X

The data contained herein is based on information currently available to Kyzen Corporation and is believed to be factual. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and consequently relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the production of this material safety data sheet. Such information is to the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to verify the safety of this material to the suitability and completeness of such information for his own particular application. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be taken as a warranty or representation of which Kyzen Corporation assumes legal responsibility.

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MATERIAL SAFETY DATA SHEET

KYZEN® Aerosol Degreaser 11 (Aerosol CAN)

1. COMPANY NAME AND ADDRESS:

www.kyzen.com

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0888

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

Effective: November 3, 2003
Supersedes: October 13, 2003

2. INGREDIENTS:

29CFR1910.1200

Hazardous Components
Liquefied Petroleum Gas

CAS Number
68476-86-8

Approximate %
5-15

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be mildly irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause mild irritation.
Skin: Prolonged exposure to the skin may cause mild irritation.
Ingestion: May be harmful if ingested. Repeated ingestion may cause abdominal pain.
Inhalation: Prolonged exposure is not likely to cause adverse effects.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability per Flame Projection Test.
Extinguisher Media:
Special Fire Fighting Procedures:

Non-flammable.
Standard methods including dry chemical, carbon dioxide, foam and water fog.
Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode.
Combustion Products: Oxides of carbon, ammonia, and nitrogen.
Other: Do not add nitrates due to possible formation of nitrosamines.

6. ACCIDENTAL RELEASE MEASURES:

Small Spill: Use proper personal protective equipment. Dike area to contain spill. Pick up spill on absorbent, non-combustible material. Place into a chemical waste container. Don't flush into sewers or natural waterways. Wipe area with water to remove last traces.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Do not puncture or incinerate container. Wear proper eye protection. Follow proper handling procedures.

Storage: Store in cool (60-80°F) ventilated area. Keep separate from strong acids, bases and oxidizers and away from heat, sparks and open flame.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Exposure Guidelines:

	<u>OSHA Hazardous Component</u>	<u>Exposure Limits</u>	
		<u>OSHA PEL, ppm</u>	<u>ACGIH TLV, mg/m³</u>
	Liquefied Petroleum Gas	1000	

Respiratory Protection: Not normally needed. In closed environments use NIOSH approved organic vapor air purifying respirator.

Ventilation: Use in well-ventilated area with local exhaust.

Protective Gloves: Standard impervious chemical, etc.

Eye Protection: Glasses, goggles or face shield, etc.

Other Protective Equipment: Eye fountain, safety shower.

Work Hygiene Practices: Do not eat, drink, or smoke when handling industrial materials.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Boiling Point	100°C	Specific Gravity	1.03 typical
Vapor Pressure	Not determined	pH 100%	10.5-11.5
Vapor Density	Not determined	Appearance	Clear colorless liquid
Volatile Organic Compound (VOC):		Odor	Mild
EPA Method 24:	18.7 g/L (plus propellant)	Solubility in Water	Complete
Vapor Pressure, VOC Components:	<0.01 mmHg @ 20°C		

10. STABILITY AND REACTIVITY:

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatibility: Strong acids, oxidizers

Hazardous Decomposition: Oxides of carbon, ammonia, and nitrogen.

Other: Do not add nitrates due to possible formation of nitrosamines.

11. TOXICOLOGICAL INFORMATION:

Acute Toxicology: No data is available on product as a whole.

Chronic Toxicology: Not established on product as a whole.

Carcinogenicity: Contains no known or suspected carcinogens.

12. ECOLOGICAL INFORMATION:

Environmental Fate and Effects:

Ecotoxicity: Not established.

Mobility: Not established.

Persistence and Degradability: Not established.

Bioaccumulative Potential: Not established.

13. DISPOSAL INFORMATION:

Disposal of Material:	Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.
Empty Containers:	Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause bursting. Do not reuse empty containers. Dispose of according to local regulations.

14. TRANSPORTATION:

ORM-D

	<u>US DOT: 49CFR 172.101</u>
Proper shipping name:	AEROSOL – Consumer Commodity or Petroleum gases, liquefied
Hazard class or division:	2.1
Identification No.:	UN1075
Packing Group:	NA
LABEL:	ORM-D
Placard:	ORM-D

15. REGULATORY INFORMATION:

29CFR 1910.1200:	Liquefied Petroleum Gas	69476-88-8
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA TITLE III, Section 313:	None	
California Proposition 65:	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMIS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION X

The data contained herein is based on information currently available to Kyzen Corporation and is subject to be revised. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and accordingly relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the composition of this material safety data sheet. Such information is to the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to carry out their own safety assessment to the suitability and compliance of such information for his own particular application. This information is not intended to be exhaustive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be taken as a warranty or representation of which Kyzen Corporation assumes legal responsibility.
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MATERIAL SAFETY DATA SHEET

KYZEN® Engine Degreaser 2 (AEROSOL CAN)

1. COMPANY NAME AND ADDRESS:

www.kyzen.com

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0868

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

Effective: November 3, 2003
Supersedes: NEW

2. INGREDIENTS:

29CFR1910.1200:

Hazardous Components
Liquefied Petroleum Gas

CAS Number
68476-86-0

Approximate %
5-15

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be mildly irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause mild irritation.
Skin: Prolonged exposure to the skin may cause mild irritation.
Ingestion: May be harmful if ingested. Repeated ingestion may cause abdominal pain.
Inhalation: Prolonged exposure is not likely to cause adverse effects.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability per Flame Projection Test:
Extinguisher Media:
Special Fire Fighting Procedures:

Non-flammable.
Standard methods including dry chemical, carbon dioxide, foam and water fog.
Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode.
Combustion Products:
Other: Oxides of carbon, ammonia, and nitrogen.
Do not add nitrates due to possible formation of nitrosamines.

6. ACCIDENTAL RELEASE MEASURES:

Small Spill: Use proper personal protective equipment. Dike area to contain spill. Pick up spill on absorbent, non-combustible material. Place into a chemical waste container. Don't flush into sewers or natural waterways. Wipe area with water to remove last traces.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Do not puncture or incinerate container. Wear proper eye protection. Follow proper handling procedures.
Storage: Store in cool (60-80°F) ventilated area. Keep separate from strong acids, bases and oxidizers and away from heat, sparks and open flame.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Exposure Guidelines:

	OSHA Hazardous Component	Exposure Limits	
		OSHA PEL ppm	ACGIH TLV mg/m ³
	Liquefied Petroleum Gas	1000	
Respiratory Protection:	Not normally needed. In closed environments use NIOSH approved organic vapor air purifying respirator.		
Ventilation:	Use in well-ventilated area with local exhaust.		
Protective Gloves:	Standard impervious chemical, etc.		
Eye Protection:	Glasses, goggles or face shield, etc.		
Other Protective Equipment:	Eye fountain, safety shower.		
Work Hygiene Practices:	Do not eat, drink, or smoke when handling industrial materials.		

9. PHYSICAL AND CHEMICAL PROPERTIES:

Boiling Point	100°C	Specific Gravity	1.03 typical
Vapor Pressure	Not determined	pH 100%	10.5-11.5
Vapor Density	Not determined	Appearance	Clear colorless liquid
Volatle Organic Compound (VOC):		Odor	Mild
EPA Method 24:	16.7 g/L (plus propellant)	Solubility in Water	Complete
Vapor Pressure, VOC Components:	<0.01 mmHg @ 20°C		

10. STABILITY AND REACTIVITY:

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility:	Strong acids, oxidizers
Hazardous Decomposition:	Oxides of carbon, ammonia, and nitrogen.
Other:	Do not add nitrates due to possible formation of nitrosamines.

11. TOXICOLOGICAL INFORMATION:

Acute Toxicology:	No data is available on product as a whole.
Chronic Toxicology:	Not established on product as a whole.
Carcinogenicity:	Contains no known or suspected carcinogens.

12. ECOLOGICAL INFORMATION:

Environmental Fate and Effects:	
Ecotoxicity:	Not established.
Mobility:	Not established.
Persistence and Degradability:	Not established.
Bioaccumulative Potential:	Not established.

13. DISPOSAL INFORMATION:

Disposal of Material: Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.

Empty Containers: Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause bursting. Do not reuse empty containers. This container may be recycled in aerosol recycling centers. Before offering for recycling, empty the can by using the product according to the label. If recycling is not available, wrap the container and discard in the trash. Dispose of unused product in accordance with local regulations.

14. TRANSPORTATION:

ORM-D

US DOT: 49CFR172.101

Proper shipping name: AEROSOL – Consumer Commodity or Petroleum gases, liquefied

Hazard class or division: 2.1

Identification No.: UN1075

Packing Group: NA

LABEL: ORM-D

Placard: ORM-D

15. REGULATORY INFORMATION:

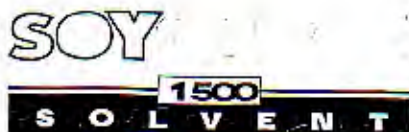
29CFR 1910.1200:	Liquefied Petroleum Gas	68476-85-6
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA TITLE III, Section 313:	None	
California Proposition 65:	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMIS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION:X

The data contained herein is based on information currently available to Kyzen Corporation and is believed to be correct. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and correspondingly relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the construction of this material safety data sheet. Such information is in the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular application. This information is not intended to be all inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be taken as a warranty or representation of which Kyzen Corporation assumes legal responsibility. Copyright 2002 Kyzen Corporation. All rights reserved.

Appendix E
MSDSs for Alternative Carburetor and Fuel Injection System Cleaners



MATERIAL SAFETY DATA SHEET

EMERGENCY PHONE: 913-599-6911

CHEMTREC: 800-424-9300

SECTION I - IDENTIFICATION

PRODUCT: SoyClear® 1500
CAS NO: 67784-90-9
CHEMICAL: Fatty acid methyl esters
SYNONYMS: Methyl esters of soybean oil

SECTION II - INGREDIENTS AND HAZARD CLASSIFICATION

TYPICAL COMPOSITION	CAS	%
Alkyl C ₁₆ -C ₁₈ Methyl Esters	67784-90-9	100

This product contains no hazardous material.

SARA HAZARD: TITLE III SECTION 313: Not listed FIRE (Section 311/312): None noted

SECTION III - HEALTH INFORMATION

EFFECTS OF OVEREXPOSURE

INHALATION: No known problems
INGESTION: LD₅₀ > 50ml/kg (albino rats) (similar products)
EYE CONTACT: Not classified as eye irritants
SKIN CONTACT: Not classified as a skin irritant or corrosive material

SECTION IV - OCCUPATIONAL EXPOSURE LIMITS

PEL: NO OSHA PEL TLV: NO ACGIH TLV

SECTION V - EMERGENCY FIRST AID PROCEDURE

FOLLOW STANDARD FIRST AID PROCEDURES

SWALLOWING: Call physician or poison control center.
SKIN CONTACT: Wash affected area with soap and water.
EYE CONTACT: Flush eyes with cool water for at least 15 minutes. Do not let victim rub eyes.
INHALATION: Immediately remove victim to fresh air. Get medical attention immediately.

SECTION VI - PHYSICAL DATA

BOILING POINT: Over 600° F (315° C) at 760 mm Hg pressure
VAPOR PRESSURE: 0.8 mm Hg at 68° F
SPECIFIC GRAVITY: 0.876 at 25° C
SOLUBILITY IN WATER: Negligible at room temperature
APPEARANCE AND COLOR: Water white to yellowish liquid
ODOR: Light vegetable oil odor

SECTION VII - FIRE AND EXPLOSION HAZARDS

FLASH POINT & METHOD USED: >300° F (PMCC)
FLAMMABLE LIMITS: Not applicable
NFPA RATING: No NFPA rating
HMIS RATING: HEALTH: 0 FIRE: 1 REACTIVITY: 0

SPECIAL FIRE FIGHTING PROCEDURES & PRECAUTIONS

Treat as oil fire. Use water spray, dry chemical, foam or carbon dioxide.

AEF 6/2001

SOYCLEAR® 1500 (CONTINUED)

UNUSUAL FIRE & EXPLOSION HAZARDS

Rags soaked with any solvent present a fire hazard and should always be stored in UL listed or Factory Mutual approved, covered containers. Improperly stored rags can create conditions that lead to oxidation. Oxidation, under certain conditions can lead to spontaneous combustion.

SECTION VIII - REACTIVITY

STABILITY:	Stable
HAZARDOUS POLYMERIZATION:	None likely
MATERIALS TO AVOID:	Strong oxidizing agents
HAZARDOUS DECOMPOSITION PRODUCTS:	CO ₂ , CO
CONDITIONS TO AVOID:	None known

SECTION IX - EMPLOYEE PROTECTION

CONTROL MEASURES:	Adequate ventilation
RESPIRATORY PROTECTION:	None required
PROTECTIVE CLOTHING:	No need anticipated
EYE PROTECTION:	None required

SECTION X - ENVIRONMENTAL PROTECTION

ENVIRONMENTAL PRECAUTIONS:	Avoid uncontrolled releases of this material into environment.
SPILL OR LEAK PRECAUTIONS:	Contain spilled material. Transfer to secure containers. Where necessary, collect using absorbent material.
WASTE DISPOSAL:	Dispose of according to federal, state and/or local requirements.

SECTION XI - REGULATORY CONTROLS

DOT CLASSIFICATION:	Class 55
DOT PROPER SHIPPING NAME:	Cleaning Compound, N.D.S.
OTHER REGULATORY REQUIREMENTS:	Listed in TSCA inventory

SECTION XII - PRECAUTIONS: HANDLING, STORAGE AND USAGE

No Special Precautions Necessary.

SECTION XIII - DATE AND SIGNATURE

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any other process. The stated MSDS is reliable to the best of the company's knowledge and believed accurate as of the date indicated. However, no representation, warranty or guarantee of any kind, express or implied, is made as to its accuracy, reliability or completeness and we assume no responsibility for any loss, damage or expense, direct or consequential, arising out of use. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use.

AG ENVIRONMENTAL PRODUCTS, L.L.C.
9804 PFLOMM
LENEXA, KS 66215

SIGNATURE: _____



PREPARED BY: WILLIAM A. AYRES

REVISION DATE: 5-01-01



MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: ACETONE

Manufacturer Information:

Sunoco, Inc. (R&M)
Ten Penn Center
1801 Market Street
Philadelphia, Pennsylvania, 19103-1699

Product Use:

Chemical intermediate

Emergency Phone Numbers:

Chemtrec (800) 424-9300
Sunoco Inc. (800) 964-8861

Information:

Product Safety Information (610) 859-1120

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No.	Amount (Vol%)
ACETONE	67-64-1	100

EXPOSURE GUIDELINES (SEE SECTION 15 FOR ADDITIONAL EXPOSURE LIMITS)

	CAS No.	Governing Body	Exposure Limits
Limit for the product	67-64-1	ACGIH	STEL 750 ppm
Limit for the product	67-64-1	ACGIH	TWA 500 ppm
Limit for the product	67-64-1	OSHA	TWA 1000 ppm

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Danger! Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Harmful if inhaled. High vapor concentrations may cause drowsiness. Causes skin and eye irritation. Harmful if swallowed. May cause target organ or system damage to the following: Eye, Skin, Respiratory system, Central nervous system

Hazards Ratings:

Key: 0 = least, 1 = slight, 2 = moderate, 3 = high, 4 = extreme

	Health	Fire	Reactivity	PI
NFPA	1	3	0	
HMIS	1	3	0	X

POTENTIAL HEALTH EFFECTS

R00000119400, ACETONE
02/14/02

1

§ PRE-EXISTING MEDICAL CONDITIONS

The following diseases or disorders may be aggravated by exposure to this product: Skin, Eye, Lung (asthma-like conditions).

§ INHALATION

High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis and loss of consciousness and even death). High vapor concentrations are irritating to the eyes, nose, throat, and lungs.

LC50 (mg/l):	no data	
LC50 (mg/m3):	rat; 8 hrs	50000
LC50 (ppm):	no data	

§ SKIN

Moderately irritating to the skin. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Draize Skin Score:	no data	Out of 8.0
LD50 (mg/kg):	rabbit	20000

§ EYES

Contact with the eye may cause moderate to severe irritation.

§ INGESTION

Product may be harmful or fatal if swallowed. Material is a pulmonary aspiration hazard. Material can enter lungs and cause damage. Ingestion of this product may cause central nervous system effects, which may include dizziness, loss of balance and coordination, unconsciousness, coma and even death.

LD50 (g/kg):	rat	5.8
--------------	-----	-----

4. FIRST AID MEASURES

• INHALATION

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen and continue to monitor. Get immediate medical attention.

• SKIN

Immediately flush skin with plenty of water. Remove clothing. Get medical attention immediately. Wash clothing separately before reuse.

• EYES

Flush eye with water for 15 minutes. Get medical attention.

• INGESTION

If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. Get medical attention immediately. See Section 15 for additional first aid information.

5. FIRE FIGHTING MEASURES

• EXTINGUISHING MEDIA

Water spray Alcohol resistant foam Dry chemical Carbon dioxide

• FIRE FIGHTING INSTRUCTIONS

Use water spray. Use water spray to cool fire exposed tanks and containers. Acetone/water solutions that contain more than 2.5% acetone have flash points. When the acetone concentration is greater than 8% (by weight) in a closed container, it would be within the flammable range and cause fire or explosion if a source of ignition were introduced.

FLAMMABLE PROPERTIES

	Typical	Minimum	Maximum	Test Result	Units	Method
Flash Point	1.4				F	N/A
Autoignition Temperature	869				F	N/A

RU0000119403, ACETONE
02/14/02

2

Lower Explosion Limit	2.5				%	N/A
Upper Explosion Limit	12.8				%	N/A

6. ACCIDENTAL RELEASE MEASURES

Prevent ignition, stop leak and ventilate the area. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Use appropriate personal protective equipment as stated in Section 8 of this MSDS. Advise the Environmental Protection Agency (EPA) and appropriate state agencies, if required. US regulations require reporting spills of this material that could reach any surface waters. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. After removal, flush contaminated area thoroughly with water.

7. HANDLING AND STORAGE

• HANDLING

Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid breathing (dust, vapor, mist, gas). Avoid contact with this material. Wash thoroughly after handling. Do not use air pressure to unload containers.

• STORAGE

Keep away from heat, sparks, and flame. Store in a cool dry place. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Consult With a Health and Safety Professional for Specific Selections

• ENGINEERING CONTROLS

Use with adequate ventilation. Ventilation is normally required when handling or using this product to keep exposure to airborne contaminants below the exposure limit. Use explosion-proof ventilation equipment.

• PERSONAL PROTECTION

§ EYE PROTECTION

Splash proof chemical goggles or full face shield recommended to protect against splash of product.

§ GLOVES or HAND PROTECTION

The glove(s) listed below may provide protection against permeation. Gloves of other chemically resistant materials may not provide adequate protection. Protective gloves are recommended to protect against contact with product. Neoprene; Natural rubber;

§ RESPIRATORY PROTECTION

Concentration in air determines the level of respiratory protection needed. Use only NIOSH certified respiratory equipment. Half-mask air purifying respirator with organic vapor cartridges is acceptable for exposures to ten (10) times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable for exposures to fifty (50) times the exposure limit. Exposure should not exceed the cartridge limit of 1000 ppm. Protection by air purifying respirators is limited. Use a positive pressure-demand full-face supplied air respirator or SCBA for exposures greater than fifty (50) times the exposure limit. If exposure is above the IDLH (Immediately Dangerous to Life and Health) or there is the possibility of an uncontrolled release, or exposure levels are unknown, then use a positive pressure-demand full-face supplied air respirator with escape bottle or SCBA. Wear a NIOSH-approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

§ OTHER

The following materials are acceptable for use as protective clothing: Neoprene; Natural rubber; Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Remove contaminated clothing and wash before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Property	Typical	Units	Test Result	Reference
Appearance		N/A	Colorless liq	

R00000119400, ACETONE
02/14/02

3

Boiling Point	133	F		
Bulk Density		lb/gal	No data	
Melting Point	-137.2	F		
Molecular Weight	58.08	g/mole		
Octanol/Water Coefficient		N/A	No data	
pH	7	N/A		
Specific Gravity	0.79	N/A		
Solubility In Water		wt %	Complete	
Odor		N/A	Sweet pungent	
Odor Threshold	62	ppm		
Vapor Pressure	181	mmHg	@ 20 C	
Viscosity (F)		SUS	No data	
Viscosity (C)		CsT	No data	
% Volatile	100	wt %		

10. STABILITY AND REACTIVITY

• STABILITY

Stable

• CONDITIONS TO AVOID

Avoid heat, sparks and open flame.

• INCOMPATIBILITY

Acetone may form explosive mixtures with chromic anhydride, chromyl alcohol, hexachloromelamine, hydrogen peroxide, permonosulfuric acid, potassium tertbutoxide, and thioglycol. Strong oxidizers

• HAZARDOUS DECOMPOSITION PRODUCTS

Combustion may produce carbon monoxide, carbon dioxide and other asphyxiants.

• HAZARDOUS POLYMERIZATION

Will not polymerize.

11. ECOLOGICAL INFORMATION

This product is not expected to persist in the environment.

12. DISPOSAL CONSIDERATIONS

Follow federal, state and local regulations. In Canada, follow federal, provincial and local regulations. This material is a RCRA hazardous waste. Do not flush material to drain or storm sewer. Contract to authorized disposal service.

13. TRANSPORT INFORMATION

Governing Body	Mode	Proper Shipping Name		
DOT	Ground	Acetone		
Governing Body	Mode	Hazard Class	UN/NA No.	Label
DOT	Ground	3 (Flammable liquid)	UN1090	

14. REGULATORY INFORMATION

Regulatory List	Component	CAS No.
ACGIH 2000 - Short Term Exposure Limits	ACETONE	67-64-1

RD0000119400, ACETONE
02/14/02

ACGIH 2000 - Time Weighted Averages	ACETONE	67-64-1
Canada - WHMIS: Ingredient Disclosure	ACETONE	67-64-1
CERCLA/SARA - Haz Substances and their RQs	ACETONE	67-64-1
Inventory - Canada - Domestic Substances List	ACETONE	67-64-1
Inventory - European EINECS Inventory	ACETONE	67-64-1
Inventory - Japan - (ENCS)	ACETONE	67-64-1
Inventory - Korea - Existing and Evaluated	ACETONE	67-64-1
Inventory - TSCA - Sect. 8(b) Inventory	ACETONE	67-64-1
Massachusetts Right To Know List	ACETONE	67-64-1
New Jersey - Department of Health RTK List	ACETONE	67-64-1
New Jersey - Special Hazardous Substances	ACETONE	67-64-1
OSHA - Final PELs - Time Weighted Averages	ACETONE	67-64-1
Pennsylvania Right to Know List	ACETONE	67-64-1
TSCA - Sect. 12(b) - Export Notification	ACETONE	67-64-1

Title III Classifications Sections 311,312:

- Acute: **YES**
- Chronic: **NO**
- Fire: **YES**
- Reactivity: **NO**
- Sudden Release of Pressure: **NO**

15. OTHER INFORMATION

Empty containers retain product residue (liquid and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner or properly disposed of. This product is subject to the Chemical Diversion and Trafficking Act of 1988 and subject to specific record keeping requirements. WHMIS Classification: Class B Division 2 - Flammable Liquids;

Appendix F
MSDSs for Alternative Brake Cleaners and General Purpose Degreasers

M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**** DRAFT COPY -- FOR EVALUATION USE ONLY ****

PRODUCT NAME : L-7769 LOW SUDS WATER CLEANER
 IDENTIFICATION NUMBER: SFCL07769
 PRODUCT USE/CLASS :
 DATE PRINTED: 10/08/03

SUPPLIER:
 Camie-Campbell
 9225 Watson Industrial Park
 St. Louis, MO 63126

MANUFACTURER:
 Camie-Campbell
 9225 Watson Industrial Park
 St. Louis, MO 63126

EMERGENCY TELEPHONE: 800-424-9330
 24 HOUR EMERGENCY PHONE

EMERGENCY TELEPHONE: 800-424-9330
 24 HOUR EMERGENCY PHONE

PREPARER: JLM, PHONE: 314/968-3222, PREPARE DATE: 10/08/03
 REPLACES DATE: 10/08/03

from 10/8/03

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	PROPRIETARY DETERGENT	NOT AVAILABLE	95.0 %
02	ISOBUTANE	75-28-5	5.0 %
03	PROPANE	74-98-6	5.0 %

EXPOSURE LIMITS						
ITEM	ACGIH		OSHA		COMPANY	SKIN
	TLV-TWA	TLV-STEL	PEL-TWA	PEL-CEILING	TLV-TWA	
01	5 mg/m3	N.E.	5 mg/m3	N.E.	N.E.	NO
02	N.E.	N.E.	N.E.	N.E.	1000 ppm	NO
03	2500 PPM	N.E.	1000 ppm	N.E.	N.E.	NO

(See Section 16 for abbreviation legend)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: CORROSIVE: This material is a clear colorless liquid. It can cause severe irritation or burns to the eyes, skin, gastrointestinal tract, and respiratory system. This product may produce corrosive damage to the gastrointestinal tract if it is swallowed. Keep from reach of children. Do not puncture, incinerate, or place aerosol product containers in compactors. Containers of this material may be hazardous when emptied since containers retain product residues (vapor, liquid, and/or solid). All hazardprecautions given must be observed. Do

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

not flame cut, braze or use welding torch. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Due to product's high PH, direct eye contact with vapors or liquid can cause pain and severe eye burns. The degree of injury depends on the concentration and duration of contact. Signs and symptoms include swelling, reddening, blurred vision, corneal opacity and iritis.

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: This material will probably induce chemical burns on human skin. Dermatitis and skin sensitization can develop after repeated and/or prolonged contact with human skin.

EFFECTS OF OVEREXPOSURE - INHALATION: Inhalation of vapors or mists of the product can be severely irritating to the respiratory system. Excessive inhalation of vapors can cause nasal and respiratory irritation, dizziness, weakness, fatigue, nausea, headache, possible unconsciousness, and even asphyxiation.

EFFECTS OF OVEREXPOSURE - INGESTION: This product may produce corrosive damage to the gastrointestinal tract if it is swallowed. Irritation of the mouth, pharynx, esophagus, and stomach can develop following ingestion.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: No Information.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT INHALATION INGESTION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Flush with large amounts of water, lifting upper and lower lids occasionally, get medical attention.

FIRST AID - SKIN CONTACT: Thoroughly wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before re-use. Get medical attention if irritation persists.

FIRST AID - INHALATION: Remove individual to fresh air. If breathing is difficult, administer oxygen. Give artificial respiration if breathing has stopped. Keep person warm and quiet. Get medical attention.

FIRST AID - INGESTION: Do not induce vomiting. Give two glasses of water if conscious. Never give anything by mouth to an unconscious person. Get immediate medical attention.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -156 F
(PENSKEY-MARTENS C.C.)

LOWER EXPLOSIVE LIMIT: 1.8 %
UPPER EXPLOSIVE LIMIT: 9.5 %

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: CO2 DRY CHEMICAL WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and travel along the ground or may be moved by ventilation and ignited by ignition sources at locations distant from material handling point. For aerosol products - exposure to temperatures over 130F may cause containers to burst releasing highly flammable gas.

SPECIAL FIREFIGHTING PROCEDURES: Wear self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode when fighting fires. Keep fire exposed containers cool with water fog.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate sources of ignition & ventilate area. Persons not properly equipped should be excluded from area. Stop spill at source - prevent spreading. Avoid inhalation of vapors. Avoid skin contact with liquid. Soak up on absorbent material and place into proper container for disposal. Use non-sparking scoops for flammable materials. Clear walking surfaces thoroughly to reduce slipping hazard.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Containers of this material may be hazardous when emptied, since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch on containers. Intentional misuse by deliberately concentrating and inhaling the vapors from this product may be harmful or fatal.

STORAGE: Do not store above 120F. Do not store in direct sunlight. Keep away from heat sources, open flame, pilot lights, sparks, and other sources of ignition. Do not store above 120F. Do not store in direct sunlight. Store at temperatures of 34 to 120 degrees F, in order to preserve product stability

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide sufficient mechanical ventilation (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

RESPIRATORY PROTECTION: If work place exposure limits of product or any component is exceeded, use a NIOSH/MSHA approved respirator. Consult your safety equipment supplier for recommendations.

(Continued on Page 4)

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

SKIN PROTECTION: Wear impervious gloves if method of use involves skin contact with product. Consult your safety supply vendor for glove recommendations.

EYE PROTECTION: Wear safety glasses at minimum, more extensive protection may be necessary depending on how the product is to be used.

OTHER PROTECTIVE EQUIPMENT: Wear impervious clothing if bodily exposure is anticipated. Consult your safety supply vendor for recommendations.

HYGIENIC PRACTICES: Wash hands before eating or smoking. Smoke in designated areas only. Remove and launder clothing if contaminated.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -44 - 11 F	VAPOR DENSITY	: Is heavier than air
ODOR	: DETERGENT	ODOR THRESHOLD	: N.D.
APPEARANCE	: CLEAR LIQUID	EVAPORATION RATE:	Is faster than Butyl Acetate
SOLUBILITY IN H2O	: SOLUBLE	SPECIFIC GRAVITY:	0.9913
FREEZE POINT	: N.D.	pH @ 0.0 %	: 13
VAPOR PRESSURE	: N.D.	VISCOSITY	: N.D.
PHYSICAL STATE	: LIQUID		
COEFFICIENT OF WATER/OIL DISTRIBUTION:	N.D.		

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, sparks, welding arcs, open flame, pilot lights, static electricity or other source of ignition.

INCOMPATIBILITY: strong oxidizers, Very strong acid, caustic or oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: carbon monoxide and carbon dioxide, various hydrocarbons,

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

No product or component toxicological information is available.

(Continued on Page 5)

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal regulations.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Aerosols

DOT TECHNICAL NAME:

DOT HAZARD CLASS: 2.1

HAZARD SUBCLASS: 8 PG III

DOT UN/NA NUMBER: UN1950

PACKING GROUP: NONE

RESP. GUIDE PAGE: 126

ADDITIONAL INFORMATION: For domestic ground and air shipment this product may be shipped as a Consumer Commodity ORM-D. Outer cartons must have the ORM-D or ORM-D AIR designation. (our original cartons are preprinted with the ORM-D designation for ground shipment)

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD FIRE HAZARD PRESSURIZED GAS HAZARD

SARA SECTION 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

----- CHEMICAL NAME ----- CAS NUMBER WT/WT % IS LESS THAN
No SARA Section 313 components exist in this product,

TOXIC SUBSTANCES CONTROL ACT:

(Continued on Page 6)

SECTION 15 - REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

----- CHEMICAL NAME ----- CAS NUMBER
No information is available.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

:

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 3 FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 10/08/03

REASON FOR REVISION: NEW FORMULA

VOC CONTENT: 6.2 % BY WEIGHT, 61 GRAMS/LITER TOTAL PRODUCT,
61 GRAMS/LITER LESS WATER AND EXEMPT, 0.03 LBS/CAN

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

:

The information contained on this MSDS is been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations. The environmental information and hazardous materials identification system have been included by Camie-Campbell Inc. in order to provide additional health and hazard classification information. The ratings recommend are based upon the criteria supplied by the developers of these rating systems, together with Camie-Campbell Inc.'s interpretation of the available data. Proper personal protective equipment varies widely with conditions of use and anticipated exposure. We recommend that a supervisor or other qualified person determine proper PPE for intended use.

<END OF MSDS>



Material Safety Data Sheet

Mirachem® Experimental Automotive Cleaner (aerosol)

(Formulation No. 2852-19)

Section I - Chemical Product and Company Identification

Manufacturer Name:	The Mirachem Corporation P.O. Box 14059 Phoenix, Arizona 85063-4059	Date Prepared: 03/04/04 Revision Date: New
Emergency Phone:	1-(800) 847-3527	

Section II - Composition/Information on Ingredients

Hazardous Component (CAS #)	OSHA PEL	ACGIH TLV	Other Limits	% (Optional)
Propane (CAS #74-98-6)				2.5
Isobutane (CAS #75-28-5)				2.5

Section III - Hazards Identification

Emergency Overview:	Clear, non-flammable, water based cleaner.
Potential Health Effects:	
Eye Contact:	May cause mild temporary irritation.
Skin Contact:	Prolonged or repeated exposure may cause mild irritation.
Inhalation:	No adverse effects expected.
Ingestion:	No adverse health effects are anticipated to occur as a result of acute ingestion. Chronic effects are not known.
Carcinogenicity:	None of the components in this material are listed by IARC, NTP, OSHA, or ACGIH as a carcinogen.
Signs/Symptoms of Overexposure:	Prolonged contact may cause mild irritation or dryness to sensitive skin.
Medical Conditions Generally Aggravated by Exposure:	None known.

Section IV - First Aid Measures

Eyes:	Immediately flush with clean water. Consult physician if necessary.
Skin:	Rinse with water.
Ingestion:	If swallowed, treat symptomatically and supportively. Do not induce vomiting. If victim conscious and alert, give two glasses of water or milk to drink. If vomiting occurs, keep head below hips to prevent aspiration. Contact Physician.
Inhalation:	No adverse effects anticipated.

Section V - Fire and Explosion Hazard

Flash Point (Method Used):	>212°F (PMCC, nonflammable)	Explosive Limits:	N/A
Extinguishing Media:	N/A		
Special Fire Fighting Procedures:	N/A	Unusual Fire Fighting and Explosion Hazards:	N/A

Section VI - Accidental Release

Small Spills: Flush with water into containing area or to sewer where applicable within Federal, State or Local disposal requirements.
Large Spills: Dike and pump into suitable containers, clean up residual with absorbent material and wash with water. Dispose of in accordance with Federal, State or Local disposal requirements.

Section VII - Handling & Storage

Handling & Storage Precautions: Wear protective goggles or face shield if splashing or spraying liquid. Protect from freezing.
Other Precautions: Keep container tightly closed. Keep out of reach of children.

Section VIII - Exposure Controls, Personal Protection

Respiratory Protection: No respiratory protection is necessary.
Ventilation: Good general ventilation is sufficient.
Protective Clothing: When prolonged skin contact is expected, wear protective gloves.
Eye Protection: Wear safety glasses.
Work/Hygiene Practices: Use good personal hygiene practices, wash hands before eating, drinking, smoking, or using toilet facilities.

Section IX - Physical/Chemical Characteristics (non-aerosol portion)

Boiling Point:	>210°F	Specific Gravity (H ₂ O = 1):	0.997
Vapor Pressure (mm Hg.) @ 20°C	Composite = 0.006	pH:	8.7-9.5
Vapor Density (AIR = 1):	> 1	Evaporation Rate (Butyl Acetate = 1):	> 1
Solubility in Water:	Complete	Melting Point:	N/A
Appearance and Odor:	Clear liquid with a mild citrus odor		

N/A = Not Applicable

N.E. = Not Established

Section X - Stability & Reactivity

Stability:	Unstable Stable	X	Incompatibility (Materials to Avoid):	Strong Acids and Alkalies demulsify product.
Hazardous Decomposition or By-products:	Thermal decomposition may produce CO ₂			
Hazardous Polymerization:	May Occur		Will Not Occur	X

Section XI - Toxicological Information

No Data Available

Section XII - Ecological Information

No Data Available

Section XIII - Disposal Considerations

Waste Disposal:
(Unused Material) Flush uncontaminated material to sewer where applicable within Federal, State or Local disposal requirements.

Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, State and local waste disposal requirements may be more restrictive or otherwise different from Federal laws and regulations.

MiraChem Experimental Automotive Parts Cleaner (aerosol)
Formulation No. 2852-19

Revision Date: 03/04/04
Page 2 of 3



MATERIAL SAFETY DATA SHEET

KYZEN® Cyber Solv Experimental Degreaser 11

1. COMPANY NAME AND ADDRESS:

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0888

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

www.kyzen.com

Effective: June 11, 2004
Superseries: NEW

2. INGREDIENTS:

29CFR1910.1200:

Hazardous Components
Liquefied Petroleum Gas

CAS Number
68476-85-8

Approximate %
5-15 10% RA KYZEN

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause irritation.
Skin: Prolonged exposure to the skin may cause irritation.
Ingestion: May be harmful if ingested. Repeated ingestion may cause abdominal pain.
Inhalation: May cause irritation, dizziness, nausea or headache.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability per Flame Projection Test:
Extinguisher Media:
Special Fire Fighting Procedures:

Non-flammable.
Standard methods including dry chemical, carbon dioxide, foam and water fog.
Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode.
Combustion Products: Oxides of carbon, ammonia, and nitrogen.
Other: Do not add nitrates due to possible formation of nitrosamines.

Section VI - Accidental Release

Small Spills: Flush with water into containing area or to sewer where applicable within Federal, State or Local disposal requirements.
Large Spills: Dike and pump into suitable containers, clean up residual with absorbent material and wash with water. Dispose of in accordance with Federal, State or Local disposal requirements.

Section VII - Handling & Storage

Handling & Storage Precautions: Wear protective goggles or face shield if splashing or spraying liquid. Protect from freezing.
Other Precautions: Keep container tightly closed. Keep out of reach of children.

Section VIII - Exposure Controls, Personal Protection

Respiratory Protection: No respiratory protection is necessary.
Ventilation: Good general ventilation is sufficient.
Protective Clothing: When prolonged skin contact is expected, wear protective gloves.
Eye Protection: Wear safety glasses.
Work/Hygiene Practices: Use good personal hygiene practices, wash hands before eating, drinking, smoking, or using toilet facilities.

Section IX - Physical/Chemical Characteristics (non-aerosol portion)

Boiling Point:	>210°F	Specific Gravity (H ₂ O = 1):	0.997
Vapor Pressure (mm Hg.) @ 20°C	Composite = 0.006	pH:	8.7-9.5
Vapor Density (AIR = 1):	> 1	Evaporation Rate (Butyl Acetate = 1):	> 1
Solubility in Water:	Complete	Melting Point:	N/A
Appearance and Odor:	Clear liquid with a mild citrus odor		

N/A = Not Applicable

N.E. = Not Established

Section X - Stability & Reactivity

Stability: Unstable X
Stable X
Incompatibility (Materials to Avoid): Strong Acids and Alkalies demulsify product.
Hazardous Decomposition or By-products: Thermal decomposition may produce CO₂
Hazardous Polymerization: May Occur
Will Not Occur X

Section XI - Toxicological Information

No Data Available

Section XII - Ecological Information

No Data Available

Section XIII - Disposal Considerations

Waste Disposal: (Unused Material) Flush uncontaminated material to sewer where applicable within Federal, State or Local disposal requirements.

Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, State and local waste disposal requirements may be more restrictive or otherwise different from Federal laws and regulations.

MiraChem Experimental Automotive Parts Cleaner (aerosol)
Formulation No. 2852-19

Revision Date: 03/04/04
Page 2 of 3

13. DISPOSAL INFORMATION:

Disposal of Material: Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.

Empty Containers: Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause bursting. Do not reuse empty containers. Dispose of according to local regulations.

14. TRANSPORTATION:

ORM-D

US DOT: 49CFR172.101

Proper shipping name: AEROSOL – Consumer Commodity or Petroleum gases, liquefied

Hazard class or division: 2.1

Identification No.: UN1075

Packing Group: NA

LABEL: ORM-D

Placard: ORM-D

15. REGULATORY INFORMATION:

29CFR 1910.1200:	Liquefied Petroleum Gas	68475-65-8
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA TITLE III, Section 313:	None	
California Proposition 65	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMIS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION:X

The data contained herein is based on information currently available to Kyzen Corporation and is believed to be factual. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and consequently relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the construction of this material safety data sheet. Such information is to the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to verify this information as to the suitability and completeness of such information for his own particular application. This information is not intended to be as-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be taken as a warranty or representation of Kyzen Corporation's legal responsibility. Copyright 2002 Kyzen Corporation. All rights reserved.



MATERIAL SAFETY DATA SHEET

KYZEN® Cyber Solv (Aerosol)

1. COMPANY NAME AND ADDRESS:

www.kyzen.com

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0688

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

Effective: May 17, 2004
Supersedes: NEW

2. INGREDIENTS:

29CFR1910.1200:

Hazardous Components
Liquefied Petroleum Gas

CAS Number
68476-86-8

Approximate %
5-15

100% P.R. KYZEN

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause irritation.
Skin: Prolonged exposure to the skin may cause irritation.
Ingestion: May be harmful if ingested. Repeated ingestion may cause abdominal pain.
Inhalation: May cause irritation, dizziness, nausea or headache.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability per Flame Projection Test:
Extinguisher Media:
Special Fire Fighting Procedures:

Non-flammable.
Standard methods including dry chemical, carbon dioxide, foam and water fog.
Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode.
Oxides of carbon, ammonia, and nitrogen.
Do not add nitrates due to possible formation of nitrosamines.

Combustion Products:
Other:

6. ACCIDENTAL RELEASE MEASURES:

Small Spill: Use proper personal protective equipment. Dike area to contain spill. Pick up spill on absorbent, non-combustible material. Place into a chemical waste container. Don't flush into sewers or natural waterways. Wipe area with water to remove last traces.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Do not puncture or incinerate container. Wear proper eye protection. Follow proper handling procedures.
Storage: Store in cool (60-80°F) ventilated area. Keep separate from strong acids, bases and oxidizers and away from heat, sparks and open flame.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Exposure Guidelines:

OSHA Hazardous Component

Exposure Limits

Liquefied Petroleum Gas

OSHA PEL, ppm

ACGIH TLV, mg/m³

1000

Respiratory Protection: Not normally needed. In closed environments use NIOSH approved organic vapor air purifying respirator.
Ventilation: Use in well-ventilated area with local exhaust.
Protective Gloves: Standard impervious chemical, etc.
Eye Protection: Glasses, goggles or face shield, etc.
Other Protective Equipment: Eye fountain, safety shower.
Work Hygiene Practices: Do not eat, drink, or smoke when handling industrial materials.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Boiling Point:	100°C	Specific Gravity:	1.03 typical
Vapor Pressure:	Not determined	pH 100%:	10.5-11.5
Vapor Density:	Not determined	Appearance:	Clear colorless liquid
Volatile Organic Compound (VOC):		Odor:	Mild
EPA Method 24:	16.7 g/L (plus propellant)	Solubility in Water:	Complete
Vapor Pressure, VOC Components:	<0.01 mmHg @ 20°C		

10. STABILITY AND REACTIVITY:

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatibility: Strong acids, oxidizers
Hazardous Decomposition: Oxides of carbon, ammonia, and nitrogen.
Other: Do not add nitrates due to possible formation of nitrosoamines.

11. TOXICOLOGICAL INFORMATION:

Acute Toxicology: No data is available on product as a whole.
Chronic Toxicology: Not established on product as a whole.
Carcinogenicity: Contains no known or suspected carcinogens.

12. ECOLOGICAL INFORMATION:

Environmental Fate and Effects:
Ecotoxicity: Not established.
Mobility: Not established.
Persistence and Degradability: Not established.
Bioaccumulative Potential: Not established.

13. DISPOSAL INFORMATION:

Disposal of Material: Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.

Empty Containers: Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause bursting. Do not reuse empty containers. Dispose of according to local regulations.

14. TRANSPORTATION:

ORM-D

US DOT: 49CFR172.101

Proper shipping name: AEROSOL – Consumer Commodity or Petroleum gases, liquefied

Hazard class or division: 2.1

Identification No.: UN1075

Packing Group: NA

LABEL: ORM-D

Placard: ORM-D

15. REGULATORY INFORMATION:

29CFR 1810.1200:	Liquefied Petroleum Gas	68475-68-8
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA TITLE III, Section 313:	None	
California Proposition 65	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION: X

The data contained herein is based on information currently available to Kyzen Corporation and is believed to be accurate. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and correspondingly relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the formulation of the material safety data sheet. Such information is to the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular application. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be given as a warranty or representation of which Kyzen Corporation assumes legal responsibility.

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MATERIAL SAFETY DATA SHEET

KYZEN® Aerosol Cleaner (Aerosol Can)

1. COMPANY NAME AND ADDRESS:

www.kyzen.com

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0888

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

Effective: November 3, 2003
Supersedes: October 13, 2003

2. INGREDIENTS:

Hazardous Components	CAS Number	Approximate %
Liquefied Petroleum Gas	68476-68-8	5-15

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be mildly irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause mild irritation.
Skin: Prolonged exposure to the skin may cause mild irritation.
Ingestion: May be harmful if ingested.
Inhalation: Prolonged exposure is not likely to cause adverse effects.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability Per Flame Projection Test:	Non-flammable.
Extinguisher Media:	Standard methods including dry chemical, carbon dioxide, foam and water fog.
Special Fire Fighting Procedures:	Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode. Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause container to burst.
Combustion Products:	Oxides of carbon, ammonia, and nitrogen.
Other:	Do not add nitrates due to possible formation of nitrosamines.

6. ACCIDENTAL RELEASE MEASURES:

Small Spill: Use proper personal protective equipment. Dike area to contain spill. Pick up spill on absorbent, non-combustible material. Place into a chemical waste container. Don't flush into sewers or natural waterways. Wipe area with water to remove last traces.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Wear proper eye protection. Follow proper handling procedures.
Storage: Store in cool (60-80°F) ventilated area. Keep separate from strong acids, bases and oxidizers and away from heat, sparks and open flame.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Exposure Guidelines:

	OSHA Hazardous Component	Exposure Limits	
		OSHA PEL, ppm	ACGIH TLV, ppm
	Liquefied Petroleum Gas	1000	
Respiratory Protection:	Not normally needed. In closed environments use NIOSH approved organic vapor air purifying respirator.		
Ventilation:	Use in well-ventilated area with local exhaust.		
Protective Gloves:	Standard impervious chemical, etc.		
Eye Protection:	Glasses, goggles or face shield, etc.		
Other Protective Equipment:	Eye fountain, safety shower, etc.		
Work Hygiene Practices:	Do not eat, drink, or smoke when handling industrial materials.		

9. PHYSICAL AND CHEMICAL PROPERTIES:

Boiling Point	100°C	Specific Gravity	1.03 typical
Vapor Pressure	Not determined	pH 100%	9.5-10.5
Vapor Density	Not determined	Appearance	Clear colorless coarse spray
Volatile Organic Compound (VOC):		Odor	Mild
EPA Method 24:	74.3 g/L (plus propellant)	Solubility in water	Complete
Vapor Pressure, VOC Components:	0.09 mmHg @ 20°C		

10. STABILITY AND REACTIVITY:

Stability:	Stable.
Hazardous Polymerization:	Will not occur.
Incompatibility:	Strong acids, oxidizers.
Hazardous Decomposition:	Oxides of carbon, ammonia, and nitrogen.
Other:	Do not add nitrates due to possible formation of nitrosoamines.

11. TOXICOLOGICAL INFORMATION:

Acute Toxicology:	No data is available on product as a whole.
Chronic Toxicology:	Not established on product as a whole.
Carcinogenicity:	Contains no known or suspected carcinogens.

12. ECOLOGICAL INFORMATION:

Environmental Fate and Effects:	
Ecotoxicity:	Not established.
Mobility:	Not established.
Persistence and Degradability:	Not established.
Bioaccumulative Potential:	Not established.

13. DISPOSAL INFORMATION:

Disposal of Material: Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.

Empty Containers: Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause container to burst. Do not reuse empty containers.

14. TRANSPORTATION:

ORM-D

US DOT: 49CFR172.101

Proper shipping name: AEROSOL-Consumer Commodity or Petroleum gases, liquefied

Hazard class or division: 2.1

Identification No.: UN1075

Packing Group: NA

LABEL: ORM-D

Placard: ORM-D

15. REGULATORY INFORMATION:

29CFR 1910.1200:	Liquefied Petroleum Gas	68476-66-9
States Right to Know:	None	
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA 302:	No	
SARA 311/312:	Health Acute	
SARA TITLE III, Section 313:	None	
California Proposition 65	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION: X

The data contained herein is based on information currently available to Kyzen Corporation and is believed to be factual. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and consequently relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the production of this material safety data sheet. Such information is to the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to verify the safety of this material to the suitability and completeness of such information for his own particular application. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be taken as a warranty or representation of which Kyzen Corporation assumes legal responsibility.

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MATERIAL SAFETY DATA SHEET

KYZEN® Aerosol Degreaser 11 (Aerosol CAN)

1. COMPANY NAME AND ADDRESS:

www.kyzen.com

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-831-0888

(24 HOUR) EMERGENCY PHONE:
CHEMTREC
800-424-9300

Effective: November 3, 2003
Supersedes: October 13, 2003

2. INGREDIENTS:

29CFR1910.1200

Hazardous Components
Liquefied Petroleum Gas

CAS Number
68476-86-8

Approximate %
5-15

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW

Aerosolized liquid. Vapors may be mildly irritating to eyes, skin and mucous membranes.

Eyes: Contact may cause mild irritation.
Skin: Prolonged exposure to the skin may cause mild irritation.
Ingestion: May be harmful if ingested. Repeated ingestion may cause abdominal pain.
Inhalation: Prolonged exposure is not likely to cause adverse effects.

4. FIRST AID:

Eyes: Immediately flush eyes with plenty of water for 15 minutes. If irritation develops, get medical attention.
Skin: Remove contaminated clothing and shoes. Wash affected area with plenty of soap and water. Get medical attention. Wash contaminated items before reuse.
Ingestion: If conscious, give person 1 to 2 glasses of water. Get medical help.
Inhalation: Remove victim from area of exposure. If unconscious, give oxygen. Give artificial respiration if not breathing. Get medical help.

5. FIRE AND EXPLOSION HAZARD DATA:

Flammability per Flame Projection Test.
Extinguisher Media:
Special Fire Fighting Procedures:

Non-flammable.
Standard methods including dry chemical, carbon dioxide, foam and water fog.
Water should be used to keep fire-exposed containers cool. Prevent runoff from fire control from entering streams, sewers or drinking water supply. This liquid is volatile and gives off invisible vapors. The liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources, where they may ignite or explode.
Oxides of carbon, ammonia, and nitrogen.
Do not add nitrates due to possible formation of nitrosamines.

Combustion Products:
Other:

6. ACCIDENTAL RELEASE MEASURES:

Small Spill: Use proper personal protective equipment. Dike area to contain spill. Pick up spill on absorbent, non-combustible material. Place into a chemical waste container. Don't flush into sewers or natural waterways. Wipe area with water to remove last traces.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Do not puncture or incinerate container. Wear proper eye protection. Follow proper handling procedures.

Storage: Store in cool (60-80°F) ventilated area. Keep separate from strong acids, bases and oxidizers and away from heat, sparks and open flame.

8. EXPOSURE CONTROLS/ PERSONAL PROTECTION:

Exposure Guidelines:

	<u>OSHA Hazardous Component</u>	<u>Exposure Limits</u>	
		<u>OSHA PEL, ppm</u>	<u>ACGIH TLV, mg/m³</u>
	Liquefied Petroleum Gas	1000	

Respiratory Protection: Not normally needed. In closed environments use NIOSH approved organic vapor air purifying respirator.

Ventilation: Use in well-ventilated area with local exhaust.

Protective Gloves: Standard impervious chemical, etc.

Eye Protection: Glasses, goggles or face shield, etc.

Other Protective Equipment: Eye fountain, safety shower.

Work Hygiene Practices: Do not eat, drink, or smoke when handling industrial materials.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Boiling Point	100°C	Specific Gravity	1.03 typical
Vapor Pressure	Not determined	pH 100%	10.5-11.5
Vapor Density	Not determined	Appearance	Clear colorless liquid
Volatile Organic Compound (VOC):		Odor	Mild
EPA Method 24:	18.7 g/L (plus propellant)	Solubility in Water	Complete
Vapor Pressure, VOC Components:	<0.01 mmHg @ 20°C		

10. STABILITY AND REACTIVITY:

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatibility: Strong acids, oxidizers

Hazardous Decomposition: Oxides of carbon, ammonia, and nitrogen.

Other: Do not add nitrates due to possible formation of nitrosamines.

11. TOXICOLOGICAL INFORMATION:

Acute Toxicology: No data is available on product as a whole.

Chronic Toxicology: Not established on product as a whole.

Carcinogenicity: Contains no known or suspected carcinogens.

12. ECOLOGICAL INFORMATION:

Environmental Fate and Effects:

Ecotoxicity: Not established.

Mobility: Not established.

Persistence and Degradability: Not established.

Bioaccumulative Potential: Not established.

13. DISPOSAL INFORMATION:

Disposal of Material:	Conditions of use may cause this material to become a hazardous waste as defined by state or federal law. Use approved treatment, transporters and disposal sites. USEPA guidelines for the classification determination are listed in 40 CFR Parts 261.3.
Empty Containers:	Do not puncture or incinerate container. Exposure to temperatures above 120°F may cause bursting. Do not reuse empty containers. Dispose of according to local regulations.

14. TRANSPORTATION:

ORM-D

	<u>US DOT: 49CFR172.101</u>
Proper shipping name:	AEROSOL – Consumer Commodity or Petroleum gases, liquefied
Hazard class or division:	2.1
Identification No.:	UN1075
Packing Group:	NA
LABEL:	ORM-D
Placard:	ORM-D

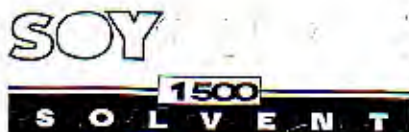
15. REGULATORY INFORMATION:

29CFR 1910.1200:	Liquefied Petroleum Gas	69476-88-8
TSCA Listed:	Yes	
CERCLA:	Not reportable	
SARA TITLE III, Section 313:	None	
California Proposition 65:	None	

16. OTHER INFORMATION:

NFPA CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	
HMIS CODES:	HEALTH: 1	FIRE: 1	REACTIVITY: 0	PROTECTION X

The data contained herein is based on information currently available to Kyzen Corporation and is subject to be revised. As a formulator, blender, and compounder, Kyzen Corporation does not manufacture the raw materials used in this product and accordingly relies on information provided to Kyzen Corporation from material safety data sheets on the specific raw materials in the composition of this material safety data sheet. Such information is to the best of Kyzen Corporation's knowledge and belief to be accurate and reliable as of the date of this MSDS. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY, OR COMPLETENESS. It is the user's responsibility to carry out their own safety and compliance of such information for his own particular application. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. This data is not to be taken as a warranty or representation of which Kyzen Corporation assumes legal responsibility. Copyright 2002 Kyzen Corporation. All rights reserved.



MATERIAL SAFETY DATA SHEET

EMERGENCY PHONE: 913-599-6911

CHEMTREC: 800-424-9300

SECTION I - IDENTIFICATION

PRODUCT: SoyClear® 1500
CAS NO: 67784-90-9
CHEMICAL: Fatty acid methyl esters
SYNONYMS: Methyl esters of soybean oil

SECTION II - INGREDIENTS AND HAZARD CLASSIFICATION

TYPICAL COMPOSITION	CAS	%
Alkyl C ₁₆ -C ₁₈ Methyl Esters	67784-90-9	100

This product contains no hazardous material.

SARA HAZARD: TITLE III SECTION 313: Not listed FIRE (Section 311/312): None noted

SECTION III - HEALTH INFORMATION

EFFECTS OF OVEREXPOSURE

INHALATION: No known problems
INGESTION: LD₅₀ > 50ml/kg (albino rats) (similar products)
EYE CONTACT: Not classified as eye irritants
SKIN CONTACT: Not classified as a skin irritant or corrosive material

SECTION IV - OCCUPATIONAL EXPOSURE LIMITS

PEL: NO OSHA PEL TLV: NO ACGIH TLV

SECTION V - EMERGENCY FIRST AID PROCEDURE

FOLLOW STANDARD FIRST AID PROCEDURES

SWALLOWING: Call physician or poison control center.
SKIN CONTACT: Wash affected area with soap and water.
EYE CONTACT: Flush eyes with cool water for at least 15 minutes. Do not let victim rub eyes.
INHALATION: Immediately remove victim to fresh air. Get medical attention immediately.

SECTION VI - PHYSICAL DATA

BOILING POINT: Over 600° F (315° C) at 760 mm Hg pressure
VAPOR PRESSURE: 0.8 mm Hg at 68° F
SPECIFIC GRAVITY: 0.876 at 25° C
SOLUBILITY IN WATER: Negligible at room temperature
APPEARANCE AND COLOR: Water white to yellowish liquid
ODOR: Light vegetable oil odor

SECTION VII - FIRE AND EXPLOSION HAZARDS

FLASH POINT & METHOD USED: >300° F (PMCC)
FLAMMABLE LIMITS: Not applicable
NFPA RATING: No NFPA rating
HMIS RATING: HEALTH: 0 FIRE: 1 REACTIVITY: 0

SPECIAL FIRE FIGHTING PROCEDURES & PRECAUTIONS

Treat as oil fire. Use water spray, dry chemical, foam or carbon dioxide.

AEF 6/2001

SOYCLEAR* 1500 (CONTINUED)

UNUSUAL FIRE & EXPLOSION HAZARDS

Rags soaked with any solvent present a fire hazard and should always be stored in UL listed or Factory Mutual approved, covered containers. Improperly stored rags can create conditions that lead to oxidation. Oxidation, under certain conditions can lead to spontaneous combustion.

SECTION VIII - REACTIVITY

STABILITY:	Stable
HAZARDOUS POLYMERIZATION:	None likely
MATERIALS TO AVOID:	Strong oxidizing agents
HAZARDOUS DECOMPOSITION PRODUCTS:	CO ₂ , CO
CONDITIONS TO AVOID:	None known

SECTION IX - EMPLOYEE PROTECTION

CONTROL MEASURES:	Adequate ventilation
RESPIRATORY PROTECTION:	None required
PROTECTIVE CLOTHING:	No need anticipated
EYE PROTECTION:	None required

SECTION X - ENVIRONMENTAL PROTECTION

ENVIRONMENTAL PRECAUTIONS:	Avoid uncontrolled releases of this material into environment.
SPILL OR LEAK PRECAUTIONS:	Contain spilled material. Transfer to secure containers. Where necessary, collect using absorbent material.
WASTE DISPOSAL:	Dispose of according to federal, state and/or local requirements.

SECTION XI - REGULATORY CONTROLS

DOT CLASSIFICATION:	Class 55
DOT PROPER SHIPPING NAME:	Cleaning Compound, N.D.S.
OTHER REGULATORY REQUIREMENTS:	Listed in TSCA inventory

SECTION XII - PRECAUTIONS: HANDLING, STORAGE AND USAGE

No Special Precautions Necessary.

SECTION XIII - DATE AND SIGNATURE

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any other process. The stated MSDS is reliable to the best of the company's knowledge and believed accurate as of the date indicated. However, no representation, warranty or guarantee of any kind, express or implied, is made as to its accuracy, reliability or completeness and we assume no responsibility for any loss, damage or expense, direct or consequential, arising out of use. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use.

AG ENVIRONMENTAL PRODUCTS, L.L.C.
9804 PFLOMM
LENEXA, KS 66215

SIGNATURE: _____



PREPARED BY: WILLIAM A. AYRES

REVISION DATE: 5-01-01



MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: ACETONE

Manufacturer Information:

Sunoco, Inc. (R&M)
Ten Penn Center
1801 Market Street
Philadelphia, Pennsylvania, 19103-1699

Product Use:

Chemical intermediate

Emergency Phone Numbers:

Chemtrec (800) 424-9300
Sunoco Inc. (800) 964-8861

Information:

Product Safety Information (610) 859-1120

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No.	Amount (Vol%)
ACETONE	67-64-1	100

EXPOSURE GUIDELINES (SEE SECTION 15 FOR ADDITIONAL EXPOSURE LIMITS)

	CAS No.	Governing Body	Exposure Limits
Limit for the product	67-64-1	ACGIH	STEL 750 ppm
Limit for the product	67-64-1	ACGIH	TWA 500 ppm
Limit for the product	67-64-1	OSHA	TWA 1000 ppm

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Danger! Extremely flammable liquid and vapor. Vapors may cause flash fire or explosion. Harmful if inhaled. High vapor concentrations may cause drowsiness. Causes skin and eye irritation. Harmful if swallowed. May cause target organ or system damage to the following: Eye, Skin, Respiratory system, Central nervous system

Hazards Ratings:

Key: 0 = least, 1 = slight, 2 = moderate, 3 = high, 4 = extreme

	Health	Fire	Reactivity	PI
NFPA	1	3	0	
HMIS	1	3	0	X

POTENTIAL HEALTH EFFECTS

R00000119400, ACETONE
02/14/02

1

§ PRE-EXISTING MEDICAL CONDITIONS

The following diseases or disorders may be aggravated by exposure to this product: Skin, Eye, Lung (asthma-like conditions).

§ INHALATION

High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis and loss of consciousness and even death). High vapor concentrations are irritating to the eyes, nose, throat, and lungs.

LC50 (mg/l):	no data	
LC50 (mg/m3):	rat; 8 hrs	50000
LC50 (ppm):	no data	

§ SKIN

Moderately irritating to the skin. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Draize Skin Score:	no data	Out of 8.0
LD50 (mg/kg):	rabbit	20000

§ EYES

Contact with the eye may cause moderate to severe irritation.

§ INGESTION

Product may be harmful or fatal if swallowed. Material is a pulmonary aspiration hazard. Material can enter lungs and cause damage. Ingestion of this product may cause central nervous system effects, which may include dizziness, loss of balance and coordination, unconsciousness, coma and even death.

LD50 (g/kg):	rat	5.8
--------------	-----	-----

4. FIRST AID MEASURES

• INHALATION

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen and continue to monitor. Get immediate medical attention.

• SKIN

Immediately flush skin with plenty of water. Remove clothing. Get medical attention immediately. Wash clothing separately before reuse.

• EYES

Flush eye with water for 15 minutes. Get medical attention.

• INGESTION

If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. Get medical attention immediately. See Section 15 for additional first aid information.

5. FIRE FIGHTING MEASURES

• EXTINGUISHING MEDIA

Water spray Alcohol resistant foam Dry chemical Carbon dioxide

• FIRE FIGHTING INSTRUCTIONS

Use water spray. Use water spray to cool fire exposed tanks and containers. Acetone/water solutions that contain more than 2.5% acetone have flash points. When the acetone concentration is greater than 8% (by weight) in a closed container, it would be within the flammable range and cause fire or explosion if a source of ignition were introduced.

FLAMMABLE PROPERTIES

	Typical	Minimum	Maximum	Test Result	Units	Method
Flash Point	1.4				F	N/A
Autoignition Temperature	869				F	N/A

RU0000119403, ACETONE
02/14/02

2

Lower Explosion Limit	2.5			%	N/A
Upper Explosion Limit	12.8			%	N/A

6. ACCIDENTAL RELEASE MEASURES

Prevent ignition, stop leak and ventilate the area. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Use appropriate personal protective equipment as stated in Section 8 of this MSDS. Advise the Environmental Protection Agency (EPA) and appropriate state agencies, if required. US regulations require reporting spills of this material that could reach any surface waters. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. After removal, flush contaminated area thoroughly with water.

7. HANDLING AND STORAGE

HANDLING

Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid breathing (dust, vapor, mist, gas). Avoid contact with this material. Wash thoroughly after handling. Do not use air pressure to unload containers.

STORAGE

Keep away from heat, sparks, and flame. Store in a cool dry place. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Consult With a Health and Safety Professional for Specific Selections

ENGINEERING CONTROLS

Use with adequate ventilation. Ventilation is normally required when handling or using this product to keep exposure to airborne contaminants below the exposure limit. Use explosion-proof ventilation equipment.

PERSONAL PROTECTION

EYE PROTECTION

Splash proof chemical goggles or full face shield recommended to protect against splash of product.

GLOVES or HAND PROTECTION

The glove(s) listed below may provide protection against permeation. Gloves of other chemically resistant materials may not provide adequate protection. Protective gloves are recommended to protect against contact with product. Neoprene; Natural rubber;

RESPIRATORY PROTECTION

Concentration in air determines the level of respiratory protection needed. Use only NIOSH certified respiratory equipment. Half-mask air purifying respirator with organic vapor cartridges is acceptable for exposures to ten (10) times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable for exposures to fifty (50) times the exposure limit. Exposure should not exceed the cartridge limit of 1000 ppm. Protection by air purifying respirators is limited. Use a positive pressure-demand full-face supplied air respirator or SCBA for exposures greater than fifty (50) times the exposure limit. If exposure is above the IDLH (Immediately Dangerous to Life and Health) or there is the possibility of an uncontrolled release, or exposure levels are unknown, then use a positive pressure-demand full-face supplied air respirator with escape bottle or SCBA. Wear a NIOSH-approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

OTHER

The following materials are acceptable for use as protective clothing: Neoprene; Natural rubber; Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Remove contaminated clothing and wash before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Property	Typical	Units	Test Result	Reference
Appearance		N/A	Colorless liq	

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02/14/02

3

Boiling Point	133	F		
Bulk Density		lb/gal	No data	
Melting Point	-137.2	F		
Molecular Weight	58.08	g/mole		
Octanol/Water Coefficient		N/A	No data	
pH	7	N/A		
Specific Gravity	0.79	N/A		
Solubility In Water		wt %	Complete	
Odor		N/A	Sweet pungent	
Odor Threshold	62	ppm		
Vapor Pressure	181	mmHg	@ 20 C	
Viscosity (F)		SUS	No data	
Viscosity (C)		CsT	No data	
% Volatile	100	wt %		

10. STABILITY AND REACTIVITY

• STABILITY

Stable

• CONDITIONS TO AVOID

Avoid heat, sparks and open flame.

• INCOMPATIBILITY

Acetone may form explosive mixtures with chromic anhydride, chromyl alcohol, hexachloromelamine, hydrogen peroxide, permonosulfuric acid, potassium tertbutoxide, and thioglycol. Strong oxidizers

• HAZARDOUS DECOMPOSITION PRODUCTS

Combustion may produce carbon monoxide, carbon dioxide and other asphyxiants.

• HAZARDOUS POLYMERIZATION

Will not polymerize.

11. ECOLOGICAL INFORMATION

This product is not expected to persist in the environment.

12. DISPOSAL CONSIDERATIONS

Follow federal, state and local regulations. In Canada, follow federal, provincial and local regulations. This material is a RCRA hazardous waste. Do not flush material to drain or storm sewer. Contract to authorized disposal service.

13. TRANSPORT INFORMATION

Governing Body	Mode	Proper Shipping Name		
DOT	Ground	Acetone		
Governing Body	Mode	Hazard Class	UN/NA No.	Label
DOT	Ground	3 (Flammable liquid)	UN1090	

14. REGULATORY INFORMATION

Regulatory List	Component	CAS No.
ACGIH 2000 - Short Term Exposure Limits	ACETONE	67-64-1

RD0000119400, ACETONE
02/14/02

ACGIH 2000 - Time Weighted Averages	ACETONE	67-64-1
Canada - WHMIS: Ingredient Disclosure	ACETONE	67-64-1
CERCLA/SARA - Haz Substances and their RQs	ACETONE	67-64-1
Inventory - Canada - Domestic Substances List	ACETONE	67-64-1
Inventory - European EINECS Inventory	ACETONE	67-64-1
Inventory - Japan - (ENCS)	ACETONE	67-64-1
Inventory - Korea - Existing and Evaluated	ACETONE	67-64-1
Inventory - TSCA - Sect. 8(b) Inventory	ACETONE	67-64-1
Massachusetts Right To Know List	ACETONE	67-64-1
New Jersey - Department of Health RTK List	ACETONE	67-64-1
New Jersey - Special Hazardous Substances	ACETONE	67-64-1
OSHA - Final PELs - Time Weighted Averages	ACETONE	67-64-1
Pennsylvania Right to Know List	ACETONE	67-64-1
TSCA - Sect. 12(b) - Export Notification	ACETONE	67-64-1

Title III Classifications Sections 311,312:

- Acute: **YES**
- Chronic: **NO**
- Fire: **YES**
- Reactivity: **NO**
- Sudden Release of Pressure: **NO**

15. OTHER INFORMATION

Empty containers retain product residue (liquid and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner or properly disposed of. This product is subject to the Chemical Diversion and Trafficking Act of 1988 and subject to specific record keeping requirements. WHMIS Classification: Class B Division 2 - Flammable Liquids;

M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**** DRAFT COPY -- FOR EVALUATION USE ONLY ****

PRODUCT NAME : L-7752 CLEANER
 IDENTIFICATION NUMBER: SFCL07752
 PRODUCT USE/CLASS :
 DATE PRINTED: 09/18/03

SUPPLIER:
 Camie-Campbell
 9225 Watson Industrial Park
 St. Louis, MO 63126

MANUFACTURER:
 Camie-Campbell
 9225 Watson Industrial Park
 St. Louis, MO 63126

EMERGENCY TELEPHONE: 800-424-9300
 24 HOUR EMERGENCY PHONE

EMERGENCY TELEPHONE: 800-424-9300
 24 HOUR EMERGENCY PHONE

PREPARER: JLM, PHONE: 314/966-3222, PREPARE DATE: 09/18/03
 REPLACES DATE: 09/18/03

09/18/03

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	ACETONE	67-64-1	40.0 %
02	PROPANE	74-98-6	25.0 %

EXPOSURE LIMITS						
ITEM	ACGIH		OSHA		COMPANY	SKIN
	TLV-TWA	TLV-STEL	PEL-TWA	PEL-CEILING	TLV-TWA	
01	500 ppm	750 ppm	1000 ppm	N.E.	N.E.	NO
02	2500 PPM	N.E.	1000 ppm	N.E.	N.E.	NO

(See Section 16 for abbreviation legend)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: Keep from reach of children. Do not puncture, incinerate, or place aerosol product containers in compactors. Containers of this material may be hazardous when emptied since containers retain product residues (vapor, liquid, and/or solid). All hazardprecautions given must be observed. Do not flame cut, braze or use welding torch. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Can cause severe irritation, redness, tearing, blurred vision.

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Prolonged or repeated contact can cause moderate irritation defatting, dermatitis.

EFFECTS OF OVEREXPOSURE - INHALATION: Excessive inhalation of vapors can cause nasal and respiratory irritation, dizziness, weakness, fatigue, nausea, headache, possible unconsciousness, and even asphyxiation.

EFFECTS OF OVEREXPOSURE - INGESTION: No Information.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: Overexposure to this material (or its components) has apparently been found to cause the following effects in laboratory animals: kidney damage, eye damage, liver damage.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT SKIN ABSORPTION INHALATION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Flush with large amounts of water, lifting upper and lower lids occasionally, get medical attention.

FIRST AID - SKIN CONTACT: Thoroughly wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before re-use. Get medical attention if irritation persists.

FIRST AID - INHALATION: Remove individual to fresh air. If breathing is difficult, administer oxygen. Give artificial respiration if breathing has stopped. Keep person warm and quiet. Get medical attention.

FIRST AID - INGESTION: Do not induce vomiting. Give two glasses of water if conscious. Never give anything by mouth to an unconscious person. Get immediate medical attention.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -156 F
(PENSKEY-MARTENS C.C.)

LOWER EXPLOSIVE LIMIT: 2.2 %
UPPER EXPLOSIVE LIMIT: 12.8 %

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: CO2 DRY CHEMICAL FOAM WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and travel along the ground or may be moved by ventilation and ignited by ignition sources at locations distant from material handling point. For aerosol products - exposure to temperatures over 130F may cause containers to burst releasing highly flammable gas. As with all unsaturated fats and oils, some porous materials such as rags, paper, insulation, or organic clay when wetted with this product may undergo spontaneous combustion. Keep such wetted materials well ventilated to prevent possible heat buildup.

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

SPECIAL FIREFIGHTING PROCEDURES: Wear self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode when fighting fires. Keep fire exposed containers cool with water fog.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate sources of ignition & ventilate area. Persons not properly equipped should be excluded from area. Stop spill at source - prevent spreading. Avoid inhalation of vapors. Avoid skin contact with liquid. Soak up on absorbent material and place into proper container for disposal. Use non-sparking scoops for flammable materials. Clean walking surfaces thoroughly to reduce slipping hazard.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Containers of this material may be hazardous when emptied, since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch on containers. Intentional misuse by deliberately concentrating and inhaling the vapors from this product may be harmful or fatal.

STORAGE: Do not store above 120F. Do not store in direct sunlight. Keep away from heat sources, open flame, pilot lights, sparks, and other sources of ignition. Do not store above 120F. Do not store in direct sunlight.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide sufficient mechanical ventilation (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

RESPIRATORY PROTECTION: If work place exposure limits of product or any component is exceeded, use a NIOSH/MSHA approved respirator. Consult your safety equipment supplier for recommendations.

SKIN PROTECTION: Wear impervious gloves if method of use involves skin contact with product. Consult your safety supply vendor for glove recommendations.

EYE PROTECTION: Wear safety glasses at minimum, more extensive protection may be necessary depending on how the product is to be used.

OTHER PROTECTIVE EQUIPMENT: Wear impervious clothing if bodily exposure is anticipated. Consult your safety supply vendor for recommendations.

HYGIENIC PRACTICES: Wash hands before eating or smoking. Smoke in

(Continued on Page 4)

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

designated areas only. Remove and launder clothing if contaminated.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -44 - 634 F	VAPOR DENSITY	: Is heavier than air
ODOR	: MINT WHEN WET	ODOR THRESHOLD	: N.D.
APPEARANCE	: CLEAR LIQUID	EVAPORATION RATE	: Is faster than Butyl Acetate
SOLUBILITY IN H2O	: PARTIALLY SOLUBLE	SPECIFIC GRAVITY	: 0.7253
FREEZE POINT	: N.D.	pH @ 0.0 %	: N.D.
VAPOR PRESSURE	: N.D.	VISCOSITY	: N.D.
PHYSICAL STATE	: LIQUID		
COEFFICIENT OF WATER/OIL DISTRIBUTION	: N.D.		

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, sparks, welding arcs, open flame, pilot lights, static electricity or other source of ignition.

INCOMPATIBILITY: acids, strong oxidizers,

HAZARDOUS DECOMPOSITION PRODUCTS: carbon monoxide and carbon dioxide, various hydrocarbons,

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

No product or component toxicological information is available.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal regulations.

(Continued on Page 5)

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Aerosols

DOT TECHNICAL NAME:

DOT HAZARD CLASS: 2.1

HAZARD SUBCLASS: NONE

DOT UN/NA NUMBER: UN1950

PACKING GROUP: NONE

RESP. GUIDE PAGE: 126

ADDITIONAL INFORMATION:: For domestic ground and air shipment this product may be shipped as a Consumer Commodity ORM-D. Outer cartons must have the ORM-D or ORM-D AIR designation. (our original cartons are preprinted with the ORM-D designation for ground shipment)

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD FIRE HAZARD PRESSURIZED GAS HAZARD

SARA SECTION 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

----- CHEMICAL NAME ----- CAS NUMBER WT/WT % IS LESS THAN
No SARA Section 313 components exist in this product.

TOXIC SUBSTANCES CONTROL ACT:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

----- CHEMICAL NAME ----- CAS NUMBER
No information is available.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

: On June 30, 1993 the OSHA Z-1-A table was revoked and OSHA reverted back to their prior exposure limits. The values on this MSDS reflect the roll

(Continued on Page 6)

SECTION 15 - REGULATORY INFORMATION

back to the prior values. Some states may continue to enforce the 1993 limits. On June 16, 1995 EPA announced in a final rule that acetone would no longer be considered a VOC for air attainment standards. (it is now an exempt compound) The VOC calculations on this MSDS are based on acetone being an exempt compound. The June 16 rule also removed acetone from the list of SARA 313 reportable chemicals.

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2 FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 09/18/03

REASON FOR REVISION: NEW FORMULA

VOC CONTENT: 22.3 % BY WEIGHT, 163 GRAMS/LITER TOTAL PRODUCT,
529 GRAMS/LITER LESS WATER AND EXEMPT, 0.20 LBS/CAN

LEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

The information contained on this MSDS is been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations. The environmental information and hazardous materials identification system have been included by Camie-Campbell Inc. in order to provide additional health and hazard classification information. The ratings recommend are based upon the criteria supplied by the developers of these rating systems, together with Camie-Campbell Inc.'s interpretation of the available data. Proper personal protective equipment varies widely with conditions of use and anticipated exposure. We recommend that a supervisor or other qualified person determine proper PPE for intended use.

<END OF MSDS>

M A T E R I A L S A F E T Y D A T A S H E E T

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**** DRAFT COPY -- FOR EVALUATION USE ONLY ****

PRODUCT NAME : L-7750 CLEANER
 IDENTIFICATION NUMBER: SFCL07750
 PRODUCT USE/CLASS :
 DATE PRINTED: 09/18/03

SUPPLIER: Camie-Campbell 9225 Watson Industrial Park St. Louis, MO 63126	MANUFACTURER: Camie-Campbell 9225 Watson Industrial Park St. Louis, MO 63126
EMERGENCY TELEPHONE: 800-424-9300 24 HOUR EMERGENCY PHONE	EMERGENCY TELEPHONE: 800-424-9300 24 HOUR EMERGENCY PHONE

PREPARED BY: JLM, PHONE: 314/968-3222, PREPARE DATE: 09/18/03
 REPLACES DATE: 09/18/03

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	ACETONE	67-64-1	80.0 %
02	PROPANE	74-98-6	25.0 %

EXPOSURE LIMITS						
ITEM	TLV-TWA	TLV-STEL	PEL-TWA	PEL-CEILING	COMPANY TLV-TWA	SKIN
01	500 ppm	750 ppm	1000 ppm	N.E.	N.E.	NO
02	2500 PPM	N.E.	1000 ppm	N.E.	N.E.	NO

(See Section 16 for abbreviation legend)

SECTION 3 - HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***: Keep from reach of children. Do not puncture, incinerate, or place aerosol product containers in compactors. Containers of this material may be hazardous when emptied since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch. Intentional misuse by deliberately concentrating and inhaling this product may be harmful or fatal.

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Can cause severe irritation, redness, tearing, blurred vision.

(Continued on Page 2)

SECTION 3 - HAZARDS IDENTIFICATION

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Prolonged or repeated contact can cause moderate irritation defatting, dermatitis.

EFFECTS OF OVEREXPOSURE - INHALATION: Excessive inhalation of vapors can cause nasal and respiratory irritation, dizziness, weakness, fatigue, nausea, headache, possible unconsciousness, and even asphyxiation.

EFFECTS OF OVEREXPOSURE - INGESTION: No Information.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: Overexposure to this material (or its components) has apparently been found to cause the following effects in laboratory animals: kidney damage, eye damage, liver damage.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT SKIN ABSORPTION INHALATION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID - EYE CONTACT: Flush with large amounts of water, lifting upper and lower lids occasionally, get medical attention.

FIRST AID - SKIN CONTACT: Thoroughly wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before re-use. Get medical attention if irritation persists.

FIRST AID - INHALATION: Remove individual to fresh air. If breathing is difficult, administer oxygen. Give artificial respiration if breathing has stopped. Keep person warm and quiet. Get medical attention.

FIRST AID - INGESTION: Do not induce vomiting. Give two glasses of water if conscious. Never give anything by mouth to an unconscious person. Get immediate medical attention.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -156 F
(PENSKEY-MARTENS C.C.)

LOWER EXPLOSIVE LIMIT: 2.2 %
UPPER EXPLOSIVE LIMIT: 12.8 %

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: CO2 DRY CHEMICAL FOAM WATER FOG

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and travel along the ground or may be moved by ventilation and ignited by ignition sources at locations distant from material handling point. For aerosol products - exposure to temperatures over 130F may cause containers to burst releasing highly flammable gas.

SPECIAL FIREFIGHTING PROCEDURES: Wear self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive

(Continued on Page 3)

SECTION 5 - FIRE FIGHTING MEASURES

pressure mode when fighting fires. Keep fire exposed containers cool with water fog.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate sources of ignition & ventilate area. Persons not properly equipped should be excluded from area. Stop spill at source - prevent spreading. Avoid inhalation of vapors. Avoid skin contact with liquid. Soak up on absorbent material and place into proper container for disposal. Use non-sparking scoops for flammable materials. Clean walking surfaces thoroughly to reduce slipping hazard.

SECTION 7 - HANDLING AND STORAGE

HANDLING: Containers of this material may be hazardous when emptied, since containers retain product residues (vapor, liquid, and/or solid). All hazard precautions given must be observed. Do not flame cut, braze or use welding torch on containers. Intentional misuse by deliberately concentrating and inhaling the vapors from this product may be harmful or fatal.

STORAGE: Do not store above 120F. Do not store in direct sunlight. Keep away from heat sources, open flame, pilot lights, sparks, and other sources of ignition. Do not store above 120F. Do not store in direct sunlight.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide sufficient mechanical ventilation (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

RESPIRATORY PROTECTION: If work place exposure limits of product or any component is exceeded, use a NIOSH/MSHA approved respirator. Consult your safety equipment supplier for recommendations.

SKIN PROTECTION: Wear impervious gloves if method of use involves skin contact with product. Consult your safety supply vendor for glove recommendations.

EYE PROTECTION: Wear safety glasses at minimum, more extensive protection may be necessary depending on how the product is to be used.

OTHER PROTECTIVE EQUIPMENT: Wear impervious clothing if bodily exposure is anticipated. Consult your safety supply vendor for recommendations.

HYGIENIC PRACTICES: Wash hands before eating or smoking. Smoke in designated areas only. Remove and launder clothing if contaminated.

(Continued on Page 4)

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: -44 - 133 F	VAPOR DENSITY	: Is heavier than air
ODOR	: MINT WHEN WET	ODOR THRESHOLD	: N.D.
APPEARANCE	: CLEAR LIQUID	EVAPORATION RATE	: Is faster than Butyl Acetate
SOLUBILITY IN H2O	: MOSTLY SOLUBLE	SPECIFIC GRAVITY	: 0.7253
FREEZE POINT	: N.D.	pH @ 0.0 %	: N.D.
VAPOR PRESSURE	: N.D.	VISCOSITY	: N.D.
PHYSICAL STATE	: LIQUID		
COEFFICIENT OF WATER/OIL DISTRIBUTION	: N.D.		

(See Section 16 for abbreviation legend)

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, sparks, welding arcs, open flame, pilot lights, static electricity or other source of ignition.

INCOMPATIBILITY: acids, strong oxidizers,

HAZARDOUS DECOMPOSITION PRODUCTS: carbon monoxide and carbon dioxide, various hydrocarbons,

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

No product or component toxicological information is available.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal regulations.

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Aerosols

DOT TECHNICAL NAME:

DOT HAZARD CLASS: 2.1

HAZARD SUBCLASS: NONE

(Continued on Page 5)

SECTION 14 - TRANSPORTATION INFORMATION

DOT UN/NA NUMBER: UN1950 PACKING GROUP: NONE RESP. GUIDE PAGE: 126

ADDITIONAL INFORMATION: For domestic ground and air shipment this product may be shipped as a Consumer Commodity ORM-D. Outer cartons must have the ORM-D or ORM-D AIR designation. (our original cartons are preprinted with the ORM-D designation for ground shipment)

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

CERCLA - SARA HAZARD CATEGORY:

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD FIRE HAZARD PRESSURIZED GAS HAZARD

SARA SECTION 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	WT/WT % IS LESS THAN
No SARA Section 313 components exist in this product.		

TOXIC SUBSTANCES CONTROL ACT:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

CHEMICAL NAME	CAS NUMBER
No information is available.	

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

: On June 30, 1993 the OSHA Z-1-A table was revoked and OSHA reverted back to their prior exposure limits. The values on this MSDS reflect the roll back to the prior values. Some states may continue to enforce the 1993 limits. On June 16, 1995 EPA announced in a final rule that acetone would no longer be considered a VOC for air attainment standards. (it is now an exempt compound) The VOC calculations on this MSDS are based on acetone being an exempt compound. The June 16 rule also removed acetone from the list of SARA 313 reportable chemicals.

(Continued on Page 6)

SECTION 16 - OTHER INFORMATION

HMIS RATINGS - HEALTH: 2 FLAMMABILITY: 4 REACTIVITY: 0

PREVIOUS MSDS REVISION DATE: 09/18/03

REASON FOR REVISION: NEW FORMULA

VOC CONTENT: 20.1 % BY WEIGHT, 142 GRAMS/LITER TOTAL PRODUCT,
507 GRAMS/LITER LESS WATER AND EXEMPT, 0.18 LBS/CANLEGEND: N.A. - Not Applicable, N.E. - Not Established,
N.D. - Not Determined

:

The information contained on this MSDS is been checked and should be accurate. However, it is the responsibility of the user to comply with all Federal, State, and Local laws and regulations. The environmental information and hazardous materials identification system have been included by Camie-Campbell Inc. in order to provide additional health and hazard classification information. The ratings recommend are based upon the criteria supplied by the developers of these rating systems, together with Camie-Campbell Inc.'s interpretation of the available data. Proper personal protective equipment varies widely with conditions of use and anticipated exposure. We recommend that a supervisor or other qualified person determine proper PPE for intended use.

<END OF MSDS>

Appendix G
MSDSs for Baseline Cleaners for Toxicity Comparison

MSDS - Material Safety Data Sheet**Product Name: ENGINE BRITE HEAVY DUTY ENGINE DEGREASER**

MSDS No.: ERI

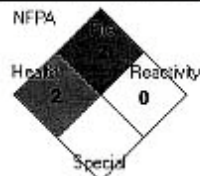
I. Basic Information:

Manufacturer: RADIATOR SPECIALTY COMPANY
 Address: P.O. BOX 159, 600 RADIATOR ROAD
 City, ST Zip: INDIAN TRAIL, NC 28079
 Emergency Contact: Rocky Mountain Poison Control Center
 Emergency Telephone Number: 303-623-5716
 Contact: Robert Geer

Information Telephone Number: 704-586-3430

Last Update: 02/19/2003

Chemical State: ☒ Liquid ☐ Gas ☐ Solid
 Chemical Type: ☐ Pure ☒ Mixture



2	Health
0	Reactivity
B	Pers. Protection

II. Ingredients:☐ Trade Secret

CAS No.	Chemical Name	% Range	EHS		IARC		SARA 313 SUB Z	OSHA PEL	ACGIH TLV	Other Limits
			NTP							
111762	2-Butoxyethanol	1-2					X	25 ppm	25 ppm	
78330128	Alkyl Aryl Sulfonate	<1								5 mg/m
124389	Carbon dioxide	1-3							5000 ppm	
9016459	Ethoxylated Nonyl Phenol	3-5						N/D	N/D	
68476346	Petroleum distillate, Aliphatic	80-88							100 ppm	
64742945	Petroleum naphtha	6-9					X	Not Establi	100 ppm	100 pp

III. Hazardous Identification:

Hazard Category:

☒ Acute ☐ Chronic ☒ Fire ☒ Pressure ☐ Reactive

Hazardous Identification Information:

Flammable. Harmful or Fatal if Swallowed. Eye and Skin Irritant. Contents Under Pressure.

Level 3 Aerosol

IV. First Aid Measures:

Route(s) of Entry:

Absorption, Eye, Inhalation, and Ingestion.

Health Hazards (Acute and Chronic):

Signs and Symptoms:

Eye Contact: Irritant. Prolonged contact may cause conjunctivitis.

Skin Contact: Irritant. Defatting of tissue, dermatitis may occur.

Inhalation: Irritant to mucous membranes. Repeated exposure may cause narcosis.

Ingestion: HARMFUL OR FATAL IF SWALLOWED.

MSDS - Material Safety Data Sheet**Product Name: ENGINE BRITE HEAVY DUTY ENGINE DEGREASER****MSDS No.: EBI****Medical Conditions Generally Aggravated by Exposure:****Emergency and First Aid Procedures:**

Eye Contact: Flush eyes with clean water for 15 minutes while lifting eyelids. Get prompt medical attention.
Skin Contact: Wash with soap and water thoroughly. If adverse effects persist, get prompt medical attention. Launder contaminated clothing before reuse.
Inhalation: Remove to fresh air. If breathing becomes difficult give oxygen and get prompt medical attention. If breathing stops, give artificial respiration and get prompt medical attention.
Ingestion: DO NOT INDUCE VOMITING! Call Poison Control Center, physician, or hospital emergency room immediately.
Aspiration of vomitus into the lungs can cause pneumonitis, which can be fatal.

Other Health Warnings:

Vomiting and subsequent aspiration into the lungs may lead to chemical pneumonia and pulmonary edema which is a potentially fatal condition.

V. Fire Fighting Measures:**Flash Point:** 165°F**Lower Explosive Limit:** NE**Upper Explosive Limit:** NE**F.P. Method:** TOC**Fire Extinguishing Media:** Water Fog, Foam, Carbon Dioxide, Dry Chemical**Special Fire Fighting Procedures:**

Wear self-contained positive pressure breathing apparatus and protective clothes. Cool containers with a water fog. Do not use forced water stream as this could cause the fire to spread. Use shield to protect from rupturing and venting containers.

Unusual Fire and Explosion:

At elevated temperatures containers may vent, rupture or burst, even violently

VI. Accidental Release Measures:**Steps to be Taken in Case Material is Released or Spilled:**

Eliminate all ignition sources. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Dike or contain spill and absorb with inert materials (sand, sawdust, absorbent sweeping compounds, rags, etc). Using a non-metallic scoop, place contaminated material into an approved chemical waste container. Where possible, vacuum spilled liquid using an explosion proof vacuum to recover material. Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify proper authorities as required that a spill has occurred.

VII. Handling and Storage:**Precautions to be Taken:**

Handling: Use with adequate ventilation and proper protective equipment.
Do not use near fire, sparks, or flame. Do not puncture or incinerate container.
Store in cool, well ventilated area below 120°F away from heat sources.

Other Precautions:

Avoid contact with eyes. Avoid prolonged or repeated breathing of vapors. If exposure may or does exceed occupational exposure limits, use a NIOSH approved respirator to prevent over-exposure.

MSDS - Material Safety Data Sheet**Product Name: ENGINE BRITE HEAVY DUTY ENGINE DEGREASER**

MSDS No.: EBI

VIII. Exposure Controls/Personal Protection:**Ventilation Requirements:**

See Section 2 for applicable exposure limits. Use with adequate ventilation. If TLV is exceeded, wear NIOSH approved respirator.

Personal Protective Equipment:

See Section 2 for applicable exposure limits. For prolonged exposure wear protective safety glasses, gloves, and apron.

IX. Physical and Chemical Properties:**Boiling Point:** 305°F**Melting Point:** N/A**Evaporation Rate (Butyl Acetate = 1):** N/D**Vapor Pressure (mm Hg.):** N/D**Specific Gravity (H₂O = 1):** 0.68000**Vapor Density (AIR = 1):** 1.2**Solubility in Water:** Emulsifies**Appearance and Odor:** Amber liquid with petroleum odor**Other Information:****X. Stability and Reactivity:****Stability:**

Stable

Incompatibility (Materials to Avoid):

Strong oxidizing agents.

Decomposition/By Products:

High temperatures and ignition sources produce products of combustion: carbon monoxide, sulfur-like smoke.

Hazardous Polymerization:

Will not occur.

XI. Toxicological Information:

N/D

XII. Ecological Information:

N/D

XIII. Disposal Considerations:

DISPOSAL: This container may be recycled in aerosol recycling centers when empty. Before offering for recycling, empty the can by using the product according to the label. DO NOT PUNCTURE! If recycling is not available, wrap the container and discard in the trash. Dispose of unused product in accordance with all local, state government and federal laws and regulations.

XIV. Transport Information:**DOT Hazard Class:** ORM-D**Shipping Name:** Consumer Commodity

MSDS - Material Safety Data Sheet**Product Name: ENGINE BRITE HEAVY DUTY ENGINE DEGREASER****MSDS No.: EB1****XV. Regulatory Information:**

See Section 2 for SARA Reportable Chemicals.

USA TSCA: All components of this material are listed on the US TSCA Inventory.

Warning: This product contains a chemical(s) known to the State of California to cause cancer or birth defects or other reproductive harm.

XVI. Other Information:Do not used in confined areas without proper ventilation. Contact lenses may cause further damage in case of splash into eye.
KEEP AWAY FROM CHILDREN AND ANIMALS!

N/E: Not Established

N/D: Not Determined

N/A: Not Applicable

N/AV: Not Available

While Radiator Specialty Company believes this data is accurate as of the revision date, we make no warranty with respect to the data and we expressly disclaim all liability for reliance thereon. The data is offered solely for information, investigation, and verification. Various government agencies may have specific regulations regarding the transportation, handling, storage, use, or disposal of this product which may not be covered by this MSDS. The user is responsible for full compliance.

MATERIAL SAFETY DATA SHEET

24 HOUR EMERGENCY NUMBER: CHEMTREC 1-800-424-9300
MOC PRODUCTS CO., INC. INFORMATION 1-818-895-2258

PRODUCT NAME: THROTTLE-BODY & AIR-INTAKE CLM

MSDS CODE: 1032
NFPA CODES: H F R
3 4 0

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: MOC PRODUCTS CO., INC.
ADDRESS: 12306 MONTAGUE STREET
PACIFICA, CA 91331

DATE PRINTED: 02/09/04 DATE REVISED: 02/05/2004
NAME OF PREPARER: YULIN GU

SECTION II - HAZARDOUS INGREDIENTS/SARA III INFORMATION

REPORTABLE COMPONENTS PEL/OSHA	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP	WEIGHT PERCENT
ACETONE 750 PPM	57-64-1		40-50
p-TOLUENE 100 PPM	108-88-3		40-50
m-METHYL ALCOHOL 200 PPM - SKIN	67-56-1		1-5

* Indicates toxic chemical(s) subject to the reporting requirements of section 313 of Title III and of 40 CFR 372

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT: <100 F
VAPOR DENSITY: HEAVIER THAN AIR
SOLUBILITY IN WATER: NOT SOLUBLE IN WATER
APPEARANCE: CLEAR
SPECIFIC GRAVITY (H2O=1): 0.83
EVAPORATION RATE: SLOWER THAN ETHER
ODOR: SOLVENT

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: <40 F
FLAMMABLE LIMITS IN AIR BY VOLUME: LOWER: NO DATA
EXTINGUISHING MEDIA: USE REGULAR FOAM, DRY CHEMICAL, OR CO2.
SPECIAL FIREFIGHTING PROCEDURES:
EXTREMELY FLAMMABLE! KEEP AWAY FROM HEAT, SPARKS, OPEN FLAME AND ALL OTHER SOURCES OF IGNITION. USE WITH ADEQUATE VENTILATION.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL ALONG THE GROUND OR BE MOVED BY AIR CURRENTS AND IGNITED BY HEAT. PILOT FLAMES
OTHER FLAMES AND IGNITION SOURCES AT LOCATIONS DISTANT FROM MATERIAL HANDLING POINT

SECTION V - REACTIVITY DATA

STABILITY: STABLE
INCOMPATIBILITY (MATERIALS TO AVOID):
AVOID CONTACT WITH ACIDS AND STRONG OXIDIZERS
HAZARDOUS DECOMPOSITION OR BYPRODUCTS:
BURNING MAY PRODUCE OXIDES OF CARBON AND TRACE OF HYDROCARBONS.
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE: (ACUTE AND CHRONIC)
EYES - CAN CAUSE IRRITATION
SKIN - PROLONGED OR REPEATED CONTACT CAN CAUSE MODERATE IRRITATION, DEFATTING AND DERMATITIS
INGESTION - CAN CAUSE GASTRO-INTESTINAL, NAUSEA, VOMITING, AND DIARRHEA.

CARCINOGENICITY: MTP CARCINOGEN: No
IARC MONOGRAPHS: No
OSHA REGULATED: Yes
N/A

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:
PREEXISTING SKIN, EYE, AND RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO PRODUCT

EMERGENCY AND FIRST AID PROCEDURES:

Page 1

MATERIAL SAFETY DATA SHEET

SKIN - IMMEDIATELY FLUSH SKIN WITH PLENTY OF RUNNING WATER FOR AT LEAST 30 MINUTES. REMOVE CONTAMINATED CLOTHING AND FOOTWEAR. WASH BEFORE REUSE.

EYES - FLUSH IMMEDIATELY WITH LARGE AMOUNT OF WATER FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN

INHALATION - IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING STOPS, GET MEDICAL ATTENTION IMMEDIATELY.

PRIMARY ROUTES OF ENTRY: SKIN, INHALATION

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

ABSORB THE LARGE SPILL WITH PLENTY OF ABSORBENT MATERIAL. WASH THE RESIDUE DOWN THE DRAIN OR PIT WITH PLENTY OF WATER. USE PLENTY OF WATER ON SMALL SPILLS.

WASTE DISPOSAL METHOD:

DISPOSE OF ACCORDING TO LOCAL, STATE, AND FEDERAL REGULATIONS FOR YOUR AREA.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

STORE BETWEEN 40 AND 120 °F

PROTECT FROM PHYSICAL DAMAGE, AND KEEP TIGHTLY CLOSED.

OTHER PRECAUTIONS: N/A

SECTION VIII - PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION: AN APPROPRIATE APPROVED HYDROCARBON CANISTER FOR ORGANIC VAPOR SHOULD BE WORN IF EXPOSURE WILL BE PROLONGED.

VENTILATION: PROVIDE SUFFICIENT MECHANICAL VENTILATION.

PROTECTIVE GLOVES: WEAR CHEMICAL RESISTANT GLOVES SUCH AS NITRILE RUBBER, PVC, ETC.

EYE PROTECTION: WEAR SAFETY GLASSES

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: N/A

WORK/HYGIENE PRACTICES:

EYE WASH AND SAFETY SHOWER SHOULD BE EASILY ACCESSIBLE. PROVIDE ADEQUATE VENTILATION. AVOID CONTACT WITH EYES AND SKIN. AVOID INHALATION OF PRODUCT VAPORS. WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING, DRINKING OR SMOKING.

SECTION IX - STATE REGULATORY INFORMATION

CALIFORNIA PROPOSITION 65

THIS PRODUCT CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS, OR OTHER REPRODUCTIVE HARM:

TOLUENE (REPRODUCTIVE HARM); BENZENE (CANCER)

SECTION X - PRECAUTION AND OTHER COMMENTS

ATTENTION:

TO THE BEST OF OUR KNOWLEDGE, THE INFORMATION CONTAINED HEREIN IS ACCURATE. HOWEVER, MOC PRODUCTS DOES NOT ASSUME ANY LIABILITY WHATSOEVER FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER. ALL MATERIALS MAY PRESENT UNKNOWN HEALTH HAZARD & SHOULD BE USED WITH CAUTION. ANY PRODUCT USE, WHICH IS NOT IN CONFORMANCE WITH THIS DATA SHEET, OR WHICH INVOLVES USING THE PRODUCT IN COMBINATION WITH ANY OTHER PROCESS, IS THE SOLE RESPONSIBILITY OF THE USER.

END OF MSDS

PRODUCT NAME: THROTTLE-BODY & AIR-INTAKE CLN

MATERIAL SAFETY DATA SHEET

Section 1: Product & Company Identification

Product Name: Brakleen® Brake Parts Cleaner - Non-Chlorinated
Product Number (s): 05084, 05084-6

Manufactured By: CRC Industries, Inc. (215) 674-4300
885 Louis Drive, Warminster, PA 18974
24-Hour Emergency Information: CHEMTREC (800) 424-9300

Section 2: Composition/Information on Ingredients

Component	CAS NUMBER	ACGIH TLV	OSHA PEL	OTHER LIMITS	%
Toluene	108-88-3	100 ppm	100 ppm	NE	22-32
Methanol	67-56-1	200 ppm	200 ppm	NE	15-25
Acetone	67-64-1	750 ppm	750 ppm	NE	45-55
Carbon Dioxide	124-38-9	5000 ppm	10000 ppm	NE	< 10

Section 3: Hazards Identification

Emergency Overview

Appearance & Odor: Clear, water-white liquid.

Danger: Extremely Flammable. Vapor Harmful. Harmful or Fatal if Swallowed. May be fatal or cause blindness if swallowed. Eye and skin irritant. Contents Under Pressure.

Potential Health Effects:

Inhalation: Dizziness, breathing difficulties, anesthetic effects, nausea and irritation to respiratory tract.
Eyes: Irritation
Skin: Irritation, defatting
Ingestion: NA
Carcinogenicity: OSHA: No IARC: No NTP: No
Chronic Overexposure: Contact dermatitis. Chronic overexposure may cause nervous system damage.
Medical Conditions Aggravated by Exposure: Breathing problems.

Section 4: First Aid Measures

Inhalation: Remove to fresh air. Give artificial respiration if necessary.
Eyes: Flush with large amounts of water for 15 minutes.
Skin: Remove contaminated clothing and wash area with soap and water.
Ingestion: Call a physician. Do not induce vomiting.

Product Name: Brakleen® Brake Parts Cleaner - Non-Chlorinated**Product Number (s): 05084, 05084-6****Section 5: Fire-Fighting Measures**

Flashpoint:	< 0°F	Method:	TCC	LEL:	1.0	UEL:	13.0
Extinguishing Media:			CO ₂ , foam and fog				
Hazardous Combustion Products:			CO ₂ , carbon monoxide				
Fire-fighting Instructions:			Remove containers from fire area if possible. Use self-contained breathing apparatus for fire fighting. Aerosol cans may explode if heated above 120°F.				
NFPA:	Health:	2	Flammability:	3	Reactivity:	0	
HMIS:	Health:	2	Flammability:	3	Reactivity:	0	PPE: B

Section 6: Accidental Release Measures

Spill/Leak Procedures: Usually not a problem with aerosols. Area should be ventilated. Absorbent should be used to pick up excess material. All used and unused product should be disposed of in accordance with federal, state and local regulations.

Section 7: Handling and Storage

Handling Procedures: Store in a cool, dry area. Aerosol cans must be maintained below 120°F to prevent cans from exploding.

Aerosol Level: III

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Adequate to prevent accumulation of vapors. Use mechanical means if necessary to maintain levels below the exposure limits. If working in a confined space, follow applicable OSHA regulations.

Respiratory: Use NIOSH/MSHA compliant respirators or self-contained breathing apparatus above exposure limits. Follow OSHA regulations 29 CFR 1910.134.

Protective Clothing/Equipment: Wear chemically protective gloves and safety glasses. Use a splash apron and boots if splashing occurs.

Section 9: Physical & Chemical Properties

Physical State:	Liquid	Appearance & Odor:	Clear, water-white liquid
Specific Gravity:	0.815	Boiling Point:	131°F (initial)
Freezing Point:	ND	Vapor Pressure:	ND
Evaporation Rate:	fast	Vapor Density (air = 1)	ND
pH:	NA	Solubility:	Partially soluble in water. Soluble in most organic liquids.
Volatile Organic Compounds %:	45	g/L:	366
		lbs./gal:	3.0

Section 10: Stability and Reactivity

Stability:	Stable	Hazardous Polymerization:	No
Chemical Incompatibilities:	Strong oxidizers.		
Materials to Avoid:	Strong oxidizing agents and sources of ignition.		

Product Name: Brakleen® Brake Parts Cleaner - Non-Chlorinated

Product Number (s): 05084, 05084-6

Hazardous Decomposition Products: None

Section 11: Toxicological Information

Long-term toxicological studies have not been conducted for this product. See Section 3 of this MSDS for acute symptoms of overexposure and carcinogenicity information.

Section 12: Ecological Information

Ecotoxicity: No data available.

Environmental Fate: No data available for biodegradation.

Section 13: Disposal Considerations

Disposal: This material if discarded may be hazardous waste under U.S. EPA RCRA regulations. All disposal activities must comply with federal, state and local regulations. Contact your local or state environmental agency for specific rules. Do not dump into sewers, on the ground or into any body of water.

Section 14: Transportation Information

Shipping Name: Consumer Commodity

Hazard Class: ORM-D

UN Number: NA

Packing Group: NA

Label: NA

Placard: NA

Special Provisions: NA

Section 15: Regulatory Information

TSCA: All components are either listed under TSCA or are exempt.

SARA Title III: Section 311/312: Acute, Pressure

Section 313*: Toluene, Methanol

CERCLA/Superfund (RQ): Mixture

Extremely Hazardous Substances: No

California Prop 65: This product contains chemicals known to the State of California to cause cancer, birth defects and other reproductive harm.

* See section 2 for percentage

Section 16: Additional Information

Prepared By: Michelle Milburn

Date: December 2, 2003

Technical Information: (800) 521-3168

CRC #: 594N

This information is accurate to the best of CRC Industries' knowledge or obtained from sources believed by CRC to be accurate. Before using any product, read all warnings and directions on the label.

CAS: Chemical Abstract Service

NA: Not Applicable

ppm: Parts per Million

ND: Not Determined

TCC: Tag Closed Cup

NE: Not Established

LEL: Lower Explosive Limit

g/L: grams per Liter

UEL: Upper Explosive Limit

lbs./gal: pounds per gallon

PPE: Personal Protection Equipment

RQ: Reportable Quantity

COC: Cleveland Closed Cup