ASSESSMENT, DEVELOPMENT AND DEMONSTRATION OF LOW-VOC MATERIALS FOR CLEANING ULTRAVIOLET AND ELECTRON BEAM CURABLE COATINGS AND ADHESIVES

Prepared for:
South Coast Air Quality Management District
Under Contract # 03133

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

May 2006

DISCLAIMER

This report was prepared as a result of work sponsored and paid for in whole by the South Coast Air Quality Management District (AQMD). The opinions, findings, conclusions, and recommendations are those of the authors and do not necessarily represent the views of AQMD. AQMD, its officers, employees, contractors, and subcontractors make no warranty, expressed or implied, and assume no legal liability for the information in this report. AQMD has not approved or disapproved this report, nor has AQMD passed upon the accuracy or adequacy of the information contained herein.

ACKNOWLEDGMENTS

This analysis 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 Adewale Oshinuga, Lou Yuhas, Rizaldy Calungcagin and Lee Lockie of the South Coast Air Quality Management District. We are especially grateful to the companies that agreed to test alternative cleaning agents for this project and to the vendors who provided the alternative cleaning agents for testing. Finally, we appreciate the efforts of Amy Blume of IRTA in helping to prepare the document.

EXECUTIVE SUMMARY

The South Coast Air Quality Management District (SCAQMD) regulates VOC emissions in four counties in Southern California. One of the SCAQMD regulations specifies VOC limits for materials used for cleaning coating and adhesive application equipment. The VOC limit for the materials used for these purposes is 25 grams per liter.

The Institute for Research and Technical Assistance (IRTA) is a nonprofit organization established in 1989 to assist companies and industries in finding alternatives to ozone depleting, toxic and VOC solvents. A major focus of IRTA's work is cleaning alternatives.

In this project, IRTA identified, tested and demonstrated alternative low-VOC materials and methods for cleaning ultraviolet (UV) and electron beam (EB) curable coating and adhesive application equipment. Four facilities participated in the project. The first facility, Sandberg Furniture, is a major wood furniture manufacturer. The company uses UV curable coatings in a flat wood coating operation. The second facility, Medtronic Diabetes, is a medical device manufacturer. Medtronic has several operations that use UV curable adhesives. The third facility, DRS Sensors & Targeting Systems, is an aerospace facility that uses a UV curable conformal coating for electronic devices. The fourth facility, Huhtamaki, applies an EB clear coating to consumer packaging.

The alternative methods and cleaning agents tested during the project included not cleaning at all, plain water, water-based cleaners, acetone and methyl acetate. Acetone and methyl acetate are exempt from VOC regulations. All of the facilities that participated in the project found alternatives that met the VOC limit of 25 grams per liter for cleaning coating and adhesive application equipment. Alternatives were judged to be effective if they cleaned at least as well as the VOC solvents used currently for cleanup.

Table E-1 summarizes the results of the low-VOC alternatives used or tested at each of the facilities that participated in the project. The table lists the facility, the type of cleaning operation and the low-VOC material that performed most effectively in the operation.

Table E-1
Results of Low-VOC Alternatives Testing

Company	Cleaning Task	Low-VOC Alternative
Sandberg Furniture	Routine Maintenance	No Cleaning
	Periodic Maintenance	Acetone
Medtronic Diabetes	CAM/TAM Adhesive Equipment	Acetone
	PATCH Equipment	Water-Based Cleaner
DRS Sensors & Targeting Systems	Conformal Coating Equipment	Methyl Acetate
Huhtamaki	Floor Cleaning	Water
	Clear Coating Station	Water-Based Cleaner

Note: CAM and TAM are automated medical device assembly machines.

The cost of using the alternative low-VOC materials for cleaning UV and EB curable coatings and adhesives from application equipment could not be determined for one of the facilities. For one participating facility, the cost of using the alternatives for cleanup would be lower than the cost of using the high VOC cleaner. For one facility, the cost would be higher and for one facility, the cost would be the same.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION AND BACKGROUND

Volatile Organic Compound (VOC) emissions from solvent cleaning operations contribute significantly to the South Coast Air Basin's emission inventory. The South Coast Air Quality Management District (SCAQMD or District) periodically adopts an Air Quality Management Plan (AQMP). This AQMP calls for significant reductions in VOC emissions from cleaning and degreasing operations by 2010 to achieve attainment status.

The SCAQMD regulates VOC emissions from businesses located in the four county area including Los Angeles County, Orange County, San Bernardino County and Riverside County. One of the District's rules that focuses on cleaning applications is Rule 1171 "Solvent Cleaning Operations." One of the categories of cleaning regulated in Rule 1171 is cleaning of coating and adhesive application equipment. On July 1, 2005, the VOC limit for this type of cleaning was reduced from 550 grams per liter VOC to 25 grams per liter VOC. This is one of the VOC limits adopted by the District to reduce VOC emissions from cleaning operations in the Basin.

The Institute for Research and Technical Assistance (IRTA) is a nonprofit organization established in 1989. IRTA works with companies to test and demonstrate alternatives to ozone depleting, VOC and toxic solvents. IRTA also conducts projects that focus on finding low-VOC, low toxicity alternatives for whole industries. IRTA runs and operates the Pollution Prevention Center, a loose affiliation of local, state and federal governmental organizations and a large electric utility company.

The District contacted with IRTA to identify, test and demonstrate low-VOC alternative materials for cleaning coating and adhesive application equipment. IRTA completed that project in 2003 and reported the results in a document entitled "Assessment, Development and Demonstration of Low-VOC Cleaning Systems for South Coast Air Quality Management District Rule 1171." The work on cleanup of coating and adhesive application equipment in that project focused only on traditional coatings and did not address cleanup of ultraviolet (UV) or electron beam (EB) cured coatings or adhesives. The District contracted with IRTA to conduct a separate project to identify, test and demonstrate low-VOC materials for specifically cleaning UV and EB curable coating and adhesive application equipment.

Tests of Alternative Low-VOC Cleaners

Performance of the alternative cleaning agents at each facility was evaluated on a case-by-case basis. In each instance, plant personnel provided information on their requirements for the cleaning process. In some cases, IRTA obtained a sample of the coating or adhesive that required cleaning. IRTA conducted laboratory testing to screen cleaners that might be appropriate for testing in the operation. IRTA then provided or took to the facility cleaners that might be effective and they were tested. In terms of performance, a cleaning alternative was judged as successful if it cleaned as well as or better than the

cleaning process the company uses currently. When there were differences in the cleaning process, these were noted.

The alternative low-VOC materials that were used by or tested in the participating facilities included not cleaning at all, plain water, water-based cleaners, methyl acetate and acetone. Acetone and methyl acetate are exempt from VOC regulations and the water-based cleaners that were tested have a VOC content of 25 grams per liter or less. The UV or EB curable coatings or adhesives that require removal from the application equipment were not cured so cleaning could be performed effectively with these techniques and materials.

Cost Analysis

IRTA performed cost analysis and comparison for the alternatives that were successful at the participating facilities. There were no capital equipment costs for the facilities and none of the facilities indicated there would be different labor costs with use of the alternatives. The cost analysis and comparison was generally based on the cleaner cost and the cleaning material costs. No cost comparison was performed for one of the facilities because there were no records of the cost of cleaning.

Report Structure

This document reports the results of a project to find alternative low-VOC cleanup materials for UV and EB curable coatings and adhesives. During the project, IRTA worked with four facilities that used UV or EB curable coatings or adhesives. Section II of this document presents the work that was performed on alternatives for each of the facilities participating in the project. In each case, it describes the process used by the facility, discusses what material is used for cleanup of the application equipment currently, presents the results of the alternative low-VOC material testing and analyzes and/or compares the cost of using the high and low-VOC cleanup materials. Section III of the document summarizes the conclusions and results of the project.

II. ANALYSIS OF THE ALTERNATIVE CLEANING AGENTS.

This section presents the results of the tests of the alternative low-VOC cleaning agents. It focuses on four facilities that agreed to participate in the project. Table 2-1 lists the four facilities and describes their UV or EB operation.

Table 2-1
Facilities Participating in the Project

Company	Description of Operation	Type of Adhesive or Coating
Sandberg Furniture	Wood Furniture Manufacture	UV Curable Coatings
Medtronic Diabetes	Medical Device Manufacture	UV Curable Adhesives
DRS Sensors and Targeting Systems, Inc.	Aerospace Facility	UV Curable Conformal Coating
Huhtamaki	Consumer Packaging	EB Curable Coating

Sandburg Furniture, a major wood furniture manufacturer in the Basin, has a flat line that uses UV curable coatings. Medtronic MiniMed is a leader in manufacturing implantable medical devices; the company has several operations that involve the use of UV curable adhesives. DRS, an aerospace facility, applies a UV curable conformal coating to electronic devices. Finally, Huhtamaki manufactures consumer packaging; the company applies an EB curable clear coating over the printed material.

The companies that participated in the project were selected to represent the range of the different types of facilities in the Basin using UV and EB curable inks or adhesives. All of the facilities produce high quality products. This section presents the detailed testing and cost analysis results for the four facilities. No cost analysis or comparison is provided for Sandberg Furniture.

Sandberg Furniture Mfg. Co., Inc.

Sandberg Furniture, one of California's longest standing premier manufacturers of bedroom and entertainment furniture is located in Vernon, California. The company was founded in 1918 and is still owned and operated by the fourth generation of the Sandberg family. The company has 450 employees. Sandberg manufactures medium priced master bedroom furniture, youth bedroom furniture and entertainment wall systems.

The Sandberg property consists of four buildings totaling 300,000 square feet, on 14 acres. The company purchases particleboard and medium density fiberboard and does its own laminating and finishing. The finishes used by Sandberg are applied by spray and roll coating. The coatings are UV cured. The flat line was engineered to use 100 percent solid UV curable coatings; components are finished first and then assembled. A picture of the flat line is shown in Figure 2-1.

Figure 2-1. Flat Line at Sandburg Furniture

After adopting the UV curable coatings, Sandberg reduced their 1990 VOC emissions by 92 percent. According to Phil Sweet, Vice President of Manufacturing, "As far as we know, Sandberg was the first wood production facility in the Los Angeles Basin to implement water-based topcoats, in 1991. And the first woodworking facility to install a 100 percent solid, sprayable zero VOC, UV-cured finishing line, in 1995."

Prior to 1996, when the company purchased eight new Accuspray paint spray guns, the first two sets caused many opportunities; cleanup involved the use of VOC solvents. Originally, the cleanup process included flushing the lines with solvent and taking the guns apart and immersing them in solvent. Once the Accuspray guns were installed, the cleanup routine was simplified to a daily inspection of the filters and a weekly wipedown of the spray guns and roll coaters. The conveyor belt has a built in scraper to recover all excess coating on an ongoing basis. Small amounts of exempt solvents are used during the routine cleanup process. Sandberg performs the higher level of cleaning, with exempt solvents, every few months. When solvent cleaning is required, the company uses a small amount of acetone. An MSDS for acetone is shown in Appendix A. There are no non-exempt VOC emissions from the cleanup process.

VOC emissions at the Sandberg facility this year will be less than five tons. Facility emissions were permitted at 219 tons in 1990.

Medtronic Diabetes

Medtronic Diabetes is a business unit of Medtronic, Inc., the world's largest medical technology company. Located in Northridge, California, Medtronic Diabetes is the world leader in insulin pump therapy and continuous glucose monitoring systems for the treatment of diabetes. Medtronic Diabetes has three types of operations that use UV curable adhesives.

IRTA began work with Medtronic Diabetes as part of a project sponsored by the South Coast Air Quality Management District. The project was designed to investigate whether low-VOC cleanup materials could be used to clean ultraviolet and electron beam curable coatings and adhesives. IRTA worked with Ginger Lichauco, Medtronic's Director of Safety, Security and Environmental Compliance, to test low-VOC alternatives for cleanup of the application equipment used to apply the adhesives.

In the disposable packaging area, Medtronic Diabetes has several machines that are used to apply adhesive to the packaging material.

In another area, the PATCH machine is used to bond polycarbonate sensors to a patch. Medtronic Diabetes wanted to start a new program of regular maintenance using a low-VOC cleaner for the application equipment.

IRTA obtained a sample of the adhesive used in the PATCH machine to conduct preliminary testing of low-VOC cleaning agents. Several alternatives, including plain water, a water-based cleaner made by Mirachem and a soy based cleaner, were tested. The Mirachem cleaner appeared to work well in the preliminary testing at 100 percent concentration without leaving a residue. An MSDS for the Mirachem cleaner, called Mirachem 500, is shown in Appendix A. IRTA provided samples of the Mirachem cleaner to Medtronic Diabetes and the cleaner was tested on the adhesive residue. According to the engineers performing the testing, the cleaner worked well.

For the CAM and TAM machines, which are automated medical device assembly machines, IRTA provided the company with several suggestions for cleaning the adhesive from the application equipment. The cleaner that worked best for this operation was acetone. The company wanted to continue using polywipes in the cleaning operation and polywipes are supplied with both IPA and acetone. Medtronic Diabetes uses 5 cases of clean room wipes containing IPA for cleaning the CAM and TAM application equipment each year. Each case contains 12 rolls of 100 sheets. The cost of each case is $235. On this basis, the annual cost of using the IPA wipes is $1,175. The acetone wipes have the same price as the IPA wipes. Assuming the same amount of wipes would be used, the cost of the acetone wipes is $1,175 annually.

For the PATCH machine, Medtronic Diabetes estimates it will use one gallon per month of the Mirachem to clean and maintain the system. The Mirachem will be used at a one-

third concentration in water. At a cost of $18 per gallon including freight for purchases in five gallon quantities, the cost of using the Mirachem would amount to $216 per year. No cost comparison with other cleaning materials was performed because the regular maintenance program has just been initiated.

Table 2-2 shows the cost comparison for the CAM and TAM equipment cleaning at Medtronic Diabetes. The values show that the cost is the same for using the low-VOC wipes containing acetone and the high VOC wipes containing IPA.

Table 2-2
Annualized Cost Comparison for Medtronic Diabetes

	IPA Wipes	Acetone Wipes
Cleaning Wipes Cost	$1,175	$1,175
Total Cost	$1,175	$1,175

DRS Sensors & Targeting Systems, Inc.

DRS is located in Cypress, California. The company develops and prototypes EO sensors and targeting systems. One of the operations at DRS involves applying a conformal coating to electronic assemblies. The company uses a spray gun to apply a UV curable conformal coating.

IRTA began work with DRS as part of a project sponsored by the South Coast Air Quality Management District. The project was designed to investigate whether low-VOC cleanup materials could be used to clean ultraviolet and electron beam curable coatings and adhesives. IRTA worked with DRS to test low-VOC alternatives for cleanup of the spray gun used to apply the UV curable conformal coating.

DRS uses isopropyl alcohol (IPA) to clean the application equipment. An MSDS for IPA is shown in Appendix A. After the conformal coating is applied, the DRS engineer puts a small amount of IPA into the spray gun cup to remove the uncured UV coating residue from the spraying operation. The engineer swirls the IPA and turns the cup upside down to ensure the IPA reaches all parts of the cup. The engineer uses a wipe cloth to wipe out the sides and bottom of the cup. Finally, the engineer then adds some additional IPA to the spray gun cup and flushes the gun. The cup is inspected under a black light which will show whether there is a residue remaining.

IRTA obtained a sample of DRS's coating from the vendor. An MSDS for the coating is provided in Appendix B. IRTA conducted screening tests to determine which low-VOC alternatives might be suitable for removing the coating. The alternatives that were tested included plain water, acetone, methyl acetate, a water-based cleaner called Mirachem 500 and a vegetable based cleaner called Soy Gold 2500. MSDSs for these materials are shown in Appendix A. IRTA also tested IPA so the cleaning capability of the alternatives could be compared to it. The results of the screening tests indicated that plain water

appeared to clean the coating well, the Mirachem 500 cleaned well but was likely to require a rinse, the soy cleaner left a significant residue, acetone did not work as well as IPA and methyl acetate worked better than IPA.

IRTA then conducted field tests at DRS with the engineer in charge of the operation, Ray Salud. The protocol involved testing the cleaner in the cup, swirling it and turning it upside down to get good coverage, wiping the cup, then adding more IPA and spraying the gun into a bucket. After the cup was cleaned, it was inspected under a black light.

The results of the testing indicated that deionized water left a residue before the sides of the cup were wiped. After the sides were wiped, the residue was substantially less but was still evident. The results also indicated that the Mirachem 500 appeared to leave some solid particles in the cup. Acetone did not clean the cup as well as IPA. Methyl acetate was the best cleaner and it cleaned the coating better than IPA. IRTA and the DRS engineer decided not to test the soy based product because it, like the Mirachem cleaner, was likely to leave a residue that would require rinsing which would be an additional step.

IRTA performed a cost analysis of using IPA and using the alternatives that performed most successfully, acetone and methyl acetate. The DRS engineer estimates that the company uses about one-half gallon of IPA annually to clean the coating application equipment. IRTA assumed that the use of acetone or methyl acetate for this purpose would be the same. The company would only purchase one gallon of cleaner at a time, probably from a specialty lab. IRTA obtained costs for the three materials if purchased in one gallon amounts. The price of acetone is the lowest, at $11.30 per gallon. The price of IPA is $16 per gallon and the price of methyl acetate is $35 per gallon. IRTA also obtained prices for the materials from a local chemical supplier that offers all three chemicals. Because the chemicals would be purchased in small one gallon quantities, he indicated he would charge $50 per gallon for all three chemicals because of the handling.

The used IPA from the cleanup operation is shipped off-site as hazardous waste. The acetone and the methyl acetate would need to be handled in the same manner. Acetone and methyl acetate are much more volatile than IPA so emissions could be higher if they were used in the operation. This means that the waste volume of the two low-VOC alternatives might be lower. For purposes of analysis, IRTA assumed that the waste volume and cost of waste disposal would be the same for all three chemicals. The waste disposal cost, accordingly, was not included in the analysis.

Table 2-3 presents the annualized cost comparison for the cleanup solvents for DRS assuming the company would purchase the IPA, acetone or methyl acetate from a laboratory. The values indicate that using acetone is the lowest cost option and that using methyl acetate would more than double the cost of using the IPA baseline chemical. If the materials were purchased from the local chemical supplier, the materials would be more expensive but they would all carry an equal cost.

Table 2-3
Annualized Cost Comparison for DRS Sensors & Targeting Systems

	IPA	Acetone	Methyl Acetate
Cleaner Cost	$8.00	$5.65	$17.50
Total Cost	$8.00	$5.65	$17.50

Huhtamaki

Huhtamaki is located in Los Angeles, California. The company is international and the business entity in Los Angeles makes consumer packaging, primarily for ice cream cartons. Huhtamaki has an eight stage web press with seven color stations and a clear coating station. A picture of the press is shown in Figure 2-2. Huhtamaki is one of the few companies in the U.S. that uses an electron beam curable ink and an electron beam curable coating for the clear coat.

Figure 2-2. Press at Huhtamaki

IRTA began work with Huhtamaki as part of a project sponsored by the South Coast Air Quality Management District. The project was designed to investigate whether low-VOC cleanup materials could be used to clean ultraviolet and electron beam curable coatings and adhesives. IRTA worked with Huhtamaki to test low-VOC alternatives on the clear coating station.

Historically, Huhtamaki used two 55 gallon drums per month of a VOC solvent called EB Wash for cleaning. An MSDS for this cleaner is shown in Appendix A. Half of the EB Wash, one drum per month or 660 gallons per year, was used for off-press cleaning and half was used for on-press cleaning as a blanket wash, a roller wash and a coating cleanup

material. Huhtamaki estimates that about 93 gallons are used on-press for cleaning the ink on each printing station annually and about one-tenth as much, or nine gallons per year, was used to clean the coating station annually. Of the nine gallons, one-half gallon was used to clean coating residue on the floor.

The alternative that was most effective in cleaning the coating is a water-based cleaner called Brulin GD 815 MX. An MSDS for this cleaner is shown in Appendix A. Through testing, it was found that plain water was effective in cleaning the coating residue on the floor. Several different concentrations of the Brulin cleaner were tested for cleaning the coating station and a concentration of 50 percent Brulin/50 percent water was found to be as effective as the EB solvent in cleaning the coating. Huhtamaki has converted to the Brulin cleaner for cleaning the coating station and plain water for cleaning the coating residue on the floor.

The cost of the EB Wash solvent is $9.09 per gallon. Assuming that nine gallons of the solvent was used for coating cleanup, the annual cost of the solvent for this purpose amounted to $82. The cost of the Brulin water-based cleaner is $5.75 per gallon. Assuming that 8.5 gallons of the cleaner are used for cleaning the coating station and that a 50 percent concentration of the cleaner is required, the annual cost of the water-based cleaner amounts to $24. The cost of the plain water for floor cleaning was assumed to be zero.

Table 2-4 shows the annualized cost comparison for Huhtamaki. The values indicate that the cost for cleanup with the water-based cleaner is significantly lower than the cost of cleaning with the high VOC solvent.

Table 2-4
Annualized Cost Comparison for Huhtamaki

	EB Wash Solvent	Water-Based Cleaner/ Water
Cleaner Cost	$82	$24
Total Cost	$82	$24

III. SUMMARY AND CONCLUSIONS

During this project, IRTA worked with four facilities in the South Coast Basin to document the use of and test alternative low-VOC materials for cleaning UV and EB curable coating and adhesive application equipment. The alternatives used or tested successfully by the facilities had a VOC content of 25 grams per liter or less. This is the current limit for materials used for cleaning coating and adhesive application equipment in SCAQMD Rule 1171.

Sandberg Furniture put in a UV coating flat line several years ago. Since then, the company does not need to use VOC solvents to clean the application equipment. Sandberg now does not clean routinely and, when periodic cleaning is required, uses acetone. Acetone is exempt from VOC regulations.

Medtronic Diabetes uses UV curable adhesives in several of their operations. The company has decided to use acetone premoistened wipes for cleaning the application equipment in some of the operations. The cost of converting to acetone for cleaning would be the same as the cost of using IPA. In another operation, the company plans to use a water-based cleaner for routinely cleaning the application equipment.

DRS Sensors & Targeting Systems historically used IPA for cleaning the application equipment used to apply UV curable conformal coatings to electronic devices. The testing indicated that the best alternative for this cleaning task is methyl acetate which performed better than IPA. The cost of converting to methyl acetate would increase DRS's cost of cleaning.

Huhtamaki applies a clear EB curable coating over ice cream carton packaging that is printed using a lithographic printing press. Plain water was found to be effective for cleaning the coating residue from the floor. A water-based cleaner was found to perform well for cleaning the coating application equipment station on the press. The cost of using the low-VOC alternatives would reduce Huhtamaki's cleaning cost.

Table 3-1 presents the facilities and the alternatives that worked most effectively for their operations.

Table 3-1
Results of Low-VOC Alternatives Testing

Company	Cleaning Task	Low-VOC Alternative
Sandberg Furniture	Routine Maintenance	No Cleaning
	Periodic Maintenance	Acetone
Medtronic Diabetes	CAM/TAM Adhesive Equipment	Acetone
	PATCH Equipment	Water-Based Cleaner
DRS Sensors & Targeting Systems	Conformal Coating Equipment	Methyl Acetate
Huhtamaki	Floor Cleaning	Water
	Clear Coating Station	Water-Based Cleaner

Note: CAM and TAM are automated medical device assembly machines.

The results of the project indicate that low-VOC alternatives can be used by facilities that employ UV and EB curable coatings in their operations. Alternatives that were tested successfully in the project include not cleaning at all, plain water, water-based cleaners, acetone and methyl acetate.

Appendix A
Material Safety Data Sheets for High VOC and Low-VOC Cleaners

High VOC Cleaner Used at DRS Sensors &Targeting Systems

VAN WATER & ROGER -- ISOPROPYL ALCOHOL -- 6505-00-261-7256

========== Product Identification ==========

Product ID:ISOPROPYL ALCOHOL
MSDS Date:05/01/1993
FSC:6505
NIIN:00-261-7256
MSDS Number: BVGJL
=== Responsible Party ===
Company Name:VAN WATER & ROGER
Address:2600 CAMPUS DR
Box:5932
City:SAN MATEO
State:CA
ZIP:94403-2522
Country:US
Info Phone Num:714-864-2310
Emergency Phone Num:800-424-9300
Preparer's Name:C.A.EISENHARD
CAGE:09N91
=== Contractor Identification ===
Company Name:CHEMICAL COMMODITIES AGENCY, INC.
Address:27447 PACIFIC STREET
Box:City:HIGHLAND
State:CA
ZIP:92346-2640
Country:US
Phone:909-864-2310
CAGE:60777
Company Name:VAN WATER & ROGERS INC.,SUB OF UNIVAR
Address:6100 CARILLON POINT
Box:5932
City:KIRKLAND
State:WA
ZIP:98033
Country:US
Phone:206-889-3400
CAGE:09N91
Company Name:VAN WATERS AND ROGERS
Address:2256 JUNCTION AVE
City:SAN JOSE
State:CA
ZIP:95131
Country:US
Phone:408-435-8700/800-424-9300(CHEMTREC)
CAGE:0AN91

========== Composition/Information on Ingredients ==========

Ingred Name:ISOPROPYL ALCOHOL (SARA III) (PER SPEC, MATERIAL IS
"ISOPROPYL ALCOHOL, N.F." FORMULATION COULD NOT BE FOUND."
CAS:67-63-0
RTECS #:NT8050000
Fraction by Wt: PER N F
Other REC Limits:NONE DETERMINED
OSHA PEL:400 PPM/500 STEL
ACGIH TLV:400 PPM/500STEL;9192

========== Hazards Identification ==========

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:INHALATION-IRRITATION OF NOSE & THROAT. EYES-IRRITATION, CORNEAL BURNS. PROLONGED EXPOSURE TO HIGH CONCENTRATIONS MAY CAUSE SEVERE OR FATAL CNS DEPRESSION.
Explanation of Carcinogenicity:NOT CARCINOGENIC.
Effects of Overexposure:INHALATION-HIGHER CONCENTRATIONS MAY CAUSE HEADACHE, VOMITING, COMA. EVEN HIGHER CONCENTRATIONS MAY CAUSE COMA OR DEATH. SKIN-DRYNESS, POSSIBLE DERMATITIS. INGESTION-LARGE AMOUNTS CAUSES HEADACHE, NAU SEA, VOMITING, STOMACH CRAMPS, UNCONSCIOUSNESS OR DEATH.
Medical Cond Aggravated by Exposure:PRE-EXISTING SKIN DISORDERS, EYE PROBLEMS, OR IMPAIRED RESPIRATORY FUNCTION MAY BE SUSCEPTIBLE.

========== First Aid Measures ==========

First Aid:INHALATION: REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NEEDED, SEEK MEDICAL ATTENTION. EYES: FLUSH WITH WATER FOR 15 MINUTES, GET MEDICAL ATTENTION. SKIN: WASH AREA WITH SOAP & WATER. IF IRRI TATION PERSISTS, SEEK MEDICAL ATTENTION.INGESTION: INDUCE VOMITING BY GIVING WATER, PREVENT ASPIRATION, GET IMMEDIATE MEDICAL ATTENTION.

========== Fire Fighting Measures ==========

Flash Point Method:TCC
Flash Point:53.0F,11.7C
Lower Limits:2.0
Upper Limits:12.7
Extinguishing Media:WATER SPRAY, DRY CHEMICAL, CARBON DIOXIDE, ALCOHOL FOAM; DO NOT USE DIRECT WATER SPRAY.
Fire Fighting Procedures:FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS & FULL PROTECTIVE CLOTHING. USE WATER SPRAY TO COOL NEARBY CONTAINERS & STRUCTURES THAT ARE EXPOSED.
Unusual Fire/Explosion Hazard:EXTINGUISH ALL NEARBY SOURCES OF IGNITION BECAUSE VAPORS MAY BE MOVED BY AIR CURRENTS TO IGNITION SOURCES DISTANT FROM THE HANDLING POINT.

========== Accidental Release Measures ==========

Spill Release Procedures:EXTINGUISH ALL IGNITION SOURCES. MAKE SURE ALL HANDLING EQUIPMENT IS ELECTRICALLY GROUNDED. FOR SMALL SPILLS MOP UP & PLACE IN D.O.T. APPROVED CONTAINERS.

========== Handling and Storage ==========

Handling and Storage Precautions:KEEP AWAY FROM HEAT, SPARKS & OPEN FLAMES. STORE IN COOL, DRY, WELL-VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERAILS. VENT CONTAINERS FREQUENTLY.
Other Precautions:MORE OFTEN IN WARM WEATHER, USE ONLY ON NON-SPARKING TOOLS AND ELECTRICALLY GROUND ALL EQUIPMENT WHEN HANDLING THIS PRODUCT. DO NOT USE PRESSURE TO EMPTY CONTAINERS. EMPTY CONTAINERS CAN HAVE RESIDUES , GASES & MISTS.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:BASED UPON CONTAMINATION LEVELS IN THE WORK PLACE. FOR EXAMPLE: HALF MASK AIR-PURIFYING CARTRIDGE RESPIRATORS

OR SUPPLIED AIR RESPIRATORS.
Ventilation:LOCAL-MECHNAICAL EXHAUST.
Protective Gloves:RUBBER GLOVES.
Eye Protection:SAFETY GOGGLES.
Other Protective Equipment:RUBBER APRON, RUBBER BOOTS, IMPERVIOUS CLOTHING.
Work Hygienic Practices:EYE WASH FOUNTAIN, QUICK DRENCH SHOWER.
Supplemental Safety and Health
AN MSDS WAS REQUESTED. CHEM COMMODITIES INFORMED US 12OCT94 THAT THEY HAD SUPPLIED VAN WATERS & ROGERS MATERIAL TO DPSC. MSDS COPIED FOR ANOTHER VWR WHICH HAD BEEN SUPPLIED BY CHEM COMMODITIES. -- MA TERIAL PER SPEC IS "ISOPROPYL ALCOHOL, N.F.". FORMULATION COULD NOT BE FOUND. FORMULA IS THOUGHT TO BE 70%/30% WATER.

========== Physical/Chemical Properties ==========

HCC:F2
NRC/State Lic Num:NONE
Boiling Pt:B.P. Text:181F,83C
Melt/Freeze Pt:M.P/F.P Text:-127F,-88C
Vapor Pres:33
Vapor Density:2.07
Spec Gravity:0.79
Evaporation Rate & Reference:3.0 (BUTYL ACETATE=1)
Solubility in Water:100%
Appearance and Odor:MEDICINAL ALCOHOLIC ODOR.

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZERS, ALUMINUM, ACETALDEHYDE, CHLORINE, ETHYLENE OXIDE, HYPOCHLOROUS ACID, ALDEHYDES.
Stability Condition to Avoid:HEAT, SPARKS AND OPEN FLAMES.
Hazardous Decomposition Products:MAY LIBERATE CARBON MONOXIDE AND CARBON DIOXIDE.

========== Disposal Considerations ==========

Waste Disposal Methods:CONSULT APPROPIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO ASCERTAIN PROPER DISPOSAL PROCEDURES.

High VOC Cleaner Used at Huhtamaki

MATERIAL SAFETY DATA SHEET

WASH EB Page: 1

PRODUCT NAME: WASH EB
PRODUCT CODE: B111
CHEMICAL NAME: BLANKET AND ROLLER WASH

HMIS CODES: H F R P
2 2 0 B

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: PRINTERS' SERVICE
ADDRESS : 26 Blanchard Street
Newark, New Jersey 07105

EMERGENCY PHONE : 1-800-424-9300
INFORMATION PHONE : 1-973-589-7800

LAST REVISION : 06/25/97
DATE REVISED : 03/17/99
PREPARER : ENVIRONMENTAL DEPT.

SECTION II - HAZARDOUS INGREDIENTS/SARA III INFORMATION

REPORTABLE COMPONENTS	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP	WEIGHT PERCENT
* 2-BUTOXYETHANOL	111-76-2	0.6 mmHg 20 C	80 - 90%
PEL 25ppm: TLV 25ppm // LD50 1.746g/kg: LC50 800ppm/8hr // HAP reportable			
n-PROPYL ALCOHOL	71-23-8	15mmHg 20 C	10 - 20%
PEL 200PPM: TLV 200PPM // LD50 1.87g/kg: LC50> 20000ppm/hr			

* Indicates chemical(s) subject to the reporting requirements of section 313 of Title III and of 40 CFR 372.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT : 204 F
VAPOR DENSITY : 3.7 (air = 1)
DRYING RATE : 0.3(nButyl Acet.=1)
PHOTOREACTIVE : NO
VOLATILES : 100%
PHYSICAL STATE : LIQUID

SPECIFIC GRAVITY (H2O=1): 0.88
VAPOR PRESSURE : 4.1 mmHg at 20 C
VOC : 7.36 lb/gal METHOD: EPA #24
H2O SOLUBILITY : 100%
APPEARANCE : CLEAR
ODOR : ALCOHOL ODOR

1 lb/Gal = 120 gm/L

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT : 105 F **METHOD USED:** TCC
FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: 1.1 **UPPER:** 13.6
EXTINGUISHING MEDIA: CARBON DIOXIDE. FOAM. OR DRY POWDER (WATER MAY BE INEFFECTIVE)
SPECIAL FIREFIGHTING PROCEDURES : KEEP CONTAINER COOL. CONTROL COOLING WATER SINCE IT MAY TEND TO SPREAD BURNING MATERIAL.
UNUSUAL FIRE AND EXPLOSION HAZARDS: IF BOILING POINT OF SOLVENT IS REACHED. THE CONTAINER MAY RUPTURE EXPLOSIVELY AND IF IGNITED. GENERATE A FIREBALL.

SECTION V - REACTIVITY DATA

STABILITY: YES **IF NO CONDITIONS:** .
INCOMPATIBILITY (MATERIALS TO AVOID): YES
IF YES WHICH ONES: STRONG OXIDIZER
HAZARDOUS DECOMPOSITION OR BYPRODUCTS: CARBON DIOXIDE. CARBON MONOXIDE ON IGNITION
HAZARDOUS POLYMERIZATION: NONE

SECTION VI - HEALTH HAZARD DATA

INDICATIONS OF EXPOSURE:
INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: HEADACHE. DIZZINESS. NAUSEA. VERY HIGH LEVELS OF VAPORS COULD CAUSE UNCONCIOUSNESS. SLIGHT IRRITATION OF THE MUCOUS MEMBRANE
EYE CONTACT AND SYMPTOMS OF EXPOSURE: REDNESS OR BURNING SENSATION.
SKIN HEALTH RISKS AND SYMPTOMS OF EXPOSURE: REDNESS. ITCHING. IRRITATION ON OVEREXPOSURE.
INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: SEVERE GASTROINTESTINAL IRRITATION. NAUSEA, VOMITING AND DIARRHEA.

EMERGENCY AND FIRST AID PROCEDURES
IF IN EYES: FLUSH WITH WATER FOR 15 MIN. LIFT UPPER AND LOWER EYE LIDS. SEE A DOCTOR.
IF ON SKIN: WASH WITH SOAP AND WATER.
IF INHALED: REMOVE TO FRESH AIR. IF UNCONSCIOUS. USE ARTIFICIAL RESPIRATON.
IF INGESTED: DO NOT INDUCE VOMITING. SEE DOCTOR IMMEDIATELY TO PUMP STOMACH.
HEALTH HAZARDS (ACUTE AND CHRONIC):

MATERIAL SAFETY DATA SHEET

EFFECT OF CHRONIC EXPOSURE: NONE
EFFECT OF ACCUTE EXPOSURE: NONE
IN ALL CASES OF EMERGENCY AND FIRST AID, WE STRONGLY RECOMMEND A DOCTOR BE SEEN

CARCINOGENICITY: NTP CARCINOGEN: No **IARC MONOGRAPHS:** No **OSHA REGULATED:** No
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: DERMATITIS. MAY AGGRAVATE EXISTING LIVER AND KIDNEY AILMENTS.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: VENTILATE AREA. KEEP AWAY FROM STRONG OXIDIZERS. HEAT, SPARKS OR OPEN FLAMES. PREVENT SPILL FROM SPREADING BY USING AN INERT MATERIAL, SUCH AS SAND, AS A DAM. KEEP OUT OF ALL WATERWAYS OR WATER DRAINS. DO NOT FLUSH AREA WITH WATER. FOR SMALL SPILLS USE ABSORBENT PADS. FOR LARGE SPILLS, CALL A SPILL RESPONSE TEAM. IF REQUIRED, CONTACT STATE/LOCAL AGENCIES.
WASTE DISPOSAL METHOD: PRODUCT SOAKED ABSORBENT SHOULD BE PLACED IN SEALED METAL DRUMS FOR DISPOSAL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: KEEP AWAY FROM STRONG OXIDIZERS, HEAT, SPARKS AND OPEN FLAMES. DO NOT CUT OR DRILL INTO AN EMPTY CONTAINER IN ANY WAY THAT MIGHT GENERATE A SPARK. SOLVENT RESIDUE IN THE CONTAINER COULD IGNITE AND CAUSE AN EXPLOSION. KEEP CONTAINER TIGHTLY CLOSED AND OUT OF THE WEATHER.
OTHER PRECAUTIONS: WE RECOMMEND THAT CONTAINERS BE EITHER PROFESSIONALLY RECONDITIONED FOR REUSE OR PROPERLY DISPOSED OF BY CERTIFIED FIRMS TO HELP REDUCE THE POSSIBILITY OF AN ACCIDENT. DISPOSAL OF CONTAINERS SHOULD BE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS. "EMPTY" DRUMS SHOULD NOT BE GIVEN TO INDIVIDUALS.

SECTION VIII - CONTROL MEASURES

EXPOSURE CONTROL AND PERSONAL PROTECTION:
RESPIRATORY PROTECTION: IF TLV IS EXCEEDED USE A GAS MASK WITH APPROPRIATE CARTRIDGES, CANNISTER OR SUPPLIED AIR EQUIPMENT.
VENTILATION: IF NORMAL VENTILATION IS INADEQUATE USE ADDITIONAL SYSTEMS.ESPECIALLY LOCAL VENTILATION. IF THE VAPOR LEVEL CAN APPROACH THE LEL - LOWER EXPLOSION LIMIT, USE EXPLOSION PROOF SYSTEMS.
PROTECTIVE GLOVES: USE SOLVENT RESISTANT GLOVES.
EYE PROTECTION: USE SAFETY GLASSES OR GOGGLES.
OTHER PROTECTIVE EQUIPMENT OR CLOTHING: NONE.
WORK/HYGIENIC PRACTICES: WASH SKIN/CLOTHES IF THEY COME IN CONTACT WITH THE PRODUCT. DO NOT WEAR CLOTHING WET WITH THE PRODUCT.

SECTION IX - SHIPPING INFORMATION

GROUND SHIPMENT. **UN No : NA 1993**
D.O.T HAZARD CLASSIFICATION: COMBUSTIBLE LIQUID- N.O.S.

SECTION X - DISCLAIMER

THE INFORMATION AND RECOMMENDATIONS HEREIN HAVE BEEN COMPILED FROM OUR RECORDS AND OTHER SOURCES BELIEVED TO BE RELIABLE. NO WARRANTY, GUARANTY OR REPRESENTATION IS MADE BY PRINTERS' SERVICE AS TO THE SUFFICIENCY OF ANY REPRESENTATION. THE ABSENCE OF DATA INDICATES ONLY THAT THE DATA IS NOT READILY AVAILABLE TO US. ADDITIONAL SAFETY MEASURES MAY BE REQUIRED UNDER PARTICULAR OR EXCEPTIONAL CONDITIONS OF USE. WITH REGARD TO THE MATERIALS THEMSELVES, PRINTERS' SERVICE MAKES NO WARRANTY OF ANY KIND WHATEVER, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

MATERIAL SAFETY DATA SHEET

E-CURE CLASSIC CA

PRODUCT NAME: E-CURE CLASSIC CA
PRODUCT CODE: R149
CHEMICAL NAME: BLANKET AND ROLLER WASH

Page: 1

HMIS CODES: H F R P
2 2 0 B

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: PRINTERS' SERVICE
ADDRESS: 26 Blanchard Street
Newark, New Jersey 07105

EMERGENCY PHONE: 1 800 424 9300
INFORMATION PHONE: 1 973 589-7800

LAST REVISION
DATE REVISED: 04/10/02
PREPARER: ENVIRONMENTAL DEPT.

SECTION II - HAZARDOUS INGREDIENTS/SARA III INFORMATION

REPORTABLE COMPONENTS	CAS NUMBER	VAPOR PRESSURE mm Hg @ TEMP	WEIGHT PERCENT
* 2-BUTOXYETHANOL	111-76 2	0 6 mmHg 20 C	70 - 80%
PEL 25ppm; TLV 25ppm // LC50 800ppm/8hr; LD50 1 746g/kg // HAP reportable			
ETHYL ALCOHOL	173-42 2	1 mmHg 20 C	10 20%
PEL 50ppm; TLV 50ppm // LD50 0 5 Kg/Kg			

* Indicates chemical(s) subject to the reporting requirements of section 313 of Title III and of 40 CFR 372.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT : 212 336 F
VAPOR DENSITY : 2 22 (air = 1)
DRYING RATE : 0 1(Butyl Acet =1)
PHOTOREACTIVE : No
VOLATILES : 100%
PHYSICAL STATE : Liquid

SPECIFIC GRAVITY (H2O=1): 0 93
VAPOR PRESSURE : 9 47 mmHg@0 66 (H2O) at 20 C
VOC : 6 69 lb/gal METHOD: EPA 24
H2O SOLUBILITY : Miscible
APPEARANCE : Clear
ODOR : Mild

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT : 126 F METHOD USED: TCC
FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: 1.1 UPPER: 10 6
EXTINGUISHING MEDIA: CARBON DIOXIDE FOAM OR DRY POWDER (WATER MAY BE INEFFECTIVE)
SPECIAL FIREFIGHTING PROCEDURES : KEEP CONTAINER COOL. CONTROL COOLING WATER SINCE IT MAY TEND TO SPREAD BURNING MATERIAL.
UNUSUAL FIRE AND EXPLOSION HAZARDS: IF BOILING POINT OF SOLVENT IS REACHED, THE CONTAINER MAY RUPTURE EXPLOSIVELY AND IF IGNITED, GENERATE A FIREBALL

SECTION V - REACTIVITY DATA

STABILITY: YES IF NO CONDITIONS:
INCOMPATIBILITY (MATERIALS TO AVOID): YES
IF YES WHICH ONES: STRONG OXIDIZER
HAZARDOUS DECOMPOSITION OR BYPRODUCTS: CARBON DIOXIDE, CARBON MONOXIDE ON IGNITION
HAZARDOUS POLYMERIZATION: NONE

SECTION VI - HEALTH HAZARD DATA

INDICATIONS OF EXPOSURE:
INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE HEADACHE DIZZINESS NAUSEA VERY HIGH LEVELS OF VAPORS COULD CAUSE UNCONCIOUSNESS.
SLIGHT IRRITATION OF THE MUCOUS MEMBRANE
EYE CONTACT AND SYMPTOMS OF EXPOSURE: REDNESS OR BURNING SENSATION
SKIN HEALTH RISKS AND SYMPTOMS OF EXPOSURE: REDNESS, ITCHING, IRRITATION ON OVEREXPOSURE.
INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: SEVERE GASTROINTESTINAL IRRITATION NAUSEA VOMITING AND DIARRHEA
EMERGENCY AND FIRST AID PROCEDURES
IF IN EYES: FLUSH WITH WATER FOR 15 MIN LIFT UPPER AND LOWER EYELIDS. SEE A DOCTOR
IF ON SKIN: WASH WITH SOAP AND WATER
IF INHALED: REMOVE TO FRESH AIR IF UNCONSCIOUS, USE ARTIFICIAL RESPIRATION
IF INGESTED: DO NOT INDUCE VOMITING. SEE DOCTOR IMMEDIATELY TO PUMP STOMACH

MATERIAL SAFETY DATA SHEET

E-CURE CLASSIC CR

HEALTH HAZARDS (ACUTE AND CHRONIC):
EFFECT OF CHRONIC EXPOSURE: PROLONGED HIGH VAPOR EXPOSURE MAY CAUSE LIVER AND KIDNEY PROBLEMS
EFFECT OF ACCUTE EXPOSURE: NONE
IN ALL CASES OF EMERGENCY AND FIRST AID, WE STRONGLY RECOMMEND A DOCTOR BE SEEN

CARCINOGENICITY: NTP CARCINOGEN: No **IARC MONOGRAPHS:** No **OSHA REGULATED:** No
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: DERMATITIS, EXISTING LIVER AND KIDNEY AILMENTS.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: VENTILATE AREA. KEEP AWAY FROM STRONG OXIDIZERS, HEAT, SPARKS OR OPEN FLAMES. PREVENT SPILL FROM SPREADING BY USING AN INERT MATERIAL, SUCH AS SAND, AS A DAM. KEEP OUT OF ALL WATERWAYS OR WATER DRAINS. DO NOT FLUSH AREA WITH WATER. FOR SMALL SPILLS USE ABSORBENT PADS. FOR LARGE SPILLS CALL A SPILL RESPONSE TEAM. IF REQUIRED, CONTACT STATE/LOCAL AGENCIES.
WASTE DISPOSAL METHOD: PRODUCT SOAKED ABSORBENT SHOULD BE PLACED IN SEALED METAL DRUMS FOR DISPOSAL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: KEEP AWAY FROM STRONG OXIDIZERS, HEAT, SPARKS AND OPEN FLAMES. DO NOT CUT OR DRILL INTO AN EMPTY CONTAINER IN ANY WAY THAT MIGHT GENERATE A SPARK. SOLVENT RESIDUE IN THE CONTAINER COULD IGNITE AND CAUSE AN EXPLOSION. KEEP CONTAINER TIGHTLY CLOSED AND OUT OF THE WEATHER.
OTHER PRECAUTIONS: WE RECOMMEND THAT CONTAINERS BE EITHER PROFESSIONALLY RECONDITIONED FOR REUSE OR PROPERLY DISPOSED OF BY CERTIFIED FIRMS TO HELP REDUCE THE POSSIBILITY OF AN ACCIDENT. DISPOSAL OF CONTAINERS SHOULD BE IN ACCORDANCE WITH APPLICABLE LAWS AND REGULATIONS. "EMPTY" DRUMS SHOULD NOT BE GIVEN TO INDIVIDUALS.

SECTION VIII - CONTROL MEASURES

EXPOSURE CONTROL AND PERSONAL PROTECTION:
RESPIRATORY PROTECTION: IF TLV IS EXCEEDED USE A GAS MASK WITH APPROPRIATE CARTRIDGES, CANNISTER OR SUPPLIED AIR EQUIPMENT.
VENTILATION: IF NORMAL VENTILATION IS INADEQUATE USE ADDITIONAL SYSTEMS ESPECIALLY LOCAL VENTILATION. IF THE VAPOR LEVEL CAN APPROACH THE LEL - LOWER EXPLOSION LIMIT, USE EXPLOSION PROOF SYSTEMS.
PROTECTIVE GLOVES: USE SOLVENT RESISTANT GLOVES
EYE PROTECTION: USE SAFETY GLASSES OR GOGGLES.
OTHER PROTECTIVE EQUIPMENT OR CLOTHING: NONE.
WORK/HYGIENIC PRACTICES: WASH SKIN/CLOTHES IF THEY COME IN CONTACT WITH THE PRODUCT. DO NOT WEAR CLOTHING WET WITH THE PRODUCT.

SECTION IX - SHIPPING INFORMATION

GROUND SHIPMENT.
D.O.T HAZARD CLASSIFICATION: COMBUSTIBLE LIQUID, N.O.S. **UN No** : NA 1993

SECTION X - DISCLAIMER

THE INFORMATION AND RECOMMENDATIONS HEREIN HAVE BEEN COMPILED FROM OUR RECORDS AND OTHER SOURCES BELIEVED TO BE RELIABLE. NO WARRANTY, GUARANTY OR REPRESENTATION IS MADE BY PRINTERS' SERVICE AS TO THE SUFFICIENCY OF ANY REPRESENTATION. THE ABSENCE OF DATA INDICATES ONLY THAT THE DATA IS NOT READILY AVAILABLE TO US. ADDITIONAL SAFETY MEASURES MAY BE REQUIRED UNDER PARTICULAR OR EXCEPTIONAL CONDITIONS OF USE. WITH REGARD TO THE MATERIALS THEMSELVES, PRINTERS' SERVICE MAKES NO WARRANTY OF ANY KIND WHATEVER, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

Low-VOC Cleaner Used at Sandberg Furniture and Tested at DRS Sensors & Targeting Systems

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

24 Hour Emergency Telephone:
CHEMTREC:

National Response in Canada
CANUTEC:

Outside U.S. and Canada
Chemtrec:

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ACETONE

MSDS Number: A0446 — *Effective Date: 04/10/01*

1. Product Identification

Synonyms: Dimethylketone; 2-propanone; dimethylketal
CAS No.: 67-64-1
Molecular Weight: 58.08
Chemical Formula: (CH3)2CO
Product Codes:
J.T. Baker: 5356, 5580, 5805, 9001, 9002, 9003, 9004, 9005, 9006, 9007, 9008, 9009, 9010, 9015, 9036, 9125, 9254, 9271, A134, V655
Mallinckrodt: 0018, 2432, 2435, 2437, 2438, 2440, 2443, 2445, 2850, H451, H580, H981

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Acetone	67-64-1	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight

Flammability Rating: 4 - Extreme (Flammable)
Reactivity Rating: 2 - Moderate
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce central nervous system depression, narcosis, and unconsciousness.
Ingestion:
Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.
Skin Contact:
Irritating due to defatting action on skin. Causes redness, pain, drying and cracking of the skin.
Eye Contact:
Vapors are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.
Chronic Exposure:
Prolonged or repeated skin contact may produce severe irritation or dermatitis.
Aggravation of Pre-existing Conditions:
Use of alcoholic beverages enhances toxic effects. Exposure may increase the toxic potential of chlorinated hydrocarbons, such as chloroform, trichloroethane.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

5. Fire Fighting Measures

Fire:
Flash point: -20C (-4F) CC
Autoignition temperature: 465C (869F)
Flammable limits in air % by volume:
lel: 2.5; uel: 12.8
Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. This material may produce a floating fire hazard. Sensitive to static discharge.

Fire Extinguishing Media:
Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Acetone:
-OSHA Permissible Exposure Limit (PEL):
1000 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
500 ppm (TWA), 750 ppm (STEL) A4 - not classifiable as a human carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin

contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless, volatile liquid.
Odor:
Fragrant, mint-like
Solubility:
Miscible in all proportions in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
56.5C (133F) @ 760 mm Hg
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
2.0
Vapor Pressure (mm Hg):
400 @ 39.5C (104F)
Evaporation Rate (BuAc=1):
ca. 7.7

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Concentrated nitric and sulfuric acid mixtures, oxidizing materials, chloroform, alkalis, chlorine compounds, acids, potassium t-butoxide.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 5800 mg/kg; Inhalation rat LC50: 50,100mg/m3; Irritation eye rabbit, Standard Draize, 20 mg severe; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Acetone (67-64-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)
Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 350LB

International (Water, I.M.O.)
Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 350LB

15. Regulatory Information

Ingredient	\Chemical Inventory Status - Part 1\ TSCA	EC	Japan	Australia

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Acetone (67-64-1)	Yes	Yes	Yes	Yes

Ingredient	-SARA 302- EQ	TPQ	------SARA 313------ List	Chemical Catg.
Acetone (67-64-1)	No	No	Yes	No

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Acetone (67-64-1)	5000	U002	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: Yes
SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2[Y]E
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0
Label Hazard Warning:
DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No changes.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Low-VOC Cleaner Tested at Medtronic Diabetes and DRS Sensors & Targeting Systems

HIGH PERFORMANCE MIRACHEM®

A division of

Material Safety Data Sheet

MIRACHEM. Pressroom Cleaner (Formulation No. 2501)

Section I - General

Manufacturer Name:	The Mirachem Corporation P.O. Box 27608 Tempe, Arizona 85285-7608	Date Prepared: Revision Date:	7/3/96
Emergency Phone:	1-(800) 847-3527		

Section II - Hazardous Ingredients/Identity Information

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

N.E. = None Established

Section III - Physical/Chemical Characteristics

Boiling Point:	>210°F	Specific Gravity (H_2O = 1):	0.9957
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 IV - Fire and Explosion Hazard

Flash Point (Method Used):	>212°F (PMCC ASTM D93)	Explosive Limits:	N/A
Extinguishing Media:	N/A		
Special Fire Fighting Procedures:	N/A	Unusual Fire Fighting and Explosion Hazards:	N/A

Section V - Reactivity

Stability:	Unstable		Incompatibility (Materials to Avoid):	Strong Acids and Alkalies. demulsify product.	
	Stable	X			
Hazardous Decomposition or By-products:	Thermal decomposition may produce CO_2				
Hazardous Polymerization:	May Occur			Will Not Occur	X

Section VI - Health Hazard Data

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 VII - Emergency and First Aid Procedures

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 VIII - Precautions for Safe Handling and Use

In Case of Spill:	Flush with water into containing area.
Waste Disposal:	Flush to sewer where applicable within Federal, State or Local disposal requirements.
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 IX - Control Measures

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.

Low-VOC Cleaners Tested at DRS Sensors & Targeting Systems

SOYGOLD 2500 RINSEABLE SOLVENT

Material Safety Data Sheet

SECTION I -- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Identity (As Used on Label and List) **SOYGOLD 2500 RINSEABLE SOLVENT - EXPERIMENTAL**	*Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.*
Chemical Name: C_{16}-C_{18}, C_{18} Unsaturated Ethoxylated Methyl Ester/Surfactant Blend	**Synonym Name:** Rinseable Solvent, Soy Methyl Ester/Surfactant Cleaner Concentrate
Another Exclusive Product of: AG Environmental Products, L.L.C.	**Emergency Telephone Number** 402-496-6688 Chemtrec 800-424-9300
Address (Number, Street, City, State, and ZIP Code 12700 West Dodge Road Omaha, NE 68154	**Telephone Number for Information** 1-800-599-9209 **Date Prepared** February 4, 2005

SECTION II -- COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components (Specific Chemical Identity, Common Name(s))	CAS No.	OSHA PEL	ACGIH-TLV	Other Limits Recommended	%(Opt.)
In accordance with 29 CFR 1910.1200, this product does not contain sufficient concentrations of any substances defined as hazardous by this standard					

There are no exposure limits established for this product.

SECTION III -- HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW – Caution! May Cause Eye Irritation. A light yellow liquid that may cause eye and skin irritation. No hazard if spilled and no unusual hazard if involved in a fire. Slippery, can cause fall if spilled and walked on.

POTENTIAL HEALTH EFFECTS –
EYES – May cause eye irritation.
SKIN – May cause skin irritation.
INHALATION – Exposure via inhalation not likely. No hazard in normal industrial use.
INGESTION – No significant adverse effects are expected upon ingestion of the products.

SECTION IV – FIRST AID MEASURES

EYES – In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. If irritation persist get medical attention.
SKIN – In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. If irritation persists get medial attention. Wash clothing before reuse.
INHALATION – No need for first aid is anticipated not likely exposure route.
INGESTION – No need for first aid is anticipated if material is swallowed.

SECTION V -- FIRE FIGHTING MEASURES

Flash Point (Method Used)	Flammable Limits	LEL	UEL
>160 C° (D93 Flash Point – Pensky Martens Closed Cup	No Data	No Data	No Data

Extinguishing Media -
Not usually necessary as this product does not readily support combustion. Use media appropriate for fire's fuel source. CO_2, dry chemical, foam.

Special Fire Fighting Procedures – Cool exposed equipment with water spray until well after fire is out. Do not scatter spilled material with high pressure water streams. Dike fire control water for later disposal. Self contained breathing apparatus and structural firefighter's clothing will provide limited protection.

Unusual Fire and Explosion Hazards – None Expected.

SECTION VI -- ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Caution, slip hazard. Wipe up small spills promptly. Use a cloth or other absorbant material.

LARGE SPILL: Isolate area. Dike area to prevent spreading. Stay upwind. Wear protective gear as required. Pick up on absorbent material. Put in suitable container for proper disposal.

SECTION VII -- HANDLING AND STORAGE

HANDLING: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

STORAGE: Store indoors in a dry area. Follow label directions carefully. Keep out of reach of children. Keep container tightly sealed when not in use. Do not contaminate water or feed by use or storage. Use from original container only. Do not store with fertilizers, seeds, insecticides or fungicides.

SECTION VIII -- EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection (Specify Type) – Use with adequate ventilation. Use NIOSH/MSHA approved respirator if PELs or TLVs are exceeded.

Engineering Controls	**Local Exhaust**	Not usually needed	**Special**	None
	Mechanical (General)	Yes	**Other**	None
Protective Gloves - Impervious			**Eye Protection -** Safety glasses or goggles	

Other Protective Clothing or Equipment -
Not usually necessary. If direct contact is possible, wear apron, boots, face shield, etc. as needed.

Work/Hygienic Practices -
Follow label instructions. Wash hands after use and before eating, drinking, smoking, using restrooms, etc.

SECTION IX -- PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point	No Data	**Specific Gravity (H_2O = 1)** @77°F / 25°C	0.93
Vapor Pressure (mm-Hg @ 68° F)	No Data	**Melting Point**	No Data
Vapor Density (AIR = 1)	Greater than one (1)	**Evaporation Rate (Butyl Acetate = 1)**	No Data
Solubility in Water	Partially Soluble	**pH**	NA
Appearance and Odor - A yellow liquid with a faint sweet odor.		**VOC's**—No Data	10 gm/l

SECTION X -- STABILITY AND REACTIVITY

Chemical Stability	Stable	**Conditions to Avoid** – None known

Incompatibility (Materials to Avoid) -
Strong oxidizing and reducing agents, strong alkalis and strong acids

Hazardous Decomposition or Byproducts -
Carbon dioxide, carbon monoxide, smoke, soot and various organic oxidation by-products.

Hazardous Polymerization	Will Not Occur	**Conditions to Avoid** - NA

SECTION XI – TOXICOLOGICAL INFORMATION

Ingestion LD_{50}	No Data	**Acute Dermal LD_{50}**	No Data
Acute Oral LD_{50}	No Data	**Acute Inhalation LC_{50}**	No Data

SECTION XII -- ECOLOGICAL INFORMATION

No Data

SECTION XIII -- DISPOSAL CONSIDERATIONS

If this product as supplied becomes a waste, it does not meet the criteria of a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261.

SECTION XIV -- TRANSPORT INFORMATION (Not meant to be all inclusive)

Domestic Highway		**Domestic Air Shipments**	
Proper Shipping Name:	Environmentally hazardous substance, liquid, n.o.s. (Fatty Methyl Ester C_{16}-C_{18} Ethoxylate)	Proper Shipping Name:	Unknown
Hazard Class/Subsidiary Hazard:	Class 9	Hazard Class/Subsidiary Hazard:	Unknown
UN/NA No.:	3082	UN/NA No.:	Unknown
Label Required:	None	Label Required:	Unknown

SECTION XV -- REGULATORY INFORMATION (Not meant to be all inclusive - selected regulations represented)

NFPA Rating	**Health**	**2**	**Fire**	**0**	**Reactivity**	**0**
HMIS Rating	**Health**	**2**	**Flammability**	**0**	**Reactivity**	**0**

U.S. FEDERAL REGULATIONS:

OSHA: There are no exposure limits established for this product. Not hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

CERCLA: SARA TITLE III SECTION 311/312 HAZARD CLASSES:

Fire	None Noted
Acute Health	None Noted
Reactive	None Noted
Chronic Health	None Noted
Release of Pressure	None Noted

SARA TITLE III SECTION 313:
This product is not known to contain any compound listed and in quantities requiring reporting under SARA Title III Section 313.

TSCA: NA

SNAP: NA.

HAPS: Not listed.

INTERNATIONAL REGULATIONS:

CANADIAN WHMIS:

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA): All components of this product are on the Domestic Substances List (DSL), and acceptable for use under the provisions of CEPA.

EINECS: All components of this product are on the European Inventory of Existing Commercial Chemical Substances.

STATE REGULATIONS:

STATE RIGHT-TO-KNOW REGULATIONS: Any substance listed as hazardous under labor statutes by the States of California, Florida, Illinois, Michigan, New Jersey, Ohio, Pennsylvania or Texas is described in Section II above if known present in regulated concentrations.

CALIFORNIA PROPOSITION 65: This product is not known to contain any material listed under California's Proposition 65.

SECTION XVI -- OTHER INFORMATION

MSDS Status: Revised Section(s):

SIGMA-ALDRICH

Material Safety Data Sheet

Date Printed: 08/05/2002
Date Updated: 11/14/2000
Version 1.20

Section 1 - Product and Company Information

Product Name	METHYL ACETATE, ANHYDROUS, 99.5%		
Product Number	296996		
Brand	Aldrich Chemical		
Company	Sigma-Aldrich		
Street Address	3050 Spruce Street		
City, State, Zip, Country	SAINT LOUIS, MO 63103 US		
Technical Phone:	314 771 5765	**Emergency Phone:**	414 273 3850 Ext. 5996
Fax:	800 325 5052		

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
METHYL ACETATE	79-20-9	No

Formula C3H6O2
Synonyms Acetate de methyle (French), Devoton, Ethyl ester of monoacetic acid, Methylacetaat (Dutch), Methylacetat (German), Methyl acetate (ACGIH:OSHA), Methyle (acetate de) (French), Methylester kiseliny octove (Czech), Metnyl ethanoate, Metile (acetato di) (Italian), Octan metylu (Polish), Tereton

Section 3 - Hazards Identification

Emergency Overview
Flammable (USA) Highly Flammable (EU), Irritant.
Highly flammable. Irritating to eyes and skin. Repeated exposure may cause skin dryness or cracking. Vapors may cause drowsiness and dizziness.
Target organ(s): Eyes, Kidneys.

HMIS Rating
Health: 1* Flammability: 3 Reactivity: 1

NFPA Rating
Health: 1 Flammability: 3 Reactivity: 1

*additional chronic hazards present. For additional information on toxicity please refer to Section 11.

Section 4 - First Aid Measures

Oral Exposure
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Inhalation Exposure
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Dermal Exposure
In case of contact, immediately wash skin with soap and copious amounts of water.

Eye Exposure
In case of contact immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

Flammable Hazards: Yes

Explosion Hazards
Vapor may travel considerable distance to source of ignition and flash back.
Container explosion may occur under fire conditions.

Flash Point:	-60.8 °F	-16 °C	
Explosion Limits:	**Lower:** 3.1 %	**Upper:** 16 %	
Autoignition Temp:	502 °C	**Flammability:**	Yes

Extinguishing Media
Suitable
Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

Firefighting
Protective Equipment
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s)
Flammable liquid. Emits toxic fumes under fire conditions.
Specific Method(s) of Fire Fighting
Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill
Evacuate area. Shut off all sources of ignition.

Procedure(s) of Personal Precaution(s)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

Methods for Cleaning Up
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling
User Exposure
Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

Storage
Suitable
Keep container closed. Keep away from heat, sparks, and open flame. Handle and store under nitrogen.

Special Requirements
Protect from moisture.

Section 8 - Exposure Controls / PPE

Engineering Controls
Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

Personal Protective Equipment

Respiratory
NIOSH/MSHA-approved respirator
Hand
Compatible chemical-resistant gloves
Eye
Chemical safety goggles.

General Hygiene Measures
Wash thoroughly after handling. Wash contaminated clothing before reuse.

Exposure Limits, RTECS

Country	Source	Type	Value	Remarks
USA	ACGIH	STEL	757 MG/M3 (250 PPM)	
USA	ACGIH	TWA	606 MG/M3 (200 PPM)	
USA	MSHA Standards	TWA	200 PPM (610 MG/M3)	
USA	OSHA.	PEL	8H TWA 200 PPM (610 MG/M3)	
New Zealand	OEL			
USA	NIOSH	TWA STEL	200 PPM 250 PPM	check ACGIH TLV

Section 9 - Physical/Chemical Properties

Appearance
Physical State Clear liquid
Color Colorless

Molecular Weight: 74.08 AMU

Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	56 - 58 °C	
MP/MP Range	-98 °C	
Freezing Point	N/A	
Vapor Pressure	165 mm-g	20 °C
Vapor Density	2.55 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	0.934 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point °F	-60.8 °F	
Flash Point °C	-16 °C	
Explosion Limits	Lower: 3.1 % Upper: 16 %	
Autoignition Temp	502 °C	
Refractive Index	1.362	
Solubility	N/A	

Section 10 - Stability and Reactivity

Stability
Stable
Stable.
Conditions to Avoid
Protect from moisture.

Materials to Avoid
Strong oxidizing agents.

Hazardous Decomposition Products
Hazardous Decomposition Products
Carbon monoxide. Carbon dioxide.

Hazardous Polymerization
Hazardous Polymerization
Will not occur.

Section 11 - Toxicological Information

Route of Exposure
Skin Contact
Causes skin irritation.
Skin Absorption
May be harmful if absorbed through the skin
Eye Contact
Causes eye irritation.
Inhalation
May be harmful if inhaled. Material is irritating to mucous membranes and upper respiratory tract.
Ingestion
May be harmful if swallowed.

Target Organ(s) or System(s)
Eyes. Kidneys. Central nervous system.

Signs and Symptoms of Exposure
Exposure can cause: Narcotic effect. This product is metabolized into formic acid. Humans and other primates metabolize formic acid more slowly than do rodents. Formic acid can build up in the body producing toxic effects possibly leading to death; therefore, data from studies in rodents may have limited relevance for human risk assessment.

RTECS Number: AI9100000

Toxicity Data

Oral - Rat: > 5,000 mg/kg (LD50)

Oral - Rabbit: 3,705 mg/kg (LD50)

Skin - Rabbit: > 5,000 mg/kg (LD50)

Intraduodenal - Rabbit: 3700 MG/KG (LD50)

Irritation Data

Skin - Rabbit: 500 mg 24H
Remarks: Mild irritation effect

Skin - Rabbit: 20 mg 24H
Remarks: Moderate irritation effect

Eyes - Rabbit: 100 mg 24H
Remarks: Moderate irritation effect

Section 12 - Ecological Information

Section 13 - Disposal Considerations

Appropriate Method of Disposal of Substance or Preparation
Contact a licensed professional waste disposal service to dispose of this material.
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable.

Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Methyl acetate
UN#: 1231
Class: 3
Packing Group: Packing Group II
PIH: Not PIH

IATA
Proper Shipping Name: Methyl acetate
IATA Number: 1231
Hazard Class: 3
Packing Group: II

Section 15 - Regulatory Information

EU Directives Classification
Symbol of Danger: F Xi
Indication of Danger
Highly Flammable. Irritant.
Risk Statements **R:** 11 36 66 67
Highly flammable. Irritating to eyes. Repeated exposure may cause skin dryness or cracking. Vapors may cause drowsiness and dizziness.
Safety Statements **S:** 16 26 29 33
Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Do not empty into drains. Take precautionary measures against static discharges.

US Classification and Label Text
Indication of Danger
Flammable (USA) Highly Flammable (EU) Irritant.
Risk Statements
Highly flammable. Irritating to eyes and skin. Repeated exposure may cause skin dryness or cracking. Vapors may cause drowsiness and dizziness.
Safety Statements
Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Do not empty into drains. Take precautionary measures against static discharges. Wear suitable protective clothing, gloves, and eye/face protection.
US Statements
Target organ(s): Eyes. Kidneys.

United States Regulatory Information
Listed: No

TSCA Inventory Item: Yes

Section 16 - Other Information

Warranty
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Low-VOC Cleaner Tested at Huhtamaki

MATERIAL SAFETY DATA SHEET

Per 29 CFR 1910.1200 DATE PREPARED : 5/21/03

SECTION I.

BRULIN & COMPANY. INC. P.O. BOX 270, INDIANAPOLIS, IN 46206-0270 (317) 923-3211

WEST COAST FACTORY
Richmond, California

24 HOUR EMERGENCY NUMBER
CHEMTREC 1-800-424-9300

IDENTITY (As listed on label):
FORMULA 815 MX

HMIS HAZARD RATINGS: Health: 1
Flammability: 0
Reactivity: 0

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity: Common Name(s))	CAS #	OSHA PEL	ACGIH TLV-TWA	OTHER LIMITS RECOMMENDED	PERCENT
Ethanolamine, 2-Aminoethanol, Monoethanolamine	141-43-5	3 PPM	3 PPM	STEL 6 PPM	1-5

SECTION 313 SUPPLIER NOTIFICATION
The toxic chemical(s) listed above which are marked with an (*) are subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372. Not all chemicals subject to Section 313 of EPCRA appear on the OSHA Floor List of Hazardous Chemicals.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	212 F	Specific Gravity (H_2O=1):	1.076
Vapor Pressure (mm Hg):	Ethanolamine 0.2@68F	Melting Point:	Approx. 30 F
Vapor Density (Air=1):	Ethanolamine 2.1	Evaporation Rate (water=1):	1.0
Solubility in Water:	Complete		

Appearance and Odor: Blue green liquid, citrus odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): None
Flammable Limits LEL NA UEL NA
Extinguishing Media: Not Applicable
Special Fire Fighting Procedures: None
Unusual Fire and Explosion Hazards: None

SECTION V - REACTIVITY DATA

Stability Unstable ___ Stable _X_
Conditions to Avoid: Freezing
Incompatibility (Materials to Avoid): Strong oxidizers and acids.
Hazardous Decomposition or Byproducts: Thermal decomposition can produce carbon monoxide, carbon dioxide, nitrogen oxides.
Hazardous Polymerization: May Occur ___ May Not Occur _X_
Conditions to Avoid: None

SECTION VI - HEALTH HAZARD DATA

Route(s) of Entry: Ingestion? Yes Skin? Yes Inhalation? Yes Eyes?
Health Hazards (Acute and Chronic): Eye - Direct contact may cause irritation. Ingestion - May cause gastrointestinal irritation and irritation of mouth and throat. Skin - Prolonged or repeated contact may cause irritation. Inhalation - Excessive exposure may cause respiratory irritation.
Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure: Eye contact may cause irritation, seen as redness and swelling. Prolonged skin contact may cause irritation, seen as redness. Excessive inhalation of mists may be irritating and cause coughing and discomfort in the nose throat and chest. Ingestion may cause pain or discomfort in the mouth, throat, and stomach.
Medical Conditions Generally Aggravated by Exposure: Ethanolamine may aggravate asthma and inflammatory or fibrotic pulmonary disease. May also aggravate an existing dermatitis.

Emergency & First Aid Procedures:

- Eye Contact: Flush with large amounts of water for at least 15 minutes lifting upper & lower lids occasionally. Get medical attention.
- Inhalation: If affected, remove to fresh air.
- Skin Contact: Wash with mild soap and water. Remove contaminated clothing and launder before reuse.
- Ingestion: If conscious, dilute by giving at least two glasses of water. Call a physician or local poison control center immediately.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Absorb on solid absorbent and shovel into containers for disposal.
Waste Disposal Method: Dispose of according to Federal, State and Local Laws and 40 CFR.
Precautions to be Taken in Handling and Storing: Store between 40 and 120 F.

SECTION VIII - CONTROL MEASURES

Respiratory Protection (Specify Type): Not normally required. Use NIOSH-MSHA approved respirator if TLV of Ethanolamine is exceeded.
Ventilation: Mechanical (General): Normally Sufficient
Protective Gloves: Neoprene or butyl rubber on prolonged contact.
Eye Protection: Goggles or safety glasses when handling concentrate
Other Protective Clothing or Equipment: None
Work/Hygienic Practices: Avoid breathing spray mist.

Appendix B
UV Curable Coating Used at DRS Sensors & Targeting Systems

Dymax Corporation

51 Greenwoods Rd, Torrington, CT 06790 Phone: (860) 482-1010 Fax: (860) 482-1308

MATERIAL SAFETY DATA SHEET

PRODUCT 984-LVF

I. PRODUCT IDENTIFICATION

Product Name: 984-LVF
Synonyms: Polyurethane Oligomer Mixture

NFPA Est:		HMIS Est:	
Health:	2	Health	2
Fire:	1	Flam:	1
React:	1	React:	1

II. COMPOSITION

Ingredient	Concentration %	C.A.S. Number	ACGIH TLV
High Boiling (Meth)Acrylate	45-55	PROPRIETARY	--
Acrylic Acid	< 5	79-10-7	2 ppm
Photoinitiator	1-3	947-19-3	--
Polyurethane Oligomer	40-50	PROPRIETARY	--
Photoinitiator	1-5	24650-42-8	--
t-Butyl Perbenzoate	0.1-3	614-45-9	--
High Boiling (Meth)Acrylate	1-10	PROPRIETARY	--

III. CHEMICAL AND PHYSICAL PROPERTIES

Vapor Pressure: 6 mm Hg at 30*C
Vapor Density: Heavier Than Air
Solubility in Water: Insoluble
Specific Gravity: 1.06
Boiling Point: N.A.
Appearance: Amber liquid
Odor: Mild

IV. FLAMMABILITY AND EXPLOSIVE PROPERTIES

Flash Point: > 200*F (P.M.C.C.)
Recommended Extinguishing Agents: Use water spray, foam, dry chemical, or CO2.
Hazardous Products Formed by Fire
or Thermal decomposition: Toxic fumes (oxides of carbon and nitrogen) may be evolved upon exposure to heat or open flame.
Unusual Fire or Explosion Hazards: None
Compressed Gasses: None
Pressure at Room Temp: N.A.

V. REACTIVITY DATA

Stability: Stable
Hazardous Polymerization: May occur
Hazardous Decomp. Prod.: None
Incompatibility: Oxidizers, amines, strong Lewis or mineral acids, thiosulfates. Smoke and toxic fumes may be evolved as a result of uncontrolled exothermic reaction of large masses of material reacting with curing agents, such as peroxides, amines, or exposure to light.

VI. SPILL OR LEAK PROCEDURES

Dike area to prevent spreading. Absorb on vermiculite, sand or other inert absorbing material. Dispose of as a chemical waste in accordance with current local, state, and federal regulations.

VII. STORAGE AND HANDLING PROCEDURES

Storage: Avoid storage over 100* F, exposure to light, loss of dissolved air, loss of polymerization inhibitor, contamination with incompatible materials.
Handling: Avoid prolonged or repeated breathing of vapor.

VIII. SHIPPING REGULATIONS

DOT and IATA Hazard Classification: Not Restricted Article
Proper DOT Shipping Name: Unrestricted
Identification Number: DOT - None IATA - None

IX. EMERGENCY TREATMENT PROCEDURES

Eye Irritation: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Skin Contact: In case of skin contact, wash thoroughly with soap and water. Do not use organic solvents for cleanup as they may dry or irritate the skin and act as a carrier for chemical absorption.
Inhalation: Remove affected person to fresh air.
Ingestion: Low toxicity; Get medical attention.

X. PERSONAL PROTECTION

Respiratory: Positive fresh air exhaust should be provided in the work area; respiratory equipment is unnecessary in normal use.
Skin: Avoid skin contact. Wear gloves and impervious protective clothing if frequent direct contact is likely.
Eyes: Do not wear contact lenses. Chemical safety goggles are recommended.

XI. HEALTH HAZARD DATA

Potential Routes of Entry: Skin, eyes, inhalation.
Symptoms of Overexposure: Possible skin and eye irritation on contact. Inhalation of vapors in an unventilated area may, over time, induce headaches.

Exposure Limits:	ACGIH (TLV)	OSHA (PEL)	OTHER
Ingredients			
Acrylic Acid	2 ppm	--	--

	Target Organs:	Carcinogen:		
		NTP	IARC	OSHA
High Boiling (Meth)Acrylate	--	NO	NO	NO
Acrylic Acid	--	NO	NO	NO
Photoinitiator	--	NO	NO	NO
Polyurethane Oligomer	--	NO	NO	NO
Photoinitiator	--	NO	NO	NO
t-Butyl Perbenzoate	--	NO	NO	NO
High Boiling (Meth)Acrylate	--	NO	NO	NO

Abbreviations:
N/A Not Applicable
IRR Irritant
LIV Liver
ALG Allergen
KID Kidney
REP Reproductive

XII. REGULATORY INFORMATION

Sara Listed Ingredients:
ACRYLIC ACID
TSCA Inventory: All Ingredients

STATE RIGHT-TO-KNOW

CALIFORNIA Proposition 65
This product does not contain materials which the State of California has found to cause cancer, birth defects, or other reproductive harm.

MASSACHUSETTS Right-To-Know, Substance List (MSL) Hazardous Substances and Extraordinary Hazardous Substances on the MSL must be identified when present in products. Components present in this product at a level which could require reporting under the statute are:
** NONE **

PENNSYLVANIA Right-To-Know, Hazardous Substance List Hazardous Substances and Special Hazardous Substances on the List must be identified when present in products. Components present in this product at a level which could require reporting under the statute are:
** NONE **

OTHER REGULATORY INFORMATION:
** NONE **

ABBREVIATIONS:

ACGIH	=	American Conference of Governmental Industrial Hygienists
OSHA	=	Occupational Safety and Health Administration
TLV	=	Threshold Limit Value
PEL	=	Permissible Exposure Limit
NTP	=	National Testing Program
IARC	=	International Agency for Research on Cancer
NFPA	=	National Fire Protection Association
HMIS	=	Hazardous Materials Identification System
--	=	No Data / Not Available

XIII. PREPARATION INFORMATION

Prepared By: Nicole Langer
Title: Laboratory Manager
24 Hr. Telephone: CHEMTREC 1-800-424-9300
REVISION DATE: August 23, 2004

To the best of our knowledge, the information contained herein is accurate. However, Dymax Corporation does not assume any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown health hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.