

Automotive Aerosol Cleaning Products: Low-VOC, Low Toxicity Alternatives

Prepared by:
Katy Wolf and Mike Morris
Institute for Research and Technical Assistance

Prepared for:
Cal/EPA's Department of Toxic Substances Control and
City of Santa Monica

November 2006

DISCLAIMER

This report was prepared as a result of work sponsored and paid for by the California Environmental Protection Agency's (Cal/EPA's) Department of Toxic Substances Control (DTSC) and the City of Santa Monica. The opinions, findings, conclusions and recommendations are those of the authors and do not necessarily represent the views of the sponsors. Mention of trade names, products or services does not convey and should not be interpreted as conveying Cal/EPA, DTSC or the City of Santa Monica approval, endorsement or recommendation. DTSC, the City of Santa Monica, their officers, employees, contractors and subcontractors make no warranty, expressed or implied, and assume no legal liability for the information in this report. The sponsors have not approved or disapproved this report nor have the sponsors passed upon the accuracy or adequacy of the information contained herein.

ACKNOWLEDGMENTS

The analysis in this report benefited considerably from the efforts of many persons within and outside the Institute for Research and Technical Assistance (IRTA). We would particularly like to acknowledge the valuable contributions made by Robert Ludwig from DTSC and Gary Welling from the City of Santa Monica. We are especially grateful to Dr. Julia Quint from the Department of Health Services Hazard Evaluation System & Information Service for her work in evaluating the toxicity of the materials. We would also like to give special thanks to Kyzen for packaging the alternative aerosol cleaners for testing. We are very thankful to the ten auto repair facilities that tested the safer alternatives. Finally, we are indebted to Amy Blume of IRTA for her assistance in preparing the document.

EXECUTIVE SUMMARY

The California Air Resources Board (CARB) estimates emissions of Volatile Organic Compounds (VOCs) from automotive cleaning products amounted to about 9.5 tons per day in 2003. Many of the chemicals used in these cleaners are also classified as Toxic Air Contaminants. The cleaners are used by auto repair shops, car washes, detailers and consumers for brake cleaning, general purpose degreasing, carburetor and fuel injection system cleaning and engine degreasing. CARB recently adopted a regulation to reduce the allowed VOC content limit of the cleaners from about 45% to 10%. This action would reduce VOC emissions by about seven tons per day and would reduce exposure of the workers and community members to toxic chemicals in California.

The Institute for Research and Technical Assistance (IRTA), a nonprofit organization, conducted a project sponsored by Cal/EPA's Department of Toxic Substances Control and the City of Santa Monica to identify, develop, test and demonstrate alternative low-VOC, safer alternatives for brake cleaning, general purpose degreasing and carburetor and fuel injection system cleaning in ten auto repair facilities. The facilities used the alternatives for an extended period and, in some cases, used them or converted to them permanently. During the project, IRTA built on earlier project results (CARB, 2004; HESIS, 2004) and also developed or demonstrated new alternatives. The alternatives that were tested are shown in Table E-1.

Table E-1
Low-VOC, Low Toxicity Alternatives Tested During the Project

Alternative	Description	Development Time-Frame
Acetone Cleaner #1	Acetone Based Aerosol for Brake Cleaning/General Purpose Degreasing	This Project
Acetone Cleaner #1	Acetone Based Aerosol for Brake Cleaning/General Purpose Degreasing	This Project
Soy/Acetone Cleaner	Soy/Acetone Aerosol for Carburetor and Fuel Injection System Cleaning	CARB/HESIS Project
Water-Based Cleaner	Water-Based Aerosol for Brake Cleanin/General Purpose Degreasing	CARB/HESIS Project
Acetone Cannister	Acetone Based Cleaners in a Portable Spray Cleaning System	This Project
Water-Based Cleaners	Water-Based Brake Cleaning Systems	CARB/HESIS Project
Spray Bottles	Water-Based Cleaners Used for All Cleaning Applications	This Project

IRTA developed the first two acetone based aerosol cleaners for this project. Acetone is not classified as a VOC and it is lower in toxicity than most other organic solvents. The soy/acetone cleaner was tested in two earlier projects; soy has very low VOC content and, like acetone, is low in toxicity. The water-based aerosol cleaner was successfully tested in two earlier projects. Vendors have developed cannister systems that rely on acetone formulations and these were tested during this project. Water-based brake cleaning systems with different water-based cleaners were tested during this project and were also tested in an earlier demonstration and conversion project. Spray bottles containing water-based cleaners were tested during this project. All of the aerosol alternatives tested during the project had a VOC content of 10% or less and all of the non-aerosol alternatives had a VOC content of 25 grams per liter or less.

The facilities participating in the project tested the alternative aerosol and brake cleaning system cleaners for at least a three month period and the cannister system for at least a one month period. IRTA conducted cost analysis and comparison of the alternative aerosol and non-aerosol technologies. The results indicate that use of the alternatives by auto repair facilities is lower or comparable in cost to the use of the high VOC solvent aerosol cleaners used today.

The results of the testing indicated that the alternative aerosol and non-aerosol technologies are acceptable as alternatives to the high VOC aerosol cleaners based on input from the test facilities and IRTA's analysis. The facilities were able to operate productively with these technologies for an extended period of time. This indicates that the lower VOC, lower toxicity alternatives can be used by the auto repair industry in California.

TABLE OF CONTENTS

Disclaimer	i
Acknowledgements.....	ii
Executive Summary	iii
Table of Contents	v
List of Figures	vii
List of Tables	viii
I. Introduction and Background	1
Previous Related Work	2
Project Alternatives Strategy	3
Structure of Document	3
II. Safer Alternative Aerosol and Non-Aerosol Technologies	4
Description of Cleaning Applications	6
General Purpose Degreasing.....	6
Brake Cleaning.....	6
Carburetor and Fuel Injection System Cleaning	10
Regulations that Affect Aerosol and Non-Aerosol Cleaning.....	11
Alternative Aerosol and Non-Aerosol Products.....	11
Alternative Aerosol Cleaners.....	12
Alternative Non-Aerosol Cleaners	13
Summary of Alternative Products	15
III. Field Testing Performance and Cost Analysis	16
Testing Description and Results	16
Evaluation of Alternative Systems	18
Cost Analysis and Comparison.....	20
Cannister System.....	20

Water-Based Brake Cleaning Equipment.....	21
Low-VOC Aerosol Cleaners.....	23
IV. Summary and Conclusions.....	26
V. References	28
Appendix A Material Safety Data Sheets and Product Sheets for Aerosol and Non-Aerosol Products.....	29

LIST OF FIGURES

Figure 2-1: Detailer Degreasing Engine.....	4
Figure 2-2: Detailer Applying Water-Based Cleaner with High Pressure Wand	5
Figure 2-3: Detailer Degreasing Undercarriage of Vehicle.....	5
Figure 2-4: Technician Performing General Purpose Degreasing.....	6
Figure 2-5: Vehicle with Drum Brakes	7
Figure 2-6: Closer View of Drum Brake Assembly	7
Figure 2-7: Telescoping Brake Cleaning System	8
Figure 2-8: Parts/Brake Cleaning System	9
Figure 2-9: Brake Cleaning System on Wheeled Stand	9
Figure 2-10: Carburetor Cleaned with Low-VOC Cleaners.....	10
Figure 2-11: Brake Cleaning System Tested by Dealership.....	14
Figure 2-12: Cannister System Tested at Dealerships	14
Figure 2-13: Cannister System with Hose Attached.....	15

LIST OF TABLES

Table E-1:	Low-VOC, Low Toxicity Alternatives Tested During the Project	iii
Table 1-1:	Emissions and VOC Limits for Automotive Consumer Products.....	1
Table 2-1:	Alternative Low-VOC Cleaning Methods	15
Table 3-1:	Products Tested in Each Facility	19
Table 3-2:	Annualized Cost Comparison for Aerosol Cleaners and Cannister System	21
Table 3-3:	Annualized Cost Comparison for Dealership for Brake Cleaning Systems	22
Table 3-4:	Annualized Cost Comparison for Auto Repair Shop for Brake Cleaning System	22
Table 3-5:	Raw Materials Costs for Aerosol Cleaners	23

I. INTRODUCTION AND BACKGROUND

The California Air Resources Board (CARB) estimates that about 4.5 million aerosol spray cans and spray bottles of automotive cleaning products are sold in California each year. In 2003, emissions of Volatile Organic Compounds (VOCs) from these products were estimated at about 9.5 tons per day. Historically, chlorinated solvents were extensively used in automotive aerosol cleaning products. In 2000, CARB 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.

When the ban on chlorinated solvents became effective, suppliers began formulating with VOC solvents, some of which are also classified as TACs. These include toluene, xylene, methyl ethyl ketone (MEK), methanol and hexane. CARB was concerned about the possible increase in VOC and toxic solvent emissions and the agency regulated the VOC content of the cleaners.

Table 1-1 summarizes the VOC emissions from four categories of automotive aerosol cleaning in 2003, the most recent year for which the data were collected. The emissions from each category of cleaning are presented in tons per day (tpd). The table also shows the VOC limits that became effective in 2004 and the future VOC limits for the categories. CARB recently adopted a regulation to reduce the VOC content for all categories of cleaning to 10%. This would result in a VOC reduction from automotive aerosol cleaning of 7.02 tpd (CARB, 2006).

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

Automotive Aerosol Cleaning Category	VOC Emissions (tpd) 2003	VOC Limits (Wt.%)		
		12/31/2004	12/31/2008	12/31/2010
Brake Cleaners	4.84	45	-	10
Carburetor or Fuel-Injection Intake Cleaners	2.61	45	-	10
Engine Degreasers	1.05	35	10	-
General Purpose Degreasers	0.98	50	-	10
Total	9.48			

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 Institute for Research and Technical Assistance (IRTA) is a nonprofit organization established in 1989. IRTA assists companies and whole industries in adopting safer alternatives in a variety of applications including cleaning, dry cleaning, paint stripping, adhesives and coatings. IRTA runs and operates the Pollution Prevention Center, a loose affiliation of a large electric utility and several federal, state and local government agencies that are concerned with air, wastewater, hazardous waste and worker exposure. Cal/EPA's Department of Toxic Substances Control (DTSC) and the City of Santa Monica contracted with IRTA to identify, develop, test and demonstrate alternative low-VOC, low toxicity aerosol automotive cleaning products and non-aerosol cleaners with auto repair facilities. The project involved converting the facilities to the safer alternatives for a three month period to determine if they would be acceptable alternatives.

PREVIOUS RELATED WORK

Over the last decade or so, IRTA conducted four projects that are related to the current project. First, U.S. EPA sponsored a project to identify, develop and test water-based cleaners as alternatives to solvent cleaners in auto repair facilities (EPA, 1997). The South Coast Air Quality Management District (SCAQMD) later regulated the VOC content of these cleaners and the action resulted in a reduction in VOC emissions from the category of about 18 tons per day.

Second, U.S. EPA sponsored a project to identify, evaluate and implement water-based cleaning alternatives for brake cleaning (EPA, 1999). The project involved converting seven facilities to water-based cleaning equipment and formulations that were shown to be effective and lower in cost than solvent aerosol products.

Third, CARB sponsored a project designed to identify, develop, test and demonstrate alternative low-VOC aerosol automotive cleaners for brake cleaning, carburetor and fuel injection system cleaning, engine degreasing and general purpose degreasing (CARB, 2004). Fourth, the California Department of Health Services Hazard Evaluation System & Information Service (HESIS) sponsored a project with the same aim to reduce worker exposure to toxic solvents in auto repair facilities (HESIS, 2004). IRTA worked with auto repair facilities, a car wash, automotive detailers and consumers to test and demonstrate the alternatives. Based on the results of these projects, CARB is currently proposing to reduce the VOC content of the aerosol automotive cleaners from about 45% to 10%.

PROJECT ALTERNATIVES STRATEGY

During this project, IRTA worked with 10 auto repair facilities in the southern California area. IRTA identified and developed alternatives for brake cleaning, carburetor and fuel injection system cleaning and general purpose degreasing. IRTA did not further test alternatives for engine degreasing since engine degreasing is not generally performed by auto repair facilities. IRTA used some of the same alternatives developed in the earlier projects and developed and tested some new alternatives for the remaining cleaning applications with the auto repair facilities.

STRUCTURE OF DOCUMENT

Section II of this document discusses the cleaning activities performed in auto repair facilities. It also presents information on the regulations that apply to these cleaning activities. Finally, it describes the alternative aerosol and non-aerosol low-VOC, low toxicity materials that can be used in place of the high solvent content aerosols used widely today. Section III focuses on the field testing and the results of the field tests. It also includes a cost analysis and comparison. Section IV summarizes the results of the project. Finally, Section V presents the references.

II. SAFER ALTERNATIVE AEROSOL AND NON-AEROSOL TECHNOLOGIES

During the field testing, IRTA relied on both aerosol and non-aerosol cleaning methods. Some of the aerosol cleaning products that were tested and used by the facilities were developed in the earlier CARB and HESIS projects. Some of the non-aerosol technologies were used in IRTA's earlier U.S. EPA brake cleaning project. Some of the aerosol and non-aerosol products tested were new technologies. In this project, IRTA focused on technologies suitable for use in three of the four applications where aerosol cleaning products are used. These include:

- brake cleaning;
- general purpose degreasing; and
- carburetor and fuel injection system cleaning.

As indicated by this list, IRTA did not focus on engine degreasing during this project. Auto repair facilities do not use engine degreasers. In addition, water-based cleaning alternatives for engine degreasing are widely available and perform effectively. Car washes and detailers generally use bulk water-based cleaners and apply them with a high pressure wand. Three views of a detailer applying an engine degreaser with a wand are shown in Figures 2-1, 2-2 and 2-3. In the earlier CARB and HESIS projects, IRTA packaged several water-based cleaners in aerosols and these cleaners all performed well when tested for engine degreasing with car washes, detailers and consumers. Consumers could use water-based aerosol cleaning products or any kind of water-based cleaners in spray bottles for engine degreasing. Since low-VOC, low toxicity water-based products are effective in this application, IRTA and DTSC did not believe that further demonstrating alternatives in this application was warranted.



Figure 2-1. Detailer Degreasing Engine



Figure 2-2. Detailer Applying Water-Based Cleaner with High Pressure Wand.



Figure 2-3. Detailer Degreasing Undercarriage of Vehicle

DESCRIPTION OF CLEANING APPLICATIONS

Many auto repair facilities purchase two types of aerosol 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 with the same cleaner. Some technicians and shops have a preference for a particular cleaner and others purchase the cleaner that is lowest in cost. The applications are discussed in more detail below.

General Purpose Degreasing

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 2-4 shows a technician performing general purpose degreasing.



Figure 2-4. Technician Performing General Purpose Degreasing.

Brake Cleaning

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 have been manufactured with disc brakes on both the front and the back. Figure 2-5 shows a picture of a vehicle with the tire removed and the drum brakes exposed. Figure 2-6 shows a closer view of the drum brake assembly.



Figure 2-5. Vehicle with Drum Brakes.



Figure 2-6. Closer View of Drum Brake Assembly.

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 cleans 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.

In southern California, many auto repair shops use water and/or water-based cleaners in small brake cleaning equipment. Pictures of three different types of brake cleaning systems are shown in Figures 2-7, 2-8 and 2-9. In general, these systems are on wheels so they can be moved easily under a car to do a brake job. They have a small reservoir containing the water-based cleaner. The cleaner is pumped to a sink area with a brush which is used to wet down the dust and clean the brakes. One of the brake cleaning systems, shown in Figure 2-9, is mounted on a wheeled stand.



Figure 2-7. Telescoping Brake Cleaning System.



Figure 2-8. Parts/Brake Cleaning System.



Figure 2-9. Brake Cleaning System on Wheeled Stand.

Some of the shops that use water-based brake cleaning systems 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.

Carburetor and Fuel Injection System Cleaning

Many auto repair facilities use cleaners to flush the fuel system. Some facilities use 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. Other facilities use 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 investigate alternatives to these types of products.

As mentioned above, most auto repair facilities purchase a carburetor cleaner which they consider faster evaporating. 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 with some of the low-VOC cleaners is shown in Figure 2-10. Most of the carburetor cleaner used today is used for cleaning throttle body valves.



Figure 2-10. Carburetor Cleaned with Low-VOC Cleaners.

REGULATIONS THAT AFFECT AEROSOL AND NON-AEROSOL CLEANING

The VOC limit for automotive aerosol cleaners in brake cleaning, carburetor and fuel injection system cleaning and general purpose degreasing is currently set at 45% in CARB's consumer product regulations. The current VOC limit for engine degreasing is 35%. CARB recently adopted a regulation to reduce the VOC limit to 10% for engine degreasing in 2008 and the other three categories in 2010.. An interim VOC limit of 20% for brake cleaning, carburetor and fuel injection system cleaning and general purpose degreasing will become effective in 2008.

SCAQMD has a regulation that affects the use of aerosol products used in auto repair facilities. SCAQMD Rule 1171 "Solvent Cleaning Operations," specifies that a facility may use 160 fluid ounces or less of VOC containing aerosol products per day. Assuming that each aerosol can contains about one pound of product, this means that facilities can use about 10 cans per day of VOC containing aerosols. If the facility uses more than 10 cans per day, the additional cans above 10 must have a VOC content of no more than 25 grams per liter. This translate roughly into 2.5% VOC.

The SCAQMD also regulates the VOC content of non-aerosol cleaners used in auto repair facilities. The VOC limit for general repair and maintenance cleaning, which is the type of cleaning performed by auto repair facilities, is 25 grams per liter. This translates roughly into 2.5% VOC. Other air districts in California have adopted or are adopting similar regulations.

According to the regulations, facilities that do not use aerosol products must use cleaners with a VOC content of about 2.5% in the South Coast Basin and other air districts in California where there are repair and maintenance cleaning limits. Facilities located outside the SCAQMD jurisdiction must use aerosol cleaners with a 45% VOC limit or lower. Inside the SCAQMD jurisdiction, facilities that use aerosol products can use about 10 cans of cleaners with a VOC content of 45%; if the facility uses more than 10 cans per day, the additional cleaners must have a VOC content of about 2.5%.

ALTERNATIVE AEROSOL AND NON-AEROSOL PRODUCTS

One of the aims of this project was to test alternative aerosol cleaners that are low in VOC content and low in toxicity. IRTA developed alternative aerosol cleaners that had a VOC content of no more than 10% for testing in this project; some of the cleaners had an even lower VOC content. IRTA also tested a commercial aerosol cleaner with low-VOC content. Another aim of the project was to test non-aerosol products that are low in VOC content and low in toxicity. The alternatives that were tested during the project are described for the three applications of focus below.

Alternative Aerosol Cleaners

In the earlier CARB and HESIS projects, some of the personnel in the auto repair facilities expressed concern about using water-based products for throttle body valve cleaning. They did not want to introduce water into the fuel system. As a consequence, IRTA developed three cleaners for testing that were blends of acetone and soy. Acetone is exempt from VOC regulations and is lower in toxicity than most other organic solvents. According to HESIS, soy based cleaners are also low in toxicity. Two of the cleaners developed in the earlier projects performed well and IRTA decided to test one of them over the longer term with the auto repair facilities during this project. The cleaner is a combination of about 25% soy and 75% acetone with a carbon dioxide propellant. The VOC content of this cleaner is no more than 0.6%. A Material Safety Data Sheet (MSDS) for this product, called Kyzen Aerosol Degreaser #1, is shown in Appendix A.

IRTA also developed two additional fast evaporating aerosol products during the current project that are based on acetone. Acetone is not classified as a VOC and, according to HESIS, is lower in toxicity than almost all other organic solvents. These products could be used for carburetor and fuel injection system cleaning, general purpose degreasing or brake cleaning. One of these is a blend of about 10% mineral spirits and 90% acetone with a carbon dioxide propellant. An MSDS for this product, Kyzen Aerosol Degreaser #3, is shown in Appendix A. The VOC content of this product is about 10%. The other cleaner is a blend of about 2.5% of a glycol ether and 97.5% acetone with a carbon dioxide propellant. An MSDS for this product, Kyzen Aerosol Degreaser #2, is shown in Appendix A. The VOC content of this product is about 2.5%.

In the earlier CARB and HESIS projects, IRTA worked with several water-based cleaner suppliers to develop and package aerosol products based on water-based cleaners that could be used for general purpose degreasing and brake cleaning. There are a variety of water-based cleaners on the market today that have been designed as non-foaming. These cleaners are used in spray equipment in industrial cleaning applications. Nearly all water-based cleaners foam when they are put in an aerosol can. The mixture of air with the cleaner causes foaming even if the cleaner has been designed not to foam. This posed a technical problem but suppliers did provide a few non- and low-foaming water-based cleaners that were tested in the CARB/HESIS projects.

One of the water-based cleaners that performed well in the earlier testing was selected for additional testing in the current project. An MSDS for this product, Kyzen Aerosol Degreaser 11, is shown in Appendix A. All of the water-based aerosol products use hydrocarbon propellants. Carbon dioxide, although it is a very good high pressure propellant, cannot be used easily with water-based cleaners. The propellant and the water-based cleaner form carbonic acid and the can may corrode. The VOC content of the Kyzen degreaser is about 10% and the contribution of the VOC is from the propellant.

Five of the facilities that participated in the project are dealerships. Dealerships, depending on how many technicians they have, may use more than 10 cans per day of aerosol cleaning products. If they do use more than 10 cans per day, they are subject to the SCAQMD regulations. Rather than monitoring the daily use of the high VOC cleaner, some dealerships are exclusively using cleaners a very low VOC content, less than 25 grams per liter or about 2.5%. As a consequence, the suppliers are offering the dealerships very low VOC content aerosols containing acetone and a carbon dioxide propellant or acetone with a very small amount of VOC solvent and a carbon dioxide propellant. IRTA evaluated the use of these low-VOC products during the project. An MSDS for Granitize AR-2 14oz/AR-14 6oz Brake Cleaner & Parts Cleaner, one cleaner that probably meets the 45% VOC CARB limit, is shown in Appendix A. An MSDS for Granitize Brake & Parts Cleaner 1171 Rule, a cleaner that may meet the 25 grams per liter VOC limit, is also shown in Appendix A.

Alternative Non-Aerosol Cleaners

Three different non-aerosol cleaning systems were tested during the project. The first system is a water-based cleaner in a spray bottle. One of the participating facilities did not want to use aerosol cans at all. Instead, the technicians used a water-based parts cleaning formulation in spray bottles for all of their cleaning. The VOC content of this cleaner is less than 25 grams per liter, the SCAQMD rule limit for general repair and maintenance cleaners. Other facilities have also decided not to use aerosol products at all.

The second system is a water-based brake cleaning system. A few facilities that participated in the project decided to use this type of system for most or all of their brake cleaning. A picture of one a brake cleaning system used by one of the participating facilities is shown in Figure 2-11. MSDSs for two different water-based brake cleaners used in the systems tested during the project are shown in Appendix A. The cleaners are called Mirachem 500 and PWF-10. Generally, the concentration of the water-based cleaners used in the brake cleaning systems ranges from about 10% to 20%. The VOC content of these cleaners, after dilution is lower than 25 grams per liter, the SCAQMD rule limit for repair and maintenance cleaning.

The third system is a cannister delivery method. An example of a cannister system tested during this project is shown in Figure 2-12 and Figure 2-13. IRTA tested the cannister system with three dealerships. The cannister system uses a carbon dioxide propellant and the cleaner must have a VOC content of 25 grams per liter or less to comply with the SCAQMD regulation limit. The systems IRTA tested all used an acetone cleaner. A product sheet for the cleaner offered by MX Factor, MX2803, is shown in Appendix A. IRTA wanted to test the systems as an alternative to aerosol cleaners since they have the potential to work more effectively because of the higher pressure possible in a cannister system.



Figure 2-11. Brake Cleaning System Tested by Dealership.



Figure 2-12. Cannister System Tested at Dealerships.



Figure 2-13. Cannister System with Hose Attached

Summary of Alternative Products

Table 2-1 summarizes the different types of aerosol and non-aerosol systems cleaning methods during the project. The VOC content of the aerosol products is shown in percent since they are subject to the CARB regulation. The VOC content of the non-aerosol products is shown in grams per liter since SCAQMD and other air districts regulate these materials.

**Table 2-1
Alternative Low-VOC Cleaning Methods**

Alternative Method	Description	Approximate VOC Content
Carburetor/Fuel Injection System Cleaner	Soy/Acetone Aerosol	0.6%
Brake Cleaner/General Purpose Degreaser	Water-Based Aerosol	10%
Brake Cleaner/General Purpose Degreaser	Mineral Spirits/Acetone Aerosol	10%
Brake Cleaner/General Purpose Degreaser	Glycol Ether/Acetone Aerosol	2.5%
Spray Bottles	Water-Based Cleaner Non-Aerosol	<25 grams per liter
Brake Cleaning Systems	Water-Based Cleaner Non-Aerosol	<25 grams per liter
Cannister Systems	Acetone and Acetone Blends Non-Aerosol	<25 grams per liter

III. FIELD TESTING PERFORMANCE AND COST ANALYSIS

IRTA tested the alternative cleaners and technologies with 10 auto repair facilities in southern California. The facilities that participated in the testing included:

- a city yard that maintains city vehicles;
- two service stations that perform repairs;
- two small privately owned general automotive repair facilities;
- a Mercedes dealership;
- a Lexus dealership;
- an Audi dealership;
- a Honda dealership; and
- a VW dealership.

IRTA deliberately recruited dealerships for the project since they were likely to use more than 10 cans per day of aerosol cleaners. This means they would have to comply with the SCAQMD regulation which is more stringent than the CARB regulation. Such facilities were more likely to be interested in testing and adopting low-VOC alternatives.

TESTING DESCRIPTION AND RESULTS

The purpose of the test program was to have each facility use the alternative aerosols and/or non-aerosol technologies for at least three months. The types of systems that were tested varied, depending on the facility. IRTA discussed different approaches with all of the facilities and allowed them to choose the path they preferred. The low-VOC Granitize aerosol product was used by three facilities permanently and IRTA got feedback from the technicians on this product. Kyzen, the company that developed the water-based aerosol cleaner that did not foam and performed well, packaged this cleaner and the other solvent aerosol products for IRTA to test with some facilities. The cannister system was used by three facilities for one month and by one facility permanently. Some of the facilities, notably two of the larger dealerships, had one team of several technicians test the alternatives for the test period. One of the larger dealerships had all the technicians test the alternative products for the three month test period.

The city yard decided they would not test alternative low-VOC aerosols since they did not want to use aerosols at all. IRTA provided this facility with two different water-based cleaners that the technicians tested in spray bottles. After the preliminary testing, the facility decided they preferred the water-based cleaner they were already using in their parts cleaner. This was the cleaner the facility used for the three month testing period and is using permanently.

One of the service stations was already using a water-based brake cleaning system and the shop wanted to use that system and aerosols. The technicians were routinely using high VOC 45% aerosol cleaners. IRTA provided the shop with all of the different aerosol cleaning products so they could decide which ones they wanted to test for the three month period. The technicians selected the soy/acetone carburetor and fuel injection system cleaners and the glycol ether/acetone blend for the three month testing period.

The other service station wanted to try a water-based brake cleaning system and IRTA provided them with a unit; this service station also tested alternative aerosols but relied heavily on the brake cleaning unit for cleaning brakes and for general purpose degreasing. The shop was routinely using the high VOC 45% aerosol products and the alternative aerosol the facility preferred for the three month testing was the mineral spirits/acetone blend. The facility also tested the soy/acetone blend for throttle body valve cleaning.

IRTA tested a water-based brake cleaning system at one of the small general automotive repair facilities which was routinely using the high VOC 45% aerosols. The shop did not like the system and preferred to use aerosols. IRTA provided this facility with the soy/acetone carburetor and fuel injection system aerosol cleaner, the water-based aerosol cleaner and both the glycol ether/acetone and mineral spirits/acetone aerosol cleaners for preliminary testing. For the three month test period, the facility opted to test the water-based aerosol cleaner and the mineral spirits/acetone aerosol cleaner.

At the second general automotive repair facility, the technicians were routinely using the high VOC 45% aerosols. IRTA provided the technicians with a water-based brake cleaning system, the carburetor and fuel injection system aerosol cleaner and the glycol ether/acetone blend for the three month testing period. Two of the technicians used the water-based brake cleaning system exclusively and the other technician used the two aerosol cleaners.

At the Mercedes dealership, the technicians were using the low-VOC Granitize aerosol products because of the SCAQMD 160 fluid ounces VOC regulation. The facility wanted to try the water-based brake cleaning systems. IRTA provided two different water-based cleaners and the facility preferred one of them which was tested for the three month period. IRTA also provided all of the aerosol cleaners for preliminary testing and the facility elected to test the soy/acetone carburetor and fuel injection system aerosol cleaner and the glycol ether/acetone blend for the three month period. This facility also tested and decided to continue using the cannister system containing acetone permanently.

The Lexus facility wanted to test only aerosol products. They were using the low-VOC Granitize aerosol cleaning product exclusively to comply with the SCAQMD regulation. IRTA provided the facility with the soy/acetone carburetor and fuel injection system aerosol cleaner and the mineral spirits/acetone cleaner for the testing period.

The Audi facility wanted to use only aerosol products. IRTA conducted preliminary testing of all of the aerosol cleaners and also tested the cannister system containing acetone. The company was routinely using high VOC aerosols with a 45% VOC content. The technicians did not think any of the alternative cleaners performed well. The shop tested the cannister system for a one month period.

The Honda dealership was routinely using high VOC aerosols with a 45% VOC content. IRTA tested the water-based aerosol cleaner, the soy/acetone carburetor and fuel injection system aerosol cleaner and both the glycol ether/acetone and the mineral spirits/acetone aerosol cleaners. For the longer term testing, the facility tested the soy/acetone and the mineral spirits/acetone aerosols. The shop also tested the acetone cannister system and thought it worked well for brake cleaning.

The VW dealership, like the Lexus dealership, was routinely using the low-VOC Granitize product to comply with the SCAQMD regulations. The facility tested the water-based aerosol, the soy/acetone aerosol for throttle body valve cleaning and the glycol ether/acetone blend for the three month test period.

Table 3-1 summarizes the products that were tested by each facility during the project. All of the products were tested for a three month period except the cannister systems which were tested for one month.

EVALUATION OF ALTERNATIVE SYSTEMS

The facilities or teams at facilities that participated in the project used or tested alternative low-VOC, safer aerosol and non-aerosol cleaners for three months or one month in the case of the cannister product. Because these alternatives had very low VOC content, this demonstrates that auto repair shops can operate their businesses without using high VOC aerosol cleaners.

During the project, IRTA staff observed that the younger technicians were more willing than the older technicians to use the water-based products. Some of the younger technicians liked the water-based brake cleaning systems and stopped using aerosol products after they adopted them. In the earlier CARB and HESIS projects, the younger technicians and consumers who performed engine degreasing preferred the water-based products. The older technicians and consumers insisted that, if the cleaner did not smell bad, it would not work well. In the earlier and current projects, the younger technicians were more willing than the older technicians to use the water-based aerosol cleaners for brake cleaning and general purpose degreasing.

IRTA also observed that technicians at the large dealerships liked the alternative low-VOC aerosol products IRTA provided for brake cleaning and general purpose degreasing as well as or better than the low-VOC Granitize products they were using routinely. The products formulated by IRTA were based on acetone but had small amounts of VOC solvents in them and the companies, because of the SCAQMD regulation, were using very low-VOC products. In contrast, the technicians at smaller facilities were routinely

using 45% VOC content aerosol cleaners and they did not think the alternatives IRTA provided them performed as well.

**Table 3-1
Products Tested in Each Facility**

Facility	Products Tested
City Yard	Water-Based Cleaner in Spray Bottles
Service Station #1	Water-Based Brake Cleaning System Soy/Acetone Aerosol Glycol Ether/Acetone Aerosol
Service Station #2	Water-Based Brake Cleaning System Soy/Acetone Aerosol Mineral Spirits/Acetone Aerosol
General Automotive Shop #1	Water-Based Aerosol Mineral Spirits/Acetone Aerosol
General Automotive Shop #2	Water-Based Brake Cleaning System Soy/Acetone Aerosol Glycol Ether/Acetone Aerosol
Mercedes Dealership	Granitize Low-VOC Aerosol Water-Based Brake Cleaning System Soy/Acetone Aerosol Glycol Ether/Acetone Aerosol Cannister System
Lexus Dealership	Granitize Low-VOC Aerosol Soy/Acetone Aerosol Mineral Spirits/Acetone Aerosol
Audi Dealership	Cannister System
Honda Dealership	Soy/Acetone Aerosol Mineral Spirits/Acetone Aerosol Cannister System
VW Dealership	Granitize Low-VOC Aerosol Water-Based Aerosol Soy/Acetone Aerosol Glycol Ether/Acetone Aerosol

A related observation is that once the facilities became used to using very low-VOC cleaners, they adjusted to it and accepted it. Because of a SCAQMD regulation that became effective in 1999, nearly all auto repair facilities in the South Coast Basin converted from mineral spirits to water-based parts cleaners to comply with the lower VOC limits. Before the regulation was adopted, the industry indicated that water-based cleaners could not clean and there would be negative technical and financial consequences for their operation if the regulation were passed. At the beginning of this project, IRTA asked the technicians how they liked the water-based parts cleaners and the technicians seemed puzzled at the question. They had been using the water-based parts cleaners for six years and most of them did not even remember that they had once used mineral spirits. This is a strong indication that, when change is first suggested, it garners strong resistance but that once the change is adopted, the technicians adjust to it and accept it as the status quo.

COST ANALYSIS AND COMPARISON

IRTA analyzed and compared the cost of using the high VOC aerosol cleaners with the cost of using the low-VOC aerosol and non-aerosol technologies. The analysis involved examining the cost for a few different types of auto repair facilities of using the alternative non-aerosol technologies. For the alternative aerosol technologies, the raw materials cost was compared with the raw materials cost of a high VOC aerosol. The cost for each of the alternative technologies is presented below.

Cannister System

IRTA analyzed the cost of using the cannister system in place of aerosol cleaners for two different types of facilities. The first facility type is a large dealership and is based on one of the facilities that participated in the project.

The dealership uses 65 cases or 780 cans of aerosol cleaners per month. The cost of the aerosol cans is \$1.80 each. On this basis, the annual cost of using the aerosol cleaners is \$16,848. Assuming each can contains one pound of product, the dealership uses 9,360 pounds of cleaner per year.

The alternative cannister system holds 20 pounds of cleaner and is propelled by carbon dioxide. The dealership converted to the cannister systems several months ago. They used 39 of the systems throughout the facility in a six week period. The supplier changes out the tanks after six weeks and the cost is \$27 per unit. The annual cost of using the cannister systems amounts to \$9,126. The amount of cleaner used by the dealership with the cannisters is 6,760 pounds per year. This is 28% lower than the amount of cleaner used with the aerosol cans.

One of the small general auto repair facilities that participated in the project uses one case per week of brake cleaner and pays \$1.75 per can. The annual cost of using the brake cleaner is \$1,092. The facility also uses one case of carburetor cleaner every two weeks at a cost of \$1.80 per can. The annual cost of using the carburetor cleaner is \$562. The total cost to the small facility of using the aerosol cans is \$1,654 annually. The amount of cleaner used by the shop each year is 936 pounds assuming that each can contains a pound of product.

Even though the dealership uses 28% less cleaner with the cannister system, to be conservative, it will be assumed that the small shop uses the same amount of product in the cannister system as in the aerosol cans. Since the cannister systems contain 20 pounds of product, the shop would need about 46.8 cannisters per year. At a cost of \$27 per unit, the annual cost amounts to \$1,264.

Table 3-2 shows the cost comparison for the two facilities. The cost to the dealership for cleaning with the cannister systems is 46% lower than the cost of cleaning with the aerosol cans. The cost of cleaning with the cannister system for the general auto repair shop is 24% less than the cost of cleaning with the aerosol cans.

**Table 3-2
Annualized Cost Comparison for Aerosol Cleaners and Cannister System**

Facility Type	Cost of Aerosol Cleaners	Cost of Cannister System
Dealership	\$16,848	\$9,126
General Auto Repair Shop	\$1,654	\$1,264

Water-Based Brake Cleaning Equipment

One of the dealerships that participated in the project has 50 technicians that represent 10 teams of five technicians each. The facility uses a total of 65 cases per month or 780 cases per year of aerosol cleaners. Two-thirds of the aerosol cleaners or 520 cases per year are used for brake cleaning. The cost of the aerosol brake cleaner is \$1.80 per can. On this basis, the cost of purchasing brake cleaner aerosols is \$11,232 annually.

For the analysis, it was assumed that each team would require one water-based brake cleaning system so the dealership would have to purchase 10 units. These units range in cost from about \$500 to \$1,500. Assuming the cost of each unit is \$1,000, the capital cost of the 10 units is \$10,000. Assuming a cost of capital of four percent and a 10 year useful life for the equipment, the annualized cost of the 10 units is \$1,040. Each of the brake cleaning systems holds eight to ten gallons of cleaner. They are used with about one gallon of cleaner concentrate and the remainder is water. A company services the units which involves cleaning them out and refilling them with cleaner concentrate and water and disposing of the spent cleaner as hazardous waste. Most dealerships require

the servicing on an eight to 12 week schedule and the cost of the servicing is \$150. Assuming the dealership requires a ten week service for the 10 units, the annual cost of servicing the brake cleaning systems amounts to \$7,800. The total cost of using the brake cleaning systems is \$8,840.

Table 3-3 shows the annualized cost comparison for the dealership. The cost of using the brake cleaning systems is 21% lower than the cost of using the aerosol cleaners.

**Table 3-3
Annualized Cost Comparison for Dealership for Brake Cleaning Systems**

	Aerosol Cleaners	Brake Cleaning Systems
Annualized Equipment Cost	-	\$1,040
Cleaner Cost	\$11,232	-
Service Cost	-	\$7,800
Total Cost	\$11,232	\$8,840

One of the small general auto repair facilities that participated in the project adopted a water-based brake cleaning system. The shop owner purchases 36 cases of brake cleaner per year and pays \$1.50 per can. The cost of using the aerosol cleaners is \$648 per year.

The shop adopted the water-based brake cleaning system and the cost of the unit is about \$1,000. Assuming a cost of capital of four percent and a 10 year useful life for the equipment, the annualized cost of the unit is \$104. This shop has the unit serviced every four months at a cost of \$150 per service. The annual cost of the servicing is \$450. The total annual cost of using the brake cleaning unit is \$554.

The cost comparison for the small auto repair shop is shown in Table 3-4. The cost of using the brake cleaning system is 15% lower than the cost of using the aerosol brake cleaners.

**Table 3-4
Annualized Cost Comparison for Auto Repair Shop for Brake Cleaning System**

	Aerosol Cleaners	Brake Cleaning System
Annualized Equipment Cost	-	\$104
Cleaner Cost	\$648	-
Service Cost	-	\$450
Total Cost	\$648	\$554

Low-VOC Aerosol Cleaners

The prices of the alternative aerosol cleaners that were developed and tested during the project are not known because the products are not yet commercialized. IRTA analyzed and compared the raw materials costs of the high and low-VOC products to determine a price for the alternatives. Table 3-5 shows the raw materials cost for the high VOC Granitize aerosol cleaner and some of the alternative low-VOC aerosol products that were tested.

Table 3-5
Raw Materials Costs for Aerosol Cleaners

Product	Description	Raw Materials Cost (cents per pound)
Granitize High VOC	Acetone/Toluene/Methanol	55
Granitize Low-VOC	Acetone/Heptane	52
Alternative Brake Cleaner #1	Acetone/Mineral Spirits	52
Alternative Brake Cleaner #2	Acetone/Glycol Ether	52
Kyzen Degreaser 11	Water-Based Cleaner	54
Alternative Carburetor Cleaner	Acetone/Soy	61

The MSDS for the Granitize high VOC product indicates that the VOC content of the product is <50%. IRTA assumed the product contained 45% by weight VOC since it was very likely developed to comply with the CARB 45% VOC limit. IRTA assumed the product contained 55% acetone, 40% toluene and 5% methanol. Toluene and methanol are VOCs whereas acetone is not.

The MSDS for the Granitize low-VOC product indicates that the VOC content of the product is < 50 grams per liter. IRTA assumed the product contained 2.5% by weight VOC since it was very likely developed to comply with the SCAQMD 25 gram per liter VOC limit. IRTA assumed the product contained 97.5% acetone and 2.5% heptane. Again, acetone is exempt from VOC regulations whereas heptane is classified as a VOC.

For the two alternative aerosols, Brake Cleaner #1 is composed of 90% acetone and 10% mineral spirits. Mineral spirits is classified as a VOC so this blend has a VOC content of 10%. Brake Cleaner #2 is composed of 97.5% acetone and 2.5% glycol ether. Since the glycol ether is classified as a VOC, the VOC content of this product is 2.5%.

IRTA obtained prices for the blends from a chemical supplier. IRTA assumed the packagers would purchase the materials in bulk form. The prices in Table 3-5 represent the raw materials prices for the Granitize products and the two brake cleaners. IRTA obtained the raw materials prices of the Kyzen product and the soy/acetone carburetor cleaner from information collected during the earlier projects (CARB, 2004; HESIS, 2004). In the earlier work, the price for the Kyzen product was estimated at 35 to 45

cents per pound and the price of the soy/acetone blend was estimated at 40 to 50 cents per pound. These were 2003 prices. Since then, the price of chemicals has increased significantly because of the higher cost of oil. One supplier estimates that chemical prices have climbed about 35% since 2003. Incorporating this assumption and adopting the midpoint of the price range, the raw materials price for the Kyzen water-based cleaner is 54 cents per pound and the raw materials price for the soy/acetone blend is 61 cents per pound.

IRTA obtained the costs of packaging aerosol cans from packagers. The cost of packaging 10,000 16 ounce cans including the propellant amounts to 89 cents per can. The cost of packaging 100,000 cans including the propellant amounts to 79 cents per can. The cost is lower as the number of cans packaged increases, as expected. If the products tested here were commercialized, they would probably be packaged in very large quantities. The price of 79 cents per can was assumed for the analysis.

The price for both the high and low-VOC Granitize brake cleaning products is \$1.80 per can according to the auto repair facilities that participated in the project. The raw materials price in Table 3-5 for the high VOC Granitize product is 55 cents. Assuming the packaging cost is 79 cents per can and that each can contains one pound of product, the markup by the manufacturer is 46 cents or about 26% of the total product price. The raw materials price in Table 3-5 for the low-VOC Granitize product is 52 cents per pound. Again, assuming the packaging cost is 79 cents per can and that the can contains one pound of product, the markup by the manufacturer is 49 cents or about 27% of the total product price. The raw materials price of the low-VOC blend is lower than the raw materials price for the high VOC blend but the price charged for the cans is the same. The price of the two alternative low-VOC brake cleaners in Table 3-5 is the same as the price of the low-VOC Granitize product. This indicates that the markup, which represents the profit, is higher for the low-VOC products. The two low-VOC alternative brake cleaning products could be priced at \$1.80 per can like the low-VOC Granitize product and the profit would be acceptable.

The raw materials price for the Kyzen Degreaser 11 product is 54 cents per pound which is comparable to the 55 cents per pound raw materials price for the high VOC Granitize product. This product could be priced at about \$1.80 per can and the supplier would make an acceptable profit.

Some of the project participants purchase a Granitize product that is a carburetor cleaner. The price the facilities pay for this product is \$2 per can, higher than the price of the Granitize brake cleaning products. The raw materials price of the soy/acetone blend, which is used for carburetor cleaning, is 61 cents per pound. This is 7 cents per pound higher than the Granitize high VOC brake cleaning blend and 9 cents per pound higher than the Granitize low-VOC brake cleaning blend. The supplier of the alternative soy/acetone cleaner could make a profit of 60 cents per can if the cans were priced at \$2 per can. This is higher than the profit per can for the brake cleaning products of 46 to 49 cents per can.

This analysis using raw materials costs indicates that the supplier of the low-VOC alternative aerosols for brake cleaning and carburetor cleaning could price their products at or below the current market price for the higher VOC products. This indicates that the prices of the alternatives would be comparable or lower than the prices of the high VOC products.

IV. SUMMARY AND CONCLUSIONS

Most of the auto repair facilities in California are using relatively high VOC content aerosol cleaners for brake cleaning, general purpose degreasing, carburetor and fuel injection system cleaning and engine degreasing. CARB estimates that the VOC emissions from these products amount to about 9.5 tons per day. CARB recently adopted a regulation that reduces the VOC content from about 45% to 10%; this would result in a reduction in VOC emissions statewide of approximately seven tons per day.

IRTA conducted a project sponsored by DTSC and the City of Santa Monica to test alternative low-VOC alternatives to the high VOC content aerosol products. The purpose of the project was to investigate and demonstrate alternative low-VOC, low toxicity alternative aerosol and non-aerosol technologies for one to three months. During the project, IRTA worked with 10 auto repair facilities that included large dealerships, small general automotive repair facilities, service stations that performed repairs and a city yard.

The alternatives that were tested included:

- two acetone based brake cleaners and general purpose degreasers;
- one commercial acetone based brake cleaner and general purpose degreaser;
- one water-based brake cleaner and general purpose degreaser;
- one soy/acetone carburetor and fuel injection system cleaner;
- a water-based cleaner used in spray bottles;
- water-based brake cleaning systems; and
- acetone based cannister systems.

IRTA conducted preliminary testing with the participating facilities and the facilities selected the alternative low-VOC, low toxicity alternatives they wanted to test. One facility tested and converted permanently to spray bottles containing a water-based cleaner. Three facilities tested the acetone based cannister system for a one month period and one converted to it permanently. Three facilities tested the water-based brake cleaning systems for several months and all converted to them permanently. Three facilities were using the commercial acetone low-VOC aerosol cleaner when IRTA began the project. Eight of the facilities tested one or more of IRTA's alternative aerosol products for a three month period.

IRTA conducted a cost analysis and comparison as part of the project. Based on this analysis, the cost of using the water-based brake cleaning systems is lower than the cost of using high VOC aerosols for both general automotive repair facilities and dealerships. The cost of using cannister systems is also lower than the cost of using high VOC aerosols for the two types of facilities. Based on the raw materials cost of the high VOC and alternative aerosol cleaners, the cost of using the low-VOC aerosols is lower than or comparable to the cost of using the high VOC aerosols.

During the project, the participating facilities either used the low-VOC, low toxicity alternatives for an extended period, used them routinely or converted to them. This indicates that the safer products perform effectively enough to substitute for the high VOC aerosol products. IRTA observed that the younger technicians were more willing to test and adopt the alternatives than older technicians. IRTA also observed that technicians that were already using low-VOC products required by an SCAQMD regulation thought the alternative technologies performed well. Technicians in facilities that were using high VOC aerosol cleaners did not rate the alternative cleaners as well in terms of performance but were acceptable. The results of the project indicate that auto repair facilities in California can convert to low-VOC, low toxicity alternatives and maintain their operations.

V. REFERENCES

“Proposed Amendments to the California Consumer Products Regulation and the Aerosol Coatings Regulation,” California Environmental Protection Agency Air Resources Board, Release Date: September 29, 2006. (CARB, 2006)

“Safer Alternatives to Solvent Aerosol Automotive Cleaning Products,” Institute for Research and Technical Assistance, prepared for the California Department of Health Services Hazard Evaluation System & Information Service, December 2004. (HESIS, 2004)

“Alternatives to Automotive Consumer Products that use Volatile Organic (VOC) Compounds (VOC) and/or Chlorinated Organic Compound Solvents,” Institute for Research and Technical Assistance, prepared for the California Air Resources Board, December 2004. (CARB, 2004)

“Brake Cleaning in Auto Repair Facilities: The Conversion to Water,” Institute for Research and Technical Assistance, prepared for U.S. EPA, September 1999. (EPA, 1999)

“Parts Cleaning in Auto Repair Facilities: The Conversion to Water,” prepared under U.S. EPA’s Environmental Justice Pollution Prevention Program, published by Cal/EPA’s Department of Toxic Substances Control, Doc. No. 613, April 1997. (EPA, 1997)

Appendix A
Material Safety Data Sheets and Product Sheets for
Aerosol and Non-Aerosol Products

Kyzen Aerosol Degreaser #1 (Soy/Acetone Carburetor and Fuel Injection System Cleaner)



Material Safety Data Sheet

Section 1 — Chemical Product And Company Identification

Manufacturer: LHB Industries Emergency Telephone Number (800) 424-9300 (Chemtrec)
 8833 Fleischer Place Information Telephone Number (314) 423-4333
 Berkeley, MO 63134 Date of Preparation April 10, 2006
Product ID: Kyzen Aerosol Degreaser #1
LHB Part Number: 0404---000

Section 2 — Composition / Information On Ingredients

CAS No.	Ingredient	Wt%	ACGIH TLV	OSHA PEL	Vapor Pressure (mm Hg, 20°C)
67-64-1	Acetone	40 - 78	750 ppm	1000 ppm	180
67784-80-9	Methyl Soyate	10 - 40	NE	NE	0.8
124-38-9	Carbon Dioxide	5 - 10	NE	NE	ND

Section 3 — Hazards Identification

ROUTES OF EXPOSURE: Exposure may be by INHALATION and/or SKIN or EYE contact, depending on conditions of use. To minimize exposure, follow recommendations for proper use, ventilation, and personal protective equipment.
EFFECTS OF OVEREXPOSURE: Irritation of eyes, skin and upper respiratory system. May cause nervous system depression. Extreme overexposure may result in unconsciousness and possibly death.
SIGNS AND SYMPTOMS OF OVEREXPOSURE: Headache, dizziness, nausea, and loss of coordination are indicative of excessive exposure to vapors or spray mists. Redness and itching of burning sensation may indicate eye or excessive skin contact.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None generally recognized.
CANCER INFORMATION: For complete discussion of toxicology data refer to Section 11.

Section 4 — First Aid Measures

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.
SKIN CONTACT: Remove contaminated clothing and launder before reuse. Wash with soap and water.
EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention after flushing.
INGESTION: DO NOT INDUCE VOMITING. Give nothing by mouth. Get immediate medical attention.

Section 5 — Fire Fighting Measures

FLASH POINT: 0 - F (Acetone) LEL 2.6% (Acetone) UEL 12.8% (Acetone)
EXTINGUISHING MEDIA: Carbon Dioxide, Dry Chemicals, Foam
SPECIAL EXPOSURE HAZARDS: Do not expose to temperatures over 120°F. Keep away from heat, sparks and fire. Containers may explode when exposed to heat. Applications to hot surfaces require special attention. During fire-fighting operations, use proper protective equipment. Fire-fighting products may create a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.
SPECIAL PROTECTIVE EQUIPMENT: Water may be used to keep fire-exposed containers cool. Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATING: HEALTH 1, FLAMMABILITY 4, REACTIVITY 0
HMS CLASSIFICATION: HEALTH 1, FLAMMABILITY 4, REACTIVITY 0

Section 6 — Accidental Release Measures

PERSONAL PRECAUTIONARY MEASURES: Avoid inhalation. Use good ventilation. Read entire label before using and follow all label directions.
ENVIRONMENTAL PRECAUTIONARY PROCEDURE FOR CLEANING/ABSORPTION: Dispose of in accordance with applicable Federal, State & Local regulations. Remove ignition sources and work with non-sparking tools. Use oil absorbent materials.

Section 7 — Handling and Storage

HANDLING: Keep out of reach of children. Keep away from heat, sparks, and open flame. Vapors will accumulate readily and may ignite explosively. During use and until all vapors are gone. Keep area ventilated. Do Not Smoke. Extinguish all flames, pilot lights, and heaters. Turn off stoves, electric tools and appliances, and any other source of ignition. Consult NFPA Code. Use approved Bonding and Grounding procedures. Contents under pressure. Do not puncture, incinerate, or expose to temperatures above 120°F. Heat from sunlight, radiators, fires, hot water, and other heat sources could cause container to burst. Do not take lightly. Keep top of container closed. Do not use if damaged.
STORAGE CATEGORY: NFPA 308 Level 2 Aerosol
 Do not store where temperatures may exceed 120°F (48 9°C).

Section 8 — Exposure Controls/Personal Protection

ENGINEERING CONTROLS: Local Exhaust, preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits.
RESPIRATORY PROTECTION: If personal exposure cannot be controlled to below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.
GLOVES: None required for normal application or aerosol products where a minimal skin contact is expected. For long or repeated contact wear chemical resistant gloves.
SKIN PROTECTION: Impervious clothes to protect skin. Wash promptly when skin becomes contaminated.
EYES: Safety glasses with side shields or chemical goggles.
OTHER PERSONAL PROTECTION DATA: Use only with adequate ventilation. Avoid contact with skin and eyes. Wash hands after using.

Section 9 — Physical and Chemical Properties

PHYSICAL STATE: Liquid/Gas
COLOR: Colorless
ODOR: Solvent
SPECIFIC GRAVITY: 0.80
DENSITY: 9.23 lb/gal
VAPOR DENSITY (AIR=1): 1 (Heavier than Air)
VAPOURLE (BY VOL): 100.0
EVAPORATION RATE: Slower than other
SOLUBILITY IN WATER: Insoluble

Section 10 — Stability and Reactivity

CHEMICAL STABILITY: Stable
HAZARDOUS POLYMERIZATION CONDITIONS TO AVOID: Will not occur
MATERIAL TO AVOID: Do not expose to heat or store at temperature above 120°F
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon Monoxide, and Carbon Dioxide
 Cautics, Amines, Oxidizing Agents, Sodium Hypochlorite



Material Safety Data Sheet

Section 11 — Toxicological Information

TOXICOLOGY DATA (listed if available)

Section 12 — Ecological Information

ECOLOGICAL INFORMATION: No data available

Section 13 — Disposal Considerations

DISPOSAL OF WASTE METHOD: Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA), 40 CFR 261. Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers. Do not incinerate. Depressure container. Dispose of in accordance with Federal, State, and Local regulations regarding pollution.

Section 14 — Transport Information

U.S. DOT: 49 CFR 172.101 Hazardous Materials Table
PROPER SHIPPING NAME: Consumer Commodity
HAZARD CLASS OR DIVISION: ORM-D
IDENTIFICATION NUMBER: None
PACKING GROUP: None

Section 15 — Regulatory Information

U.S. REGULATORY RULES: None
SARA SECTION 302: None
SARA 313 CHEMICALS: None
CALIFORNIA PROPOSITION 65: None
TSCA CERTIFICATION: All chemicals in this product are listed, or are exempt from listing on the TSCA Inventory.

Section 16 — Other Information

REVISION NUMBER: 00

IMPORTANT NOTE: This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. This information may not be valid under all conditions nor if this material is used in combination with other materials or any process. Final determination of suitability of any material is the sole responsibility of the user.

Prepared by: Mark Epstein, R&D Manager

*** END OF MSDS***

Kyzen Aerosol Degreaser #3 (Mineral Spirits/Acetone Brake Cleaner)



Material Safety Data Sheet

Section 1 — Chemical Product And Company Identification

Manufacturer: LHB Industries Emergency Telephone Number (800) 424-9300 (Chemtrec)
 8833 Fleischer Place Information Telephone Number (314) 423-4333
 Berkeley, MO 63134 Date of Preparation April 10, 2008
Product ID: Kyzen Aerosol Degreaser #3
LHB Part Number: 0404-002

Section 2 — Composition / Information On Ingredients

CAS No.	Ingredient	Wt%	ACGIH TLV	OSHA PEL	Vapor Pressure (mm Hg, 20°C)
67-54-1	Acetone	85 - 95	750 ppm	1000 ppm	180
64742-49-8	Solvent naphtha, Light Aliphatic (NM&P)	5 - 10	300 ppm	500 ppm	10
124-38-9	Carbon Dioxide	5 - 10	NE	NE	ND

Section 3 — Hazards Identification

ROUTES OF EXPOSURE: Exposure may be by INHALATION and/or SKIN or EYE contact, depending on conditions of use. To minimize exposure, follow recommendations for proper use, ventilation, and personal protective equipment.
EFFECTS OF OVEREXPOSURE: Irritation of eyes, skin and upper respiratory system. May cause nervous system depression. Excessive exposure may result in unconsciousness and possibly death.
SIGNS AND SYMPTOMS OF OVEREXPOSURE: Headache, dizziness, nausea, and loss of coordination are indicators of excessive exposure to vapors or spray mists. Redness and itching or burning sensation may indicate eye or excessive skin exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None generally recognized.
CANCER INFORMATION: For complete discussion of toxicology data refer to Section 11.

Section 4 — First Aid Measures

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.
SKIN CONTACT: Remove contaminated clothing and launder before reuse. Wash with soap and water.
EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention after flushing.
INGESTION: DO NOT INDUCE VOMITING. Give nothing by mouth. Get immediate medical attention.

Section 5 — Fire Fighting Measures

FLASH POINT 0 °F (Acetone) LEL 2.6% (Acetone) UEL 12.8% (Acetone)
EXTINGUISHING MEDIA: Carbon Dioxide, Dry Chemicals, Foam
SPECIAL EXPOSURE HAZARDS: Do not expose to temperatures over 120°F. Keep away from heat, sparks and flame. Containers may explode when exposed to extreme heat. Applications to hot surfaces require special precautions. During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.
SPECIAL PROTECTIVE EQUIPMENT: Water may be used to keep fire-exposed containers cool. Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATING: HEALTH 1, FLAMMABILITY 4, REACTIVITY 0
HMS CLASSIFICATION: HEALTH 1, FLAMMABILITY 4, REACTIVITY 0

MSDS Part No. 0402-002

Section 6 — Accidental Release Measures

PERSONAL PRECAUTIONARY MEASURES: Avoid inhalation. Use good ventilation. Read entire label before using and follow all label directions.
ENVIRONMENTAL PRECAUTIONARY PROCEDURE FOR CLEANING/ABSORPTION: Dispose of in accordance with applicable Federal, State & Local regulations. Remove ignition sources and work with non-sparking tools. Use oil absorbent materials.

Section 7 — Handling and Storage

HANDLING: Keep out of reach of children. Keep away from heat, sparks, and open flame. Vapors will accumulate readily and may ignite explosively. During use and until all vapors are gone, keep area ventilated. Do Not Smoke—Extinguish all flames, pilot lights, and heaters — Turn off stoves, electric tools and appliances, and any other source of ignition. Consult NFPA Code. Use approved Bonding and Grounding procedures. Contents under pressure. Do not puncture, incinerate, or expose to temperatures above 120°F. Heat from sunlight, radiators, stoves, hot water, and other heat sources could cause container to burst. Do not take internally. Keep out of reach of children.
STORAGE CATEGORY — NFPA 30B Level 2 Aerosol
 Do not store where temperatures may exceed 120°F (48.9°C).

Section 8 — Exposure Controls/Personal Protection

ENGINEERING CONTROLS: Local Exhaust, preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits.
RESPIRATORY PROTECTION: If personal exposure cannot be controlled to below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.
GLOVES: None required for normal application of aerosol products where a minimal skin contact is expected. For long or repeated contact wear chemical resistant gloves.
SKIN PROTECTION: Impervious clothes to protect skin. Wash promptly when skin becomes contaminated.
EYES: Safety glasses with side shields or chemical goggles.
OTHER PERSONAL PROTECTION DATA: Use only with adequate ventilation. Avoid contact with skin and eyes. Wash hands after using.

Section 9 — Physical and Chemical Properties

PHYSICAL STATE: Liquid/Gas
COLOR: Colorless
ODOR: Solvent
SPECIFIC GRAVITY: 0.792
DENSITY: 0.72 (Heavier than Air)
VAPOR DENSITY (AIR=1): 100.0
EVAPORABLE (BY VOL.): Insoluble
SOLUBILITY IN WATER: Insoluble

Section 10 — Stability and Reactivity

CHEMICAL STABILITY: Stable
HAZARDOUS POLYMERIZATION CONDITIONS TO AVOID: Will not occur
MATERIAL TO AVOID: Do not expose to heat or store at temperature above 120°F
HAZARDOUS DECOMPOSITION PRODUCTS: Causatics, Amines, Oxidizing agents, Sodium Hypochlorite, Carbon Monoxide, and Carbon Dioxide.

Page 1 of 2

Kyzen Aerosol Degreaser #3



Material Safety Data Sheet

Section 11 — Toxicological Information

TOXICOLOGY DATA (listed if available)

Section 12 — Ecological Information

ECOLOGICAL INFORMATION: No data available

Section 13 — Disposal Considerations

DISPOSAL OF WASTE METHOD: Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA), 40 CFR 261. Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers. Do not incinerate. Depressurize container. Dispose of in accordance with Federal, State, and Local regulations regarding pollution.

Section 14 — Transport Information

U.S. DOT: 49 CFR 172.101 Hazardous Materials Table

PROPER SHIPPING NAME: Consumer Commodity
HAZARD CLASS OR DIVISION: ORM-D
IDENTIFICATION NUMBER: None
PACKING GROUP: None

Section 15 — Regulatory Information

U.S. REGULATORY RULES: None
SARA SECTION 302: None
SARA 313 CHEMICALS: None
CALIFORNIA PROPOSITION 65: None
TSCA CERTIFICATION: All chemicals in this product are listed, or are exempt from listing on the TSCA Inventory

Section 16 — Other Information

REVISION NUMBER: 00

IMPORTANT NOTE: This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. This information may not be valid under all conditions nor if this material is used in combination with other materials or any process. Final determination of suitability of any material is the sole responsibility of the user.

Prepared by: Mark Epstein, R&D Manager

*** END OF MSDS ***

Kyzen Aerosol Degreaser #2 (Glycol Ether/Acetone Brake Cleaner)



Material Safety Data Sheet

Section 1 — Chemical Product And Company Identification

Manufacturer: LHB Industries Emergency Telephone Number (800) 424-9330 (Chemtrec)
 8633 Fieischer Place, Information Telephone Number (314) 423-4333
 Berkeley, MO 63134 Date of Preparation April 10, 2005
Product ID: Kyzem Aerosol Degreaser #2
 LHB Part Number: 0404-003

Section 2 — Composition / Information On Ingredients

CAS No.	Ingredient	WT%	ACGIH TLV	OSHA PEL	Vapor Pressure (mm Hg, 20°C)
07-64-1	Acetone	85 - 95	350 ppm	1000 ppm	180
112-34-5	Diethylene Glycol n-Butyl Ether	1 - 5	NE	NE	0.08
124-38-3	Carbon Dioxide	5 - 10	NE	NE	ND

Section 3 — Hazards Identification

ROUTES OF EXPOSURE: Exposure may be by INHALATION and/or SKIN or EYE contact, depending on conditions of use. To minimize exposure, follow recommendations for proper use, ventilation, and personal protective equipment.
EFFECTS OF OVEREXPOSURE: Irritation of eyes, skin and upper respiratory system. May cause nervous system depression. Extreme overexposure may result in unconsciousness and possibly death.
SIGNS AND SYMPTOMS OF OVEREXPOSURE: Headache, dizziness, nausea, and loss of coordination are indications of excessive exposure to vapors or spray mists. Redness and itching or burning sensation may indicate eye or excessive skin exposure.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None generally recognized.
CANCER INFORMATION: For complete discussion of toxicology data refer to Section 11.

Section 4 — First Aid Measures

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Get medical attention.
SKIN CONTACT: Remove contaminated clothing and footwear before reuse. Wash with soap and water after flushing.
EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes and get medical attention after flushing.
INGESTION: DO NOT INDUCE VOMITING. Give nothing by mouth. Get immediate medical attention.

Section 5 — Fire Fighting Measures

FLASH POINT: 0 °F (Acetone) LEL 2.6% (Acetone) UEL 12.8% (Acetone)
EXTINGUISHING MEDIA: Carbon Dioxide, Dry Chemicals, Foam
SPECIAL EXPOSURE HAZARDS: Do not expose to temperatures over 120°F. Keep away from heat, sparks and flame. Containers may explode when exposed to extreme heat. Applications to hot surfaces require special precautions. During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.
SPECIAL PROTECTIVE EQUIPMENT: Water may be used to keep fire-exposed containers cool. Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATING: HEALTH 1, FLAMMABILITY 4, REACTIVITY 0
HMS CLASSIFICATION: HEALTH 1, FLAMMABILITY 4, REACTIVITY 0

Section 6 — Accidental Release Measures

PERSONAL PRECAUTIONARY MEASURES: Avoid inhalation. Use good ventilation. Read entire label before using and follow all label directions.
ENVIRONMENTAL PRECAUTIONARY PROCEDURE FOR CLEANING/ABSORPTION: Dispose of in accordance with applicable Federal, State & Local regulations. Remove ignition sources and work with non-sparking tools. Use oil absorbent materials.

Section 7 — Handling and Storage

HANDLING: Keep out of reach of children. Keep away from heat, sparks, and open flame. Vapors will accumulate readily and may ignite explosively. During use and until all vapors are gone. Keep area ventilated. Do Not Smoke. Extinguish all flames, pilot lights, and heaters - Turn off stoves, electric tools and appliances, and any other source of ignition. Consult NFPA Code. Use approved Bonding and Grounding procedures. Contents under pressure. Do not puncture, incinerate, or expose to temperatures above 120°F. Heat from sunlight, radiators, stoves, hot water, and other heat sources could cause container to burst. Do not take internally. Keep out of reach of children.
STORAGE CATEGORY - NFPA 308 Level 2 Aerosol
 Do not store where temperatures may exceed 120°F (48.9°C)

Section 8 — Exposure Controls/Personal Protection

ENGINEERING CONTROLS: Local Exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits.
RESPIRATORY PROTECTION: If personal exposure cannot be controlled to below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.
GLOVES: None required for normal application of aerosol products where a minimal skin contact is expected. For long or repeated contact wear chemical resistant gloves.
SKIN PROTECTION: Impervious clothes to protect skin. Wash promptly when skin becomes contaminated.
EYES: Safety glasses with side shields or chemical goggles.
OTHER PERSONAL PROTECTION DATA: Use only with adequate ventilation. Avoid contact with skin and eyes. Wash hands after using.

Section 9 — Physical and Chemical Properties

PHYSICAL STATE: Liquid/Gas
COLOR: Colorless
ODOR: Solvent
SPECIFIC GRAVITY: 0.790
DENSITY: 6.58 lb/gal
VAPOR DENSITY (AIR=1): >1 (Heavier than Air)
%VOLATILE (BY VOL): 100.0
EVAPORATION RATE: Slower than ether
SOLUBILITY IN WATER: Insoluble

Section 10 — Stability and Reactivity

CHEMICAL STABILITY: Stable
HAZARDOUS POLYMERIZATION: Will not occur
CONDITIONS TO AVOID: Do not expose to heat or store at temperature above 120°F
MATERIAL TO AVOID: Caustics, Amines, Oxidizing agents, Sodium Hypochlorite
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon Monoxide, and Carbon Dioxide.



Material Safety Data Sheet

Section 11 — Toxicological Information

TOXICOLOGY DATA (listed if available)

Section 12 — Ecological Information

ECOLOGICAL INFORMATION: No data available

Section 13 — Disposal Considerations

DISPOSAL OF WASTE METHOD: Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA), 40 CFR 261. Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers. Do not incinerate. Depressurize container. Dispose of in accordance with Federal, State, and Local regulations regarding pollution.

Section 14 — Transport Information

U.S. DOT: 49 CFR 172.101 Hazardous Materials Table
PROPER SHIPPING NAME: Consumer Commodity
HAZARD CLASS OR DIVISION: ORM-D
IDENTIFICATION NUMBER: None
PACKING GROUP: None

Section 15 — Regulatory Information

U.S. REGULATORY RULES: None
SARA SECTION 302: Glycol Ethers
SARA 313 CHEMICALS: None
CALIFORNIA PROPOSITION 65: All chemicals in this product are listed, or are exempt from listing on the TSCA Inventory
TSCA CERTIFICATION: listing on the TSCA Inventory

Section 16 — Other Information

REVISION NUMBER: 00

IMPORTANT NOTE: This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or any process. Final determination of suitability of any material is the sole responsibility of the user.

Prepared by: Mark Epstein, R&D Manager

*** END OF MSDS***

Cyber Solv (Water-Based Brake Cleaner)



MATERIAL SAFETY DATA SHEET

KYZEN® Aerosol Degreaser 11 (Aerosol CAN)

1. COMPANY NAME AND ADDRESS:

Kyzen Corporation
430 Harding Industrial Drive
Nashville, TN 37211
PHONE: 615-821-0888

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

www.kyzen.com
Effective: November 5, 2023
Supersedes: October 13, 2023

2. INGREDIENTS:

29CFR1910.1200

Hazardous Component	CAS Number	Approximate %
Liquefied Petroleum Gas	68470-95-8	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. 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:	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 irritable 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. Codes of color, ammonia, and nitrogen.
Combustion Products:	Do not add nitrites due to possible formation of nitrosamines.
Other:	

6. ACCIDENTAL RELEASE MEASURES:

Spill/Soil: 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 fast tracks.

7. HANDLING AND STORAGE:

Handling: Do not drink, smoke or eat in handling area. Do not puncture or incise/cut 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, mg/m ³	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:	Goggles, goggles or face shield, etc.		
Other Protective Equipment:	Eye wash, 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:	None
EPA Method 24:	14.7 g/L (plus propellant)	Solubility in Water:	Complete
Vapor Pressure, VOC Components:	<0.01 mg/L @ 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 alcohols 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 Part 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	68470-88-8
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 not intended to be "legal". As a manufacturer, purveyor and distributor, KYZEN Corporation does not manufacture the materials herein and does not practice and consequently relies on information provided to KYZEN Corporation from material safety data sheets on the specific law criteria in the construction of the material safety data sheet. Such information is the best of KYZEN Corporation's knowledge and belief as of the date of the data sheet. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY OR COMPLETENESS. It is the user's responsibility to comply with all applicable laws and regulations of such jurisdictions for their own particular application. This information is intended to be informative to the user and not a substitute for the user's own knowledge and experience. Other factors may include class or chemical safety or performance considerations. This data is not to be taken as a warranty or representation of KYZEN Corporation's products or services.

Granitize High VOC Cleaner

MATERIAL SAFETY DATA SHEET

MANUFACTURER'S NAME		<i>GRANITIZE PRODUCTS, INC.</i>	
STREET ADDRESS		11022 VULCAN STREET	
CITY, STATE AND ZIP CODE		SOUTH GATE, CALIFORNIA 90280-0893	
EMERGENCY PHONE NUMBER (24 Hours):			
Transportation Emergencies Call: CHEMTREC (800) 424-9300 Health Emergencies Call: Los Angeles Poison Information Center (800) 876-4766			
PHONE, FAX, e-MAIL		FAX	
562.923.5438 562-861-3475 info@granitize.com			
PRODUCT: AR-2 14oz / AR-14 6oz BRAKE CLEANER & PARTS CLEANER		WARNING STATEMENT: Harmful if swallowed. DO NOT induce vomiting if swallowed. Seek medical attention immediately.	
CAS NUMBER: (Not Applicable for Blends)		KEEP AWAY FROM CHILDREN. FOR INDUSTRIAL USE.	
DOT (Proper Shipping Name) ORM-D CONSUMER COMMODITY		IMO/MDG (PROPER SHIPPING NAME) AEROSOLS, 2, UN1950, PGII	
HAZARD RATING NFPA 0-LEAST FIRE - <u> 3 </u> 1-SLIGHT TOXICITY - <u> 3 </u> 2-MODERATE REACTIVITY - <u> 0 </u> 3-HIGH SPECIAL - _____ 4-EXTREME		MARINE POLLUTANT- NO STOWAGE AND SEGREGATION- CATEGORY A EMERGENCY SCHEDULE - F-D S-U	

SECTION I ... INGREDIENTS			
PRODUCT	CAS #	TLV	
ACETONE	67-64-1	750	PPM
AROMATIC HYDROCARBON	108-88-3	50	PPM
METHYL ALCOHOL	67-56-1	200	PPM
CARBON DIOXIDE COMPRESSED GAS	124-38-9	30,000	PPM

* Threshold Limit Value

A, Osha [] B, ACGII [] C, See Section III [] D, Other [] Cal Osha []

Section II .. EMERGENCY AND FIRST AID PROCEDURES	
EMERGENCY: Have a physician call: LOS ANGELES POISON INFORMATION CENTER (24 Hrs.) (800) 876-4766	
EYE CONTACT	Gently flush with large quantities of water for at least 15 minutes. Seek medical attention immediately.
SKIN CONTACT	Remove any contaminated clothing. Wash with soap and large quantities of water. Seek medical attention if irritated.
INHALATION	If breathing difficulties, dizziness, or light-headedness occur when working in areas with high vapor concentration, move to outside air immediately. If breathing stops, begin artificial respiration and seek immediate medical attention.
INGESTION	If this product is swallowed, seek medical attention immediately. <u>DO NOT</u> induce vomiting unless directed by a physician.

Section III .. PHYSIOLOGICAL EFFECTS AND HEALTH INFORMATION	
EYE EFFECTS	This product may be an eye irritant.
SKIN EFFECTS	Prolonged skin contact may result in irritation and/or Dermatitis.
SYSTEMIC EFFECTS	Various studies have shown a possible association with exposure to this product and the following:
CARCINOGEN:NTP IARC MONOGRAPHS OSHA NONE KNOWN PROP 65: THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS AND OTHER REPRODUCTIVE HARM	

SECTION IV .. SPECIAL PROTECTION INFORMATION	
RESPIRATORY PROTECTION (Specify Type)	The use of respiratory protection depends on vapor concentration of the time-weighted TLV. Use a respirator/gas mask with appropriate cartridges and canister (NIOSH approved, if available), or supplied air equipment, depending on airborne concentration.
VENTILATION	If general mechanical ventilation proves inadequate to maintain safe vapor concentrations, supplemental local exhaust may be required. Other special precautions, such as respiratory protection, may be required if vapor concentrations cannot be reduced to below the TLV by ventilation.
EYE PROTECTION	Safety glasses and/or face shields are recommended.
PROTECTIVE GLOVES	The use of heavy rubber gloves is advised to prevent skin irritation and absorption.
OTHER PROTECTIVE EQUIPMENT	Impermeable aprons, availability of eye washes and safety washes are recommended.

SECTION V .. REACTIVITY DATA	
STABILITY	Stable
Conditions to avoid	NONE
INCOMPATIBILITY (Materials to avoid)	NONE
HAZARDOUS DECOMPOSITION PRODUCTS	Thermal decomposition in the presence of air may yield carbon monoxide and/or carbon dioxide.
HAZARDOUS POLYMERIZATION	Will Not Occur

SECTION VI .. SPILL OR LEAK PROCEDURES	
HIGHWAY OR RAILWAY SPILLS - CALL CHEMTREC (800) 424-9300	
PRECAUTIONS IN CASE OF RELEASE OR SPILL	Stay upwind and away from spill unless wearing appropriate protective equipment. Stop and/or contain spill if it can be done safely. Keep all sources of ignition away.
WASTE DISPOSAL METHOD	Dispose of product in accordance with applicable local, county, state and Federal regulations.

SECTION VII .. STORAGE AND SPECIAL PRECAUTIONS	
HANDLING AND STORING PRECAUTIONS	Keep product containers cool, dry and away from sources of ignition. Use and store with adequate ventilation.
OTHER PRECAUTIONS	Personnel should avoid inhalation of vapors. Should contact be made, remove saturated clothing and flush with water.

DOT FLAMMABILITY CLASSIFICATION	Flash Point TCC LEVEL 3 AEROSOL
EXTINGUISHING MEDIA	Use Foam, CO ₂ or dry chemical fire fighting apparatus.
UNUSUAL FIRE & EXPLOSION HAZARDS	Keep work areas free of hot metal surfaces and other sources of ignition.
HAZARDOUS POLYMERIZATION	The use of self-contained breathing apparatus is recommended for fire fighters. Avoid spreading burning liquid with water. Contact Fire Dept. immediately.

SECTION IX .. PHYSICAL DATA			
BOILING RANGE N/D			
Vapor Density: : (AIR=1): N/A		V.O.C. <50%	
EVAPORATION RATE: N-BU ACKTATE=1: N/A		Percent Volatile: 18	Solubility in water: DISPERSIBLE
SPECIFIC GRAVITY: WATER=1: .82		Weight Per Gallon: 6.83#	
APPEARANCE AND ODOR: CLEAR LIQUID			

SECTION X .. DOCUMENTARY INFORMATION		
Product Code No. AR-2 / AR-14	Issue date Aug-06	Prepared By: Marty Raymondo

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, we make no representations as to its accuracy or sufficiency. Conditions of use are beyond our control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication of use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

Granitize Low-VOC Cleaner

MATERIAL HEALTH AND SAFETY BULLETIN

MANUFACTURER'S NAME GRANITIZE PRODUCTS, INC.	
STREET ADDRESS 11022 VULCAN STREET	
CITY, STATE AND ZIP CODE SOUTH GATE, CALIFORNIA 90280-0893	
EMERGENCY PHONE NUMBER (24 Hours): Transportation Emergencies Call: CHEMTREC (800) 424-9300 Health Emergencies Call: Los Angeles Poison Information Center (800) 876-4766	
PRODUCT: AR-18 BRAKE & PARTS CLEANER 1171 RULE CHEMICAL NAME: CAS NUMBER: (Not Applicable for Blends)	WARNING STATEMENT: Harmful if swallowed. DO NOT induce vomiting if swallowed. Seek medical attention immediately. KEEP AWAY FROM CHILDREN. FOR INDUSTRIAL USE.
DOT (Proper Shipping Name) ORM-D/CONSUMER COMMODITY <u>HAZARD RATING NFPA</u> 0-LEAST FIRE - <u> 3 </u> 1-SLIGHT TOXICITY - <u> 0 </u> 2-MODERATE REACTIVITY - <u> 0 </u> 3-HIGH SPECIAL - _____ 4-EXTREME	

SECTION I .. INGREDIENTS				
PRODUCT	CAS #	TLV	PEL	VOC (GRAMS PER LITER)
ACETONE	67-64-1	750	1000	0
ALIPHATIC HYDROCARBON	142-82-5	500	400	< 50
CARBON DIOXIDE COMPRESSED GAS	1330-20-7	30,000	5,000	0

* Threshold Limit Value

A, Osha [] B, ACGII [] C, Sec Section III [] D, Other [] Cal Osha []

Section II .. EMERGENCY AND FIRST AID PROCEDURES	
EMERGENCY: Have a physician call: LOS ANGELES POISON INFORMATION CENTER (24 Hrs.) (800) 876-4766	
EYE CONTACT	Gently flush with large quantities of water for at least 15 minutes. Seek medical attention immediately.
SKIN CONTACT	Remove any contaminated clothing. Wash with soap and large quantities of water. Seek medical attention if irritated.
INHALATION	If breathing difficulties, dizziness, or light-headedness occur when working in areas with high vapor concentration, move to outside air immediately. If breathing stops, begin artificial respiration and seek immediate medical attention.
INGESTION	If this product is swallowed, seek medical attention immediately. DO NOT induce vomiting unless directed by a physician.

Section III .. PHYSIOLOGICAL EFFECTS AND HEALTH INFORMATION	
EYE EFFECTS	This product may be an eye irritant.
SKIN EFFECTS	Prolonged skin contact may result in irritation and/or Dermatitis.
SYSTEMIC EFFECTS	Various studies have shown a possible association with exposure to this product and the following:
CARCINOGEN: NTP IARC MONOGRAPHS OSHA NONE KNOWN	

SECTION IV .. SPECIAL PROTECTION INFORMATION	
RESPIRATORY PROTECTION (Specify Type)	The use of respiratory protection depends on vapor concentration of the time-weighted TLV. Use a respirator/gas mask with appropriate cartridges and canister (NIOSH approved, if available), or supplied air equipment, depending on airborne concentration.
VENTILATION	If general mechanical ventilation proves inadequate to maintain safe vapor concentrations, supplemental local exhaust may be required. Other special precautions, such as respiratory protection, may be required if vapor concentrations cannot be reduced to below the TLV by ventilation.
EYE PROTECTION	Safety glasses and/or face shields are recommended.
PROTECTIVE GLOVES	The use of Heavy rubber gloves is advised to prevent skin irritation and absorption.
OTHER PROTECTIVE EQUIPMENT	Impermeable aprons, availability of eye washes and safety washes are recommended.

SECTION V .. REACTIVITY DATA	
STABILITY	Unstable _____ Conditions to avoid: Stable X NONE
INCOMPATIBILITY (Materials to avoid)	NONE
HAZARDOUS DECOMPOSITION PRODUCTS	Thermal decomposition in the presence of air may yield carbon monoxide and/or carbon dioxide.
HAZARDOUS POLYMERIZATION	May Occur _____ Conditions to avoid: Will Not Occur X NONE

SECTION VI .. SPILL OR LEAK PROCEDURES	
HIGHWAY OR RAILWAY SPILLS - CALL CHEMTREC (800) 424-9300	
PRECAUTIONS IN CASE OF RELEASE OR SPILL	Stay upwind and away from spill unless wearing appropriate protective equipment. Stop and/or contain spill if it can be done safely. Keep all sources of ignition away.
WASTE DISPOSAL METHOD	Dispose of product in accordance with applicable local, county, state and Federal regulations.

SECTION VII . STORAGE AND SPECIAL PRECAUTIONS	
HANDLING AND STORING PRECAUTIONS	Keep product containers cool, dry and away from sources of ignition. Use and store with adequate ventilation.
OTHER PRECAUTIONS	Personnel should avoid inhalation of vapors. Should contact be made, remove saturated clothing and flush with water.

SECTION VIII . FIRE AND EXPLOSION HAZARD DATA	
DOT FLAMMABILITY CLASSIFICATION	Flash Point Range <input type="checkbox"/> 20° F. <input type="checkbox"/> 20° F. to 100° F. <input checked="" type="checkbox"/> 100° F. to 200° F. <input type="checkbox"/> Over 200° F. <input type="checkbox"/> None to Boiling
EXTINGUISHING MEDIA	Use Foam, CO ₂ or dry chemical fire fighting apparatus.
UNUSUAL FIRE & EXPLOSION HAZARDS	Keep work areas free of hot metal surfaces and other sources of ignition.
HAZARDOUS POLYMERIZATION	The use of self-contained breathing apparatus is recommended for fire fighters. Avoid spreading burning liquid with water. Contact Fire Dept. immediately.

SECTION IX . PHYSICAL DATA			
APPROXIMATE BOILING RANGE °F	Vapor Density: <input checked="" type="checkbox"/> Heavier <input type="checkbox"/> Lighter Than Air		
EVAPORATION RATE: <input type="checkbox"/> Faster <input checked="" type="checkbox"/> Slower Than Ether	Percent Volatile: 60-70	Solubility in water: INCOMPLETE	
SPECIFIC GRAVITY: <input type="checkbox"/> Lighter <input checked="" type="checkbox"/> Heavier Than water	Weight Per Gallon: 10 LBS.		
APPEARANCE AND ODOR:			
CLEAR COAT WITH SOLVENT ODOR			

SECTION X . DOCUMENTARY INFORMATION		
Product Code No. AR-18	Issue date 2/00	Prepared By: R.LUKICH

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, we make no representations as to its accuracy or sufficiency. Conditions of use are beyond our control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication of use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

Mirachem 500



Material Safety Data Sheet

Mirachem[®] 500 Cleaner/Degreaser

(Formulation No. 2500)

Section I - Chemical Product and Company Identification

Manufacturer Name: The Mirachem Corporation
P.O. Box 14059
Phoenix, Arizona 85063-4059

Date Prepared: 9/24/93
Revision Date: 03/22/04

Emergency Phone: 1-(800) 847-3527

Section II - Composition/Information on Ingredients

Hazardous Component (CAS #)	OSHA PEL	ACGIH TLV	Other Limits	% (Optional)
None				

Section III - Hazards Identification

Emergency Overview: Clear, non-flammable, water based cleaner with a light citrus odor.

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

Section XI - Toxicological Information

Acute Oral: LD₅₀ > 13.0 g/kg
Acute Dermal: LD₅₀ > 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

Aerobic Aquatic Biodegradation (EPA Method 796.3100) The percentage biodegradation in 28 days was 85.8%

MiraChem 500 Cleaner/Degreaser
Formulation No. 2500

Revision Date: 08/14/02
Page 2 of 4

Section XIII - Disposal Considerations

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

Section XIV - Transportation Information

D.O.T Shipping Name:	Not Regulated	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		

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 warrantee, 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)

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.

Section 313 This product does not contain a chemical, which is listed in Section 313 at or above de minimis concentrations.

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.

TSCA All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act.

NFPA Ratings	Health = 1	Flammability = 0	Reactivity = 0	Special = 0
NPCA-HMIS Ratings	Health = 1	Flammability = 0	Reactivity = 0	Protective Equipment = None

State Regulations:

Arizona

Maricopa County Under the definitions of Rule 331, this product is considered a Low-VOC Cleaner.

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) The VOC content of this product is 80 grams/liter (0.67 pounds/gallon) with a composite partial pressure at 20°C of less than 1mm Hg.

BAAQMD This product meets the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 16 when used at a 1:1 dilution with water. The VOC content at this dilution is 40 grams/Liter (0.33 pounds/gallon) with a composite partial pressure at 20°C of less than 1 mm Hg.

SCAQMD This product, when used at normal use dilutions of 2:1 or greater is certified by the South Coast Air Quality Management District as a Clean Air Solvent (CAS). The VOC content at this dilution as determined by SCAQMD is 25 g/L (0.21 lbs./gal.) with a composite partial pressure at 20°C of less than 1 mm Hg.

Section XVI - International 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 their federal, state/province, and local laws. The following specific information is made for the purpose of complying with numerous specific foreign regulations.

Australia This product is not classified as hazardous according to criteria of Worksafe Australia. MiraChem has reviewed Australia's List of Hazardous Substances and Australia's Standard of the Uniform Scheduling of Drugs and Poisons and determined that no ingredient in this product is listed in either listing. We have also verified with NICNAS at the Australian National Occupational Health & Safety Commission (NOHSC) that all of the components in this formulation are listed in the Australian Inventory of Chemical Substances (AICS) and that no notification will be necessary under the Industrial Chemicals (Notification and Assessment) Act 1989.

Canada Non-controlled under WHMIS.

European Union All materials in this formulation are EINECS listed. Not a hazardous preparation according to the EC-Directive 88/379/EEC.

Korea All materials in this formulation have ECL Serial Numbers. No material in this product is made from animal by-products.

MiraChem 500 Cleaner/Degreaser
Formulation No. 2500

Revision Date: 08/14/02
Page 4 of 4

PWF-10



Recovery Systems Inc.

2621 Green River Rd. Unit # 105- PMB# 226 Corona, California 92882

Phone: (909) 865-2281, Fax: (909) 865-2632

Toll Free: (866) 90-WASTE

MATERIAL SAFETY DATA SHEET

PWF-10

EMERGENCY TELEPHONE NUMBER: (800) 424-9300

PAGE 1 of 3 PAGES

Latest Revision: 4 June 2002

Print Date: 4 June 2002

SECTION 1, PRODUCT IDENTIFICATION

PRODUCT NAME OR NUMBER.....PWF-10
TRADE NAME OR CHEMICAL NAME.....PWF-10
SYNONYMS.....None
FORMULA.....Proprietary
CHEMICAL FAMILY.....Cleaner
MOLECULAR WEIGHT.....N/A
NFPA.....See Section 8
HMIS RATING.....See Section 8

SECTION 2, HAZARDOUS INGREDIENTS AND HAZARD DATA

CHEMICAL NAME	CAS NUMBER	%WT	TLV-ACGIH	PEL-OSHA	SEC.313	NTP	IARC	PROP.65
Tetrapotassium Pyrophosphate	7320-34-5	<5	N/A	N/A	No	N/A	N/A	No

SECTION 3, REGULATORY DATA

NTP.....NATIONAL TOXICOLOGY PROGRAM
IARC.....INTERNATIONAL AGENCY FOR RESEARCH ON CANCER
PROPOSITION 65.....THIS PRODUCT DOES NOT CONTAIN INGREDIENTS ON THE LIST OF PROPOSITION 65. STATE OF CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986.
SECTION 313, SARA TITLE III.....THE CHEMICAL(S) MARKED WITH A "YES" ON SECTION 313 ARE SUBJECT TO THE REPORTING REQUIREMENTS OF THIS SECTION.

SECTION 4, PHYSICAL DATA

BOILING/MELTING POINT.....>212°F
Ph.....7.0 - 9.0
PERCENT VOLATILE BY WEIGHT (%).... 98
SPECIFIC GRAVITY OR BULK DENSITY...1.043
SOLUBILITY IN WATER..... COMPLETE
ODOR.....LIGHT CHERRY SCENTED

SECTION 5, FIRE AND EXPLOSION HAZARD DATA

FLASH POINT OF..... N/A
AUTOIGNITION TEMPERATURE..... N/A
FLAMMABILITY LIMITS IN AIR (%V)..... NOT DETERMINED
EXTINGUISHING MEDIA.....WATER, CARBON DIOXIDE, FOAM, DRY CHEMICAL
SPECIAL FIRE FIGHTING PROCEDURES...WEAR SELF-CONTAINED BREATHING APPARATUS & FULL PROTECTIVE EQUIPMENT.
UNUSUAL FIRE & EXPLOSION HAZARDS..EXTINGUISH ALL NEARBY SOURCES OF IGNITION.

SECTION 6, HEALTH HAZARD DATA – EFFECTS OF OVEREXPOSURE

THRESHOLD LIMIT VALUE.....See Section 2.

SIGN AND SYMPTOMS OF EXPOSURE

EYES.....DIRECT CONTACT WITH CONCENTRATED PRODUCT MAY CAUSE MODERATE IRRITATION AND TEARING.
 SKIN.....REPEATED OR PROLONGED CONTACT MAY CAUSE IRRITATION OR DRYING.
 INHALATION.....BREATHING DUST OR MIST MAY IRRITATE THE NOSE & THROAT.
 INGESTION.....SWALLOWING LARGE QUANTITIES MAY CAUSE NAUSEA, VOMITING, DIARRHEA AND ABDOMINAL PAIN.
 CHRONIC OVEREXPOSURE.....NONE KNOWN.

SECTION 7, EMERGENCY AND FIRST AID PROCEDURES

INHALATION.....MOVE SUBJECT TO FRESH AIR. IF BREATHING IS DIFFICULT, OBTAIN MEDICAL HELP.
 EYES.....FLUSH EYES WITH A LARGE AMOUNT OF WATER FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN IF IRRITATION PERSISTS.
 SKIN.....WASH AFFECTED SKIN AREAS WITH WATER. CONSULT PHYSICIAN IF IRRITATION PERSISTS.
 INGESTION.....NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. DO NOT INDUCE VOMITING. GIVE LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION IMMEDIATELY.

SECTION 8, HMIS RATING SYSTEM

HMIS RATING

HEALTH HAZARD.....1
 FIRE HAZARD.....0
 REACTIVITY.....0
 PERSONAL PROTECTION.....SEE SECTION 10

NFPA



SECTION 9, REACTIVITY DATA

PRODUCT STABILITY.....STABLE
 CONDITIONS TO AVOID.....EXTREME HEAT, SPARK, OPEN FLAME
 CHEMICAL INCOMPATIBILITY.....STRONG ACID, ACID VAPOR. MAY PRODUCE CARBON DIOXIDE, CARBON MONOXIDE
 HAZARDOUS DECOMPOSITION PRODUCTS.....N/D
 HAZARDOUS POLYMERIZATION.....WILL NOT OCCUR
 CONDITIONS TO AVOID.....EXTREME HEAT, SPARK, OPEN FLAME
 CORROSIVE TO METAL.....NO
 OXIDIZER.....NO

SECTION 10, SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION.....NOT NEEDED

VENTILATION:
LOCAL EXHAUST.....NEEDED

PROTECTIVE CLOTHING.....SAFETY GLASSES, NEOPRINE OR RUBBER GLOVES

SECTION 11, ENVIRONMENTAL DATA

ENVIRONMENTAL TOXICITY DATA.....NONE
SPILL OR LEAK PROCEDURES.....CONTAIN, COLLECT AND DISPOSE PER LOCAL, STATE
AND FEDERAL REGULATIONS.
WASTE DISPOSAL METHODS.....PER LOCAL, STATE AND FEDERAL REGULATIONS.
CONTAINER DISPOSAL.....PER LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION 12, SHIPPING DATA

D.O.T. PROPER SHIPPING NAME.....NOT REGULATED
HAZARDOUS SUBSTANCES 49CFR CERCLA.....NONE
D.O.T. HAZARD CLASS.....NONE
D.O.T. LABELS REQUIRED.....NONE
D.O.T. PLACARDS REQUIRED.....NONE
POISON CONSTITUENT.....NONE
BILL OF LADING DESCRIPTION.....PWF-10
PACKING GROUP.....NONE
UN/NA CODE.....NONE

SECTION 13, SUPPLIER INFORMATION

Worldwide Recovery Systems, Inc supplies PWF-10. For additional information call (909) 865-2281

EMERGENCY TELEPHONE NUMBER: (800) 424-9300

MX Factor MX2803

MX2803

Parts & Brake Cleaner

South Coast Air Quality Management District Compliant
The Best SCAQMD Compliant Product on the Market!

Looking for a Rule 1171 compliant product that works?

MX Factor has found the answer. MX Factor's **MX2803** is the best South Coast AQMD Parts and Brake Cleaner on the market. Our less than 25 grams per liter formula meets all air quality regulations in California. **MX2803's** special blend of cleaning agents will blast away brake fluid, grease, oil and other contaminants.

PRODUCT FEATURES

- The best South Coast AQMD Rule 1171 Compliant product on the market!
- California Air Resources Board (CARB) Compliant
- Quickly removes grease & oil
- Powerful spray assists cleaning action
- Flushes oil, dirt and carbon from electric motors
- Cleans brakes, engine and ignition parts & carburetors
- Quick and Easy to Use
- Leaves no residue
- Fast Drying
- Safe for most plastics

MX Factor's **MX2803** is ideal for maintenance and repair on:

- Automobiles
- Heavy trucks
- City buses
- Motorcycles and ATVs
- Recreational vehicles
- Fork lifts and other mechanical vehicles

With **MX2803's** powerful spray, you can quickly and effectively remove:

- Brake fluid
- Brake dust
- Grease and oil
- Carbon buildup



Please see MX Factor's MSDS sheet for additional information.



1888) USE - MXNOW

WWW.MXFACTOR.COM
4230 Charter Street Vernon, California 90058

INFO@MXFACTC

PATENT PENDING