DEVELOPMENT OF IMPROVED EMISSION INVENTORY FOR FURNITURE STRIPPING AND OTHER USES OF METHYLENE CHLORIDE

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EXECUTIVE SUMMARY

The South Coast Air Quality Management District (SCAQMD) commissioned the Institute for Research and Technical Assistance (IRTA) to characterize the emissions of methylene chloride (METH) from furniture stripping operations and other types of facilities that use the chemical. METH is a suspect carcinogen and is listed in SCAQMD Rule 1401 which regulates new, modified and relocated sources of toxics and SCAQMD Rule 1402 which regulates existing sources of toxics. The District recently modified Rule 1402 to require existing facilities to reduce the risk they pose to the surrounding community to below 25 in a million. The District is also planning to develop industry specific rules for several of the industries that use METH. This project is part of the SCAQMD effort to investigate the industries that use toxics like METH.

The project involved developing and conducting surveys for 12 separate industries which were known or suspected to use METH. These industries included:

- Furniture Strippers
- Foam Fabricators
- Counter Top Manufacturers
- Aircraft Strippers
- Metal Cleaning
- Storage Tanks
- Other Tank Operations
- Kitchen Cabinet Manufacturers
- Kitchen Cabinet Refinishers
- Furniture Manufacturers
- Lithographic Printers
- Plastics

IRTA also collected data on METH emissions from consumer products.

Full telephone surveys were conducted for the first seven industries listed above. Partial telephone surveys were conducted for the next three industries listed above. More limited telephone surveys were conducted for the last three industries listed above.

Table E-1 summarizes the results of the survey. For most of the industry categories, it shows the total number of facilities in the Basin, the number that use METH based products, the estimated emissions and the source of the emissions estimates. The results are discussed below.

IRTA surveyed 407 furniture stripping facilities and 88 shops that performed stripping responded to the survey. The survey results indicated that emissions from this industry amount to about 72 tons of METH per year. IRTA also obtained information from industry sources that suggests emissions are actually more than double this figure, about 146 tons per year.

IRTA surveyed 121 foam fabrication facilities but did not receive meaningful responses. Using information from industry sources, IRTA estimates there are 10 foam fabricators in the South Coast Basin using adhesives containing METH. The annual emissions from this industry are estimated at 409 tons per year.

IRTA surveyed 145 counter top manufacturers but did not receive meaningful responses. IRTA estimates that of the 145 facilities, only about 73 actually are involved in the manufacture of counter tops. IRTA also estimates that only a few of these use METH based adhesives. Emissions of METH from this industry are unknown but are likely to be small.

Table E-1
METH Emissions by Category in the South Coast Basin

Category	Total Number of Facilities	Number Using METH	Emissions (tons/year)	Source
Furniture Stripping	407	88	72 to 146	Survey Industry/IRTA
Foam Fabrication	121	10	409	Industry
Counter Top Manufacture	73	few	unknown (small)	Industry
Aircraft Stripping	3	2	unknown (small)	-
Metal Cleaning	-	>1	unknown (small)	-
Storage Tanks	-	5	> 6	Reported Emissions
Other Tank Operations	-	3	> 3	Reported Emissions
Kitchen Cabinet Manufacture	442	110	15 to 41	Limited Survey; Industry
Kitchen Cabinet Refinishing	50	50	11	Industry
Furniture Manufacture	845	unknown	unknown (possibly high)	Limited Survey
Plastics Manufacture	1,272	unknown	unknown (possibly high)	Limited Survey
Other Industries	-	-	201	Reported Emissions
Consumer Products				
Paint Strippers	-	-	1,312	CARB
Automotive Products	-	-	119	CARB
Adhesives	-	-	86	CARB
Other	-	-	33	CARB

IRTA surveyed three aircraft maintenance operations in the Basin. Two of these facilities are using METH based strippers. The emissions of METH from this industry are unknown but are likely to be small.

IRTA surveyed three facilities that perform metal cleaning. Only one of these facilities uses METH for cleaning. Emissions from this industry are unknown but likely to be small.

IRTA surveyed 11 facilities that were thought to have storage tanks containing METH. Only five of these facilities were still storing the chemical. Emissions of METH from storage tanks are greater than six tons per year.

IRTA surveyed three facilities that were thought to have other types of tank operations utilizing METH. Emissions from these operations are estimated at more than 3 tons per year.

IRTA performed a partial survey of the 442 kitchen cabinet manufacturers and refinishers in the Basin. From the responses, it is estimated that there may be 110 manufacturers in the Basin using METH based adhesives. Emissions of METH are estimated to range from 15 to 41 tons per year. Industry sources indicate that there are at least 50 companies in the Basin that refinish kitchen cabinets in the field and that all of them use METH based stripping formulations. Emissions from this activity are estimated at 11 tons per year.

IRTA performed a limited survey of 845 furniture manufacturers in the Basin to determine if any of them used METH based adhesives. Some of the manufacturers use METH based adhesives but the number is unknown. Although is not possible to estimate the METH emissions from this industry, they may be high because of the large number of manufacturers.

IRTA also performed a limited survey of 1,272 plastics manufacturers. Only one of the facilities surveyed indicated they used METH. Again, the number of facilities in this industry is unknown. The emissions are also unknown but, again, they could be high because of the large number of facilities in this category.

Surveys were not conducted for the "Other Industries" category listed in Table E-1. These represent facilities of certain industry types that reported emissions to the District. Emissions from these facilities are estimated at 201 tons per year.

IRTA obtained data from the California Air Resources Board (CARB) for METH emissions from consumer products. Emissions from consumer product paint strippers are extremely high, higher than for every other category. They are estimated at 1,312 tons per year. CARB recently adopted bans on chlorinated solvents, including METH, in automotive and adhesive consumer products. The emissions in Table E-1, 119 tons per year for automotive products and 86 tons per year for aerosol adhesives, will be eliminated by the end of 2002. Other consumer product emissions are estimated at 33 tons per year.

The project findings suggest that the highest METH emitting categories would be reasonable targets for additional regulations. Although SCAQMD does not have jurisdiction over consumer products, the District could work with CARB to examine restrictions on METH use in consumer paint strippers. Other industries where emissions are high, where sources are few and where facilities are already identified are also good targets for regulation. These include foam fabrication, other industries and furniture strippers.

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I. INTRODUCTION

The Institute for Research and Technical Assistance (IRTA) received a contract from the South Coast Air Quality Management District (SCAQMD) to investigate and better characterize the emissions of methylene chloride (METH) from furniture stripping firms and other METH emitters in the South Coast Basin. The project involved developing and performing surveys of the industries that use METH in a variety of different ways and summarizing and analyzing the results of the surveys. It also involved collecting information from the California Air Resources Board (CARB) and industry sources on the industries that use METH. It involved characterizing the processes where METH is used and determining emission factors. Finally, it included determining, analyzing and summarizing the alternatives to METH or the methods of reducing METH emissions or risk in the major end uses.

METH is a suspect carcinogen and is classified as a Hazardous Air Pollutant (HAP) by EPA and a Toxic Air Contaminant (TAC) by the state of California. METH is listed on SCAQMD District Rule 1401 which regulates new, modified and relocated sources of toxics. Companies in the Basin that use Rule 1401 listed chemicals must meet a 1 in a million risk level if they do not have Toxics-Best Available Control Technology (T-BACT) and a 10 in a million risk level if they do use T-BACT. METH is also listed on SCAQMD District Rule 1402 which regulates existing sources of toxics. The District has recently modified this rule. Facilities posing a risk greater than 25 in a million must reduce the risk below that level unless they qualify for extensions of time for technical or economic reasons. The District is also proposing to develop industry specific toxics rules for several of the industries that use METH and are dominated by small businesses. This project is part of the District's effort to evaluate the industries that use Rule 1402 listed chemicals like METH.

IRTA performed full telephone surveys for seven industries that use or were thought to use METH. For these industries, IRTA attempted to identify and survey all companies that were members of the industries. IRTA performed a partial telephone survey of two additional industries and a more limited telephone survey of three industries. IRTA also did further investigation of several of the industries which were thought to use METH. Finally, IRTA collected inventory data for consumer products regulated by CARB that rely on METH as an ingredient. In some cases, in addition to the surveys and data collection, IRTA also relied on industry contacts to better characterize the industries and their use of METH. Table 1-1 summarizes the industries and the approach used to collect information on the METH products they use.

The project findings indicate that the furniture stripping industry contributes significantly to the METH emissions in the Basin. The findings also indicate that other industries or groups of industries contribute. in some cases, more than the strippers, to the emissions inventory. The consumer products category is the largest contributor, by far, to METH emissions in the Basin.

This document summarizes the results of all of the surveys, other data collection efforts and analysis. Section II provides background information, survey results, emission factors and methods of reducing METH emissions and risk for the furniture stripping industry. Section III presents similar information for the other industries for which full telephone surveys were performed. Section IV describes the results of the partial surveys and data collection efforts for the other industries. The last section, Section V, provides estimates of the emissions of METH in the Basin by industry category. It also summarizes the results of the project.

Table 1-1
Approach to Characterizing METH Use

Industry	Full Survey	Partial Survey	Limited Survey	Investigation/ Data Collection
Furniture Strippers	X			X
Foam Fabricators	X			X
Counter Top Manufacturers	X			X
Aircraft Strippers	X			X
Metal Cleaning	X			X
Storage Tanks	X			
Other Tank Operations	X			
Kitchen Cabinet Manufacturers		X		X
Kitchen Cabinet Refinishers		X		X
Furniture Manufacturers			X	
Lithographic Printers			X	
Plastics			X	
Consumer Products				X

II. FURNITURE STRIPPING INDUSTRY

There are an estimated 219 firms in the South Coast Basin that strip, repair and refinish wood furniture and other wood items. These firms are virtually all small businesses with one to 10 employees. Some of the companies perform only stripping; others conduct both stripping and refinishing operations.

Various types of woods are used to make wood items and furniture. A variety of coating types are also used on the woods. The most important factor in the stripping process is the type of coating that needs to be stripped. Stripper effectiveness is determined by its ability to strip the coating and the wood type is comparatively unimportant.

The most common type of coating that requires stripping today is the conventional solventborne coating. This type of coating represents more than 50 percent of the coatings that require stripping by furniture strippers. Between 20 and 30 percent of the coatings encountered are conventional clear varnishes which include shellacs. Cross-linked clear finishes that also fall into this category have begun to be used over the last 15 or 20 years. Waterborne latex and acrylic coatings and high performance cross-linked pigmented and clear coatings account for the remaining 15 to 20 percent of the finishes encountered by furniture strippers today.

The waterborne, cross-linked and pigmented coatings are more difficult to strip than the traditional solventborne lacquers. The mix of coatings furniture strippers encounter will change in the future because of the regulations requiring greater use of low VOC coatings. Furniture strippers rely on effective strippers capable of removing a wide range of coatings.

METH-based formulations can strip all kinds of coatings in a fairly short period of time. The most commonly used formulation contains about 82 percent METH and various other ingredients like methanol, surfactants and waxes. These are designed to enhance the stripping and rinsing capability of the stripping formulation. Furniture strippers use between a few gallons to about 2,000 gallons of stripper annually depending on their operation.

The largest strippers use equipment to apply the stripper. The most widely used type of equipment is the flow tray. Figure 2-1 shows a view of a flow tray used in a typical stripping operation. It is a sloped shallow tank eight feet long and four feet wide with a drain at the lower end. The stripper is pumped through a brush from a five gallon container. The item to be stripped is placed in the tray and the worker moves the brush over the part vigorously. At times it is necessary to scrape the item to completely remove the coating.

Some furniture strippers use a dip tank instead of a flow tray for stripping. In these cases, the dip tank has a sloped cover on which the item to be stripped is placed. A pump delivers the stripper to the item and the residual stripper flows back into the dip tank.

Some stripping firms have both a flow tray and a dip tank. In this case, the dip tank is used to pre-soak certain wood items that have tough coatings. When the item is ready to be stripped, it is moved to the flow tray and stripped as described above. The dip tank, in this case, is also used as a repository for the used stripper from the flow tray. Figure 2-2 shows a dip tank from a facility that has both a flow tray and a dip tank.

Figure 2-1 Typical Flow Tray

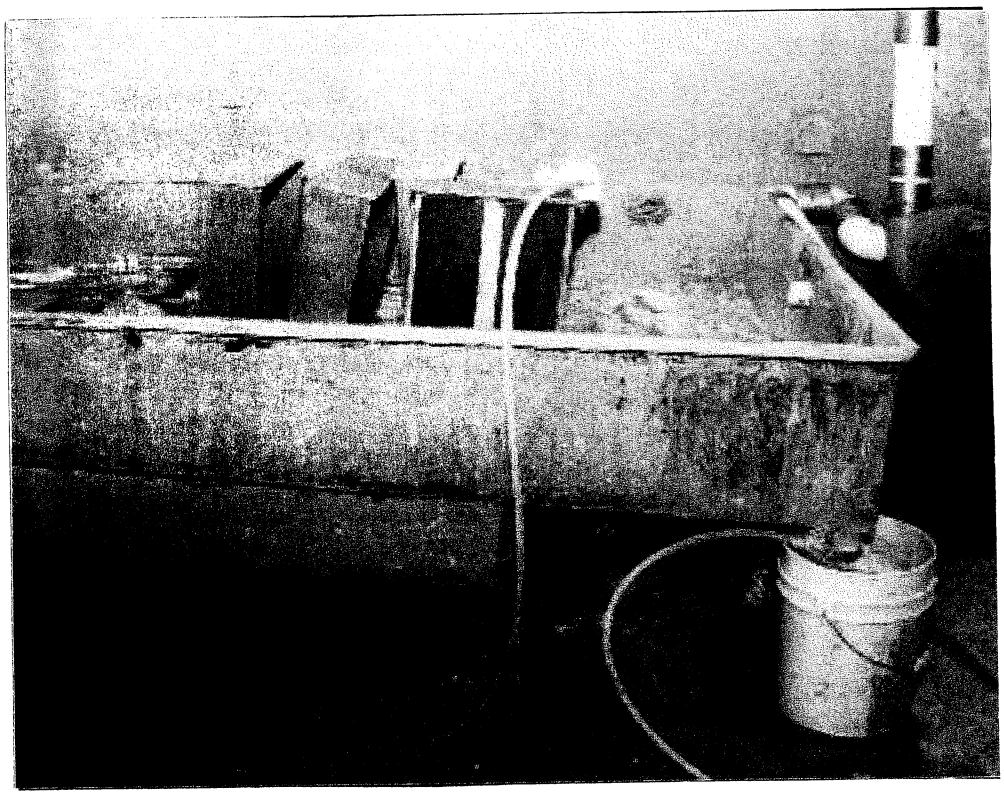
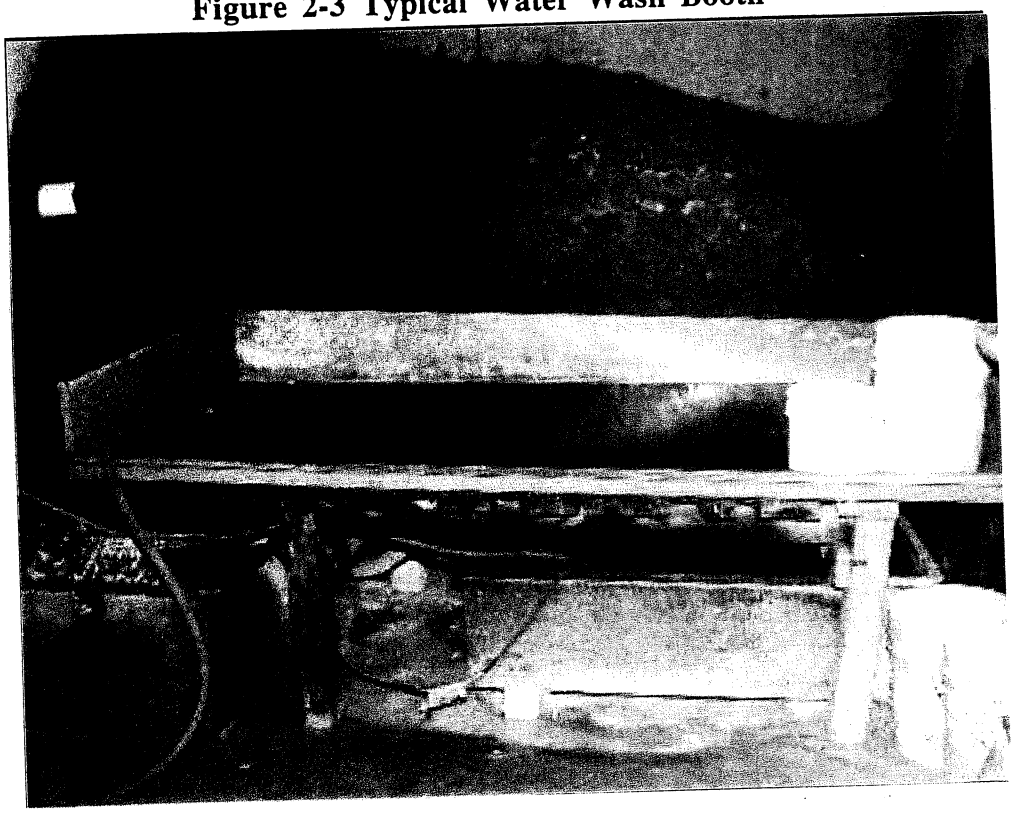


Figure 2-2 Typical Dip Tank

When the worker is finished stripping the wood item, it is transferred to a water wash booth. Figure 2-3 shows various views of a typical water wash booth. High pressure spray wands containing water and oxalic acid are used to rinse the remaining stripper and coating residue from the item. The oxalic acid is used to brighten the wood surface.

Figure 2-3 Typical Water Wash Booth



SURVEY APPROACH

IRTA relied on several sources to compile a list of furniture strippers in the four-county area in the South Coast Basin over which the District has jurisdiction. The major list of furniture strippers was compiled from the listings in the Yellow Pages USA Deluxe provided by InfoUSA Inc. under the following two SIC codes:

- 7641-04 Furniture--Stripping
- 7641-05 Furniture--Repairing and Refinishing

Other sources used to develop the survey shops included a list of furniture strippers located in Southern California provided by Yahoo and a list of furniture strippers used in a previous survey IRTA conducted in a project for the District.

In the earlier project, IRTA mailed a written survey to the strippers and requested a response. The response was so poor--about 10 responses out of approximately 400 surveys--that IRTA decided that telephone surveys would be conducted this time. IRTA staff telephoned the entire list of furniture strippers.

SURVEY QUESTIONS

Exhibit 2-1 presents the survey form IRTA used to survey the furniture strippers. Section 1 of the survey asks for the name, address and telephone number of the facility. IRTA staff also asked for the facility SCAQMD ID number.

Section 2 of the survey focuses on the use of stripper. It asks if the company strips wood items and if the company uses METH-based stripper. It also asks how much METH stripper the company uses.

Most furniture strippers do not use equipment for stripping. As discussed earlier, some furniture strippers use a flow tray for stripping, some use a dip tank and some use both a flow tray and a dip tank. Section 3 of the questionnaire is designed to collect information on which types of equipment are used by each company.

The focus of Section 4 of the questionnaire is on the stripping frequency. The questions ask for information on the hours per day and number of days each week the company strips.

SURVEY RESULTS

IRTA performed a full telephone survey for 407 firms in the four county area including Los Angeles, Orange, Riverside and San Bernardino. Of these facilities, 164 facilities or about 40 percent responded to the survey. Seventy-six of the 164 facilities that responded do not perform stripping. Eighty-eight facilities that responded to the survey indicated that they perform stripping. Table 2-1 provides information on the location of the furniture stripping facilities that responded to the survey and indicate they perform stripping.

Table 2-1
Survey Results--Location of Responding Furniture Stripping Facilities

County	Number of Stripping Facilities	Percent of Total Facilities
Los Angeles	53	60.2
Orange	21	23.9
Riverside	9	10.2
San Bernardino	5	5.7
Total	88	100

Of the 88 facilities that responded to the survey and perform stripping, 12 indicated they had stripping equipment and 76 indicated they have no equipment and do hand stripping. Of the 12 facilities that have equipment, seven indicated they used a flow tray, four indicated they have a dip tank and one did not know the kind of equipment.

None of the strippers that were surveyed provided their facility I.D. number. It is not possible to estimate the number of firms that have permits. The District does not have a specific category for stripping tanks so there is no straightforward method of determining how many of the strippers have permitted equipment from the AQMD data base.

The survey results on the types of equipment used by furniture strippers are summarized in Table 2-2.

EXHIBIT 2-1

IRTA FURNITURE STRIPPER SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

Facility Use of Stripper

circle one

Do you strip furniture or other wood items? yes no

If no, survey is completed. If yes,

Do you use methylene chloride stripper? yes no

If no, what kind of stripper do you use? _____

If yes, how much methylene chloride stripper do you use?

_____ gal/wk _____ gal/mo _____ gal/yr

Facility Stripping Equipment

circle one

Do you use stripping equipment? yes no

If yes:

Do you use a flow tray for stripping? _____

Do you use a dip tank for stripping? _____

Do you use both a flow tray and dip tank for stripping? _____

If no:

Do you strip by hand? _____

If no:

How do you strip? _____

Facility Stripping Frequency

How often do you strip? _____ days/wk

How many hours each day? _____

Table 2-2
Survey Results--Stripping Equipment

# Surveys performed	407
# Survey respondents	164
# Firms that perform stripping	88
# Firms with flow trays only	7
# Firms with dip tanks only	4
# Firms with unknown equipment	1
Total number of firms with equipment	12

Of the 88 survey respondents that perform stripping, the average amount of stripper use they reported amounted to about 1.5 gallons per week. There were 25 shops (28 percent) who reported using two gallons per week or more and 63 shops (72 percent) who reported using less than two gallons per week. Only one stripping facility reported using more than five gallons per week; this facility indicated they use 12.5 gallons per week.

The 12 furniture strippers that have equipment reported using more stripper--an average of approximately 3.5 gallons per week--than the strippers that do not have equipment. The strippers that indicated they stripped exclusively by hand reported using an average of about 1.2 gallons of stripper per week.

Of the 88 strippers responding to the survey who perform stripping, 19 (22 percent) reported that they strip three or more days per week. The remaining 69 (78 percent) facilities strip less than three days per week. The overall average is about 1.9 days per week.

The shops that reported they used equipment for stripping stripped an average of about 2 days per week. Three of them indicated they stripped for three days or more each week. The shops that reported they did hand stripping indicated they stripped an average of about 1.9 days each week. Sixteen facilities reported they stripped three days a week or more.

Table 2-3 summarizes the survey results for the stripper usage and frequency of stripping for those facilities that perform stripping.

Table 2-3
Survey Results--Stripper Usage and Frequency of Stripping

	Surveyed Facilities That Strip	Facilities That Hand Strip	Facilities With Equipment
Number of Facilities	88	76	12
Average Stripper Usage (gallons/week)	1.5	1.2	3.5
Average Stripping Frequency (days/week)	1.9	1.9	2.0

EXTENSION OF SURVEY RESULTS TO OTHER FURNITURE STRIPPERS

Of the 407 shops surveyed, 164 shops or about 40 percent responded to the survey. Only 88 of the surveyed shops (54 percent) perform stripping. The results of the survey for the 164 shops can be translated to the sector as a whole.

Of the 407 furniture strippers in the Basin, about 46 percent or 188 facilities do not perform stripping. Of the remaining 219 facilities (54 percent) that perform stripping, 188 (86 percent) strip exclusively by hand. They strip an average of 1.9 days each week and use an average of 1.2 gallons of stripper each week. The total stripper usage for the shops that do hand stripping is about 226 gallons per week.

Of the 219 facilities that perform stripping, thirty-one stripping facilities (14 percent) use equipment for stripping. They strip an average of 2.0 days per week and use an average of 3.5 gallons each week. Total stripper usage for shops with equipment is about 104 gallons per week.

Table 2-4 extends the results of the survey to the stripper population as a whole.

Table 2-4
Extension of Survey Results--Stripper Usage and Frequency of Stripping

	All Facilities	Facilities That Hand Strip	Facilities With Equipment
Number of Facilities	219	188	31
Average Stripper Usage (gallons/week)	1.5	1.2	3.5
Average Stripping Frequency (days/week)	1.9	1.9	2.0

Using the extension assumptions of Table 2-4, the total stripper usage for all stripping facilities is approximately 339 gallons per week or 17,160 gallons per year.

OTHER INFORMATION ON FURNITURE STRIPPING

IRTA and industry sources have estimated the amount of stripper used by the estimated 219 stripping shops in the Basin. This information is presented in Table 2-5. Perhaps two or three of the largest strippers use more than 1,200 gallons of stripper per year. An estimated 15 strippers use between 700 and 1,200 gallons of stripper annually. About 20 strippers

use between 200 and 700 gallons per year. The smallest strippers, about half of the firms in the Basin, use less than 5 gallons of stripper per year. The remaining strippers, 86 of them, use between 5 and 200 gallons of stripper per year.

Table 2-5
Estimated Annual Stripper Usage

Annual Stripper Usage (gallons per year)	Number of Firms
1,200 - 2,000	3
700 - 1,200	15
200 - 700	20
5 - 200	71
< 5	110
Total	219

Using the average of the range for each category in Table 2-5, the amount of stripper usage in the Basin is estimated at 35,603 gallons per year. This is approximately double the amount--17,160 gallons annually--estimated from the survey results. This is not unexpected since it is likely that the survey respondents indicated they used less stripper than they actually purchase.

EMISSION FACTOR FOR FURNITURE STRIPPING

A typical formulation used by furniture strippers contains between about 70 and 85 percent METH. Exhibit 2-2 shows an example of a typical Material Safety Data Sheet (MSDS) used by furniture strippers. The density of the formulation is about 10 pounds per gallon. Assuming the METH content of the stripper is 78 percent, one gallon of stripper contains 7.8 pounds of METH.

During the stripping process, hazardous waste consisting of the coating sludge and various components of the stripping formulation is generated. Industry sources estimate that about 10 percent of the METH that is used in the stripper is contained within the hazardous waste. Strippers that have equipment likely dispose of the hazardous waste properly but strippers that strip by hand probably do not. Strippers with equipment account for about 80 percent of stripper use. On this basis, the amount of METH in the hazardous waste that is not emitted is estimated at 8 percent.

Most of the parts that have been stripped are rinsed down with water. A small amount of the METH becomes entrained in the water and trace quantities may enter the sewer. Strippers with water wash booths rinse the furniture with water containing the METH. It is likely that most of this METH is emitted during the spray process because METH has a very high vapor pressure. For purposes of this materials balance, it is assumed that none of the METH is lost to the water.

Exhibit 2-2 Typical Stripper MSDS

MATERIAL SAFETY DATA SHEET

Benco Sales, Inc., P.O. Box 3649, Crossville, TN 38557

Emergency Phone: 931-484-9578

Product Name: **BENCO #B7 INDUSTRIAL PAINT REMOVER**

1. PRODUCT INFORMATION:
General or Generic ID: Chlorinated Hydrocarbon, Alcohol Blend
Trade Name: Benco #B7
DOT Hazard Classification: Paint Related Material, 8, UN3066, II

2. HAZARDOUS COMPONENTS:

INGREDIENT	PEL(OSHA)	TWA(OSHA)	APPROX%
Dichloromethane	25 ppm	25 ppm	70-85
Methanol	200 ppm	200 ppm	8-15
2-Butoxyethanol	50 ppm	25 ppm	1-10
2-Methoxymethylethoxypropanol	25 ppm	25 ppm	1-10
Biodegradable Wetting Agents & Wax	N/A	N/A	1-5

NOTE: Dichloromethane and Methanol are subject to reporting requirements of Section 313 of Title III of the 1986 Superfund Amendments and Reauthorization Act (SARA) and 40CFR Part 372, which apply to businesses with 10 or more employees. Please call Benco regarding reporting quantities at 800-632-3626.

3. PHYSICAL DATA:

Boiling Point:	104F (Initial)	Vapor Pressure:	<300 mm Hg
Vapor Density:	2.93 (Air=1)	Percent Volatile:	>97.0%
Specific Gravity	1.20	VOC Content:	180 grams/l

Odor: Typical Methylene Chloride

4. FIRE AND EXPLOSION HAZARD DATA:
Flash Point: None to boiling point **Lower Explosive Limit: Unknown**
Extinguishing Media: Water Fog
Fire and Explosion Hazards: May form flammable vapor-air mixtures at temperatures above ambient. Lower temperatures decrease the difficulty of ignition.
Special Firefighting Procedures: Self-Contained Breathing Apparatus with a full facepiece operated in pressure demand or other positive pressure mode.

5. HEALTH HAZARD DATA:
Effects of Overexposure:
Eyes: Can cause severe irritation and slight corneal injury. Vapors may also irritate eyes. Injury intensifies with extended contact.
Skin: Prolonged or repeated exposure will cause a burn. The burn will intensify with extended contact.
Skin Absorption: A single prolonged exposure is not likely to result in the material being absorbed through the skin in harmful amounts.
Ingestion: Can cause gastrointestinal irritation, nausea, vomiting, diarrhea, blindness, and even death. If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.
Inhalation: Major route of potential exposure. **Dichloromethane depresses the central nervous system. Concentrations between 900-1,000 ppm may cause dizziness or drunkenness. Nausea, headache, and vomiting can occur at concentrations above 2,000 ppm. At 7,000 ppm, numbness and tingling in arms and legs and rapid heartbeat have occurred. Loss of consciousness and death have occurred at levels above 9,000 ppm, if exposure is prolonged. Carboxyhemoglobin levels can be elevated in persons exposed to Dichloromethane and can cause a substantial stress on the cardiovascular system. This elevation can be additive to the increase caused by smoking and other carbon monoxide sources.**
Medical Conditions Aggravated by Exposure: Alcoholism, acute and chronic liver disease, chronic lung disease, or rhythm disorders of the heart.
Notice: Reports have associated repeated and prolonged exposure to solvents to permanent brain and nervous system damage. Persons thought to have heart or respiratory problems should seek medical advice before using solvents of any kind. If signs of allergy develop (breathing difficulty, eye itching, prolonged itching and redness of the skin, headaches, dizziness, etc.) discontinue use of this product immediately and consult a physician. Drinking alcohol before or after exposure to solvents may cause undesirable effects.
FIRST AID:
Skin: Thoroughly wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.
Eyes: Flush with large amounts of water, lifting upper and lower lids occasionally. Get medical attention.
Ingestion: Call physician, poison control center, or hospital emergency room immediately.
Inhalation: If affected, remove individual to fresh air. If breathing is difficult, administer respiration. Keep person warm, quiet, and get medical attention.
NOTE TO PHYSICIAN: This product can induce cardiac sensitization to circulating epinephrine-like compounds. Do not administer adrenaline or similar sympathomimetic drugs for 24 hours following potentially toxic exposures.
TOXICITY
Chronic Toxicity: The findings of chronic toxic affects in laboratory animals may indicate toxicity to humans. Overexposure should be avoided. Failure to do so could result in injury, illness, or even death.
Carcinogenicity: Humans exposed repeatedly to 250 ppm methylene chloride for 7.5 hours per day developed no adverse health effects. Repeated and or prolonged exposure to high concentrations has induced liver and kidney effects in experimental animals. The National Toxicology Program (NTP) has issued a study which reports that mice exposed for two years by inhalation to methylene chloride vapors at concentrations of 2000 and 4000 ppm developed lung and liver tumors. Rats similarly exposed to 1000, 2000, and 4000 ppm developed benign mammary gland tumors. In two earlier inhalation studies, rats and hamsters exposed to methylene chloride at concentrations from 50-3500 ppm did not develop significant incidences of mammary, lung, or liver tumors. EPA's Science Advisory Board recently concluded that the animal evidence for carcinogenicity is "sufficient" to indicate that methylene chloride has carcinogenic potential. Two epidemiological studies showed no evidence of human carcinogenicity or any other health effects related to methylene chloride exposure. The collective evidence of several animal studies and human experience suggests that there is little carcinogenic risk for humans under controlled conditions of occupational exposure.
The State of California has listed Dichloromethane under Proposition 65 as a chemical known to the State to cause cancer. Epidemiology studies of 751 humans chronically exposed to dichloromethane in the workplace of which 252 were exposed a minimum of 20 years did not demonstrate any increase in deaths caused by cancer or cardiac problems. A second study of 2,227 workers confirmed these results.

Reproductive Toxicity: Reproductive toxicity tests have been conducted to evaluate the adverse effects dichloromethane may have on reproduction and offspring of laboratory animals. The results indicate that Dichloromethane does not cause birth defects in laboratory animals.

6. REACTIVITY DATA:
Hazardous Polymerization: Can not occur.
Stability: Stable
Incompatibility: Avoid contact with strong oxidizing agents.
Hazardous Decomposition Products: Open flames and welding arcs can cause thermal degradation with the evolution of hydrogen chloride and very small amounts of phosgene and chlorine.

7. SPILL OR LEAK PROCEDURES:
Action to take for spills or leaks:
Small Spills: Mop up, wipe up, or soak up immediately. Remove to out of doors.
Large Spills: Evacuate area. Contain liquid and transfer to closed metal or polyethylene containers. Avoid contamination of ground and surface waters. If spill occurs indoors, turn off air conditioning and/or heating system to prevent vapors from contaminating entire building.
Disposal Method: Evaporate small quantities in compliance with local, state, and federal regulations. Do not dispose of this material or any waste residue into septic systems, storm drains, or directly onto the ground.
Reportable Quantity (RQ) is 1,250 lb. Notify National Response Center at 800-424-8802 of uncontrolled spills in excess of reportable quantity.

8. HANDLING PRECAUTIONS:
Ventilation: Controlling airborne concentrations below the ACGIH TLV exposure guideline is recommended. ACGIH TWA is 50 ppm. OSHA PEL is 25 ppm 8 hour TWA, and a STEL of 125 ppm. This rule also establishes an Action Level of 12.5 ppm. Use only with adequate ventilation. Local exhaust ventilation is necessary for most applications. Lethal concentrations may exist in areas with poor ventilation. Contact Benco for further information. Medical monitoring is also required by OSHA for applications that exceed the Action Level of 12.5 ppm.
Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. If this level is exceeded, use an approved air purifying respirator. For emergency and other conditions where the exposure guideline may be greatly exceeded, use an approved positive pressure self-contained breathing apparatus.
Skin Protection: Wear chemical resistant rubber gloves, apron, boots, and plastic arm sleeves.
Eye Protection: Use safety glasses. Where contact is likely, use chemical splash goggles.
Hygiene: Avoid contact with skin and avoid breathing vapors. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using restroom. Any clothing or shoes that have been contaminated should be removed immediately and thoroughly laundered before wearing again.
Safety Shower and Eyewash Station should be available in work area.
SARA Title III Hazard Categories - Immediate Health, Delayed Health.

9. ADDITIONAL INFORMATION:
Special Precautions to be Taken in Handling & Storage: Exercise reasonable care and caution. Avoid breathing vapors. Store in a cool place out of direct sunlight. Concentrated vapors of this product are heavier than air and will collect in low areas such as pits and degreasers, storage tanks, and other confined areas. Do not enter those areas where vapors of this product are suspected unless special breathing apparatus is used and an observer is present for assistance. Do not use this product in a tank or vat where the product level is 12" from the top of the tank. Lethal concentrations of vapors occur in tanks and every effort should be made to keep from breathing below or near the top level of the tank.
Do not pressure product out of container with air. When opening bung, open bung partially and vent any accumulated pressure before removing bung completely. Empty product containers may contain liquid or vapor residues of this product. All precautions suggested in this Data Sheet apply to empty containers also. Empty containers are property of Benco Sales, Inc. and should not be sold to individuals or other parties. Do not repackage this product for resale. Any product purchased for resale must have this MSDS attached to each container and must be in original container. If each container does not have an MSDS, call Benco at 800-632-3626. Do not use this product in areas where contact of vapors with gas flames or hot electric elements can occur. Please call Benco at 800-632-3626 for advice on proper heating systems. Contact with flames or hot electric elements can produce hydrochloric acid and phosgene fumes which can be fatal.
Overexposure to this product can raise the level of carbon monoxide in the blood causing cardiovascular stress.
Do not remove or deface labels off containers.

This Material Safety Data Sheet supersedes any previous Material Safety Data Sheet on this product. Effective Date: June 1, 1999.

The information accumulated herein is given in good faith and believed to be accurate, but no warranty, express or implied, of merchantibility, fitness, or otherwise is made. The suggested procedures are based on experience as of the date of publication. They are not necessarily all inclusive nor fully adequate in every circumstance. Consult Benco Sales, Inc. for proper handling procedures in specific situations or for any further information.

The materials balance equation for the METH used by furniture strippers annually is as follows:

EMISMETHFURN (pounds) = PSTRIP (gallons) X 10 (pounds/gallon) X 0.78 X 0.92

where EMISMETHFURN = annual METH emissions
PSTRIP = annual paint stripper purchases
the factor 0.78 is the percent of METH in the stripper
the factor 0.92 is the percent of the stripper emitted

As an example, consider a stripping shop that purchases 1,000 gallons of stripper a year. The METH emissions for that shop amount to 7,176 pounds or about 3.6 tons per year.

The materials balance or emission factor can also be applied to the amount of stripper used by the industry as a whole. Assuming that furniture strippers use (or purchase) 35,603 gallons of stripper each year, the METH emissions for the industry amount to 255,487 pounds or about 128 tons per year.

TECHNOLOGIES FOR REDUCING METH USE/EMISSIONS/RISK IN FURNITURE STRIPPING

There are three methods that could be effective in reducing the risk posed by furniture strippers to the surrounding community. First, the risk can be reduced through the use of strippers that do not contain METH or contain a lower concentration of METH. Second, the risks can be reduced through use of higher air flow ventilation systems. Such systems dilute the METH concentration outside the facility. Third, the METH emissions could be reduced through use of a control device. Each of these methods is discussed below.

Alternative Strippers

The stripper most commonly used today by most furniture stripping facilities has the following approximate composition:

- 70 to 85 % METH
- 8 to 15 % methanol
- 5 to 10% other ingredients.

The METH is the active agent that penetrates the coating film and lifts the coating from the surface of the wood. The methanol acts synergistically to enhance the stripping capability of the METH. The other ingredients include other VOC solvents, surfactants to make the stripper rinseable and wax to hold the volatile METH on the surface long enough to strip the coating.

IRTA investigated and tested alternative non-METH strippers over the last few years extensively during a project funded by SCAQMD and NIOSH. IRTA is currently conducting a project with CARB and plans to evaluate additional alternative strippers. SCAQMD Rule 1136 establishes limits for the VOC content of strippers. Strippers must contain 350 grams per liter or less VOC or have a vapor pressure less than 2 mm Hg. The strippers that IRTA has tested and plans to test during the CARB project must meet the VOC content requirements of SCAQMD Rule 1136. Note that METH is not classified as a VOC.

Several classes of alternative stripping formulations have been investigated and tested over the years. These can generally be categorized as flammable strippers, combustible strippers

and low-METH content strippers. Flammable and combustible strippers have received the most attention as potential alternatives.

Flammable strippers commonly consist of blends of low flash point solvents including acetone and methanol. One problem with these strippers is that they are dangerous because of the flammability. In fact, most fire departments will not allow the use of these stripping formulations in flow trays or dip tanks. Another problem with these strippers is that they are not very effective. IRTA has not tested these strippers and does not plan to test them during the CARB project because of the fire department regulations.

Combustible strippers are commonly composed of n-methyl pyrrolidone (NMP), dibasic esters (DBE) and terpenes or their blends. Generally, in the tests that have been conducted to date, these strippers also have performance problems. The flammable and combustible strippers can often strip older coating types, like solventborne lacquer coatings and varnishes, fairly well. They are much less effective than the traditional METH-based products on the newer coatings, like cross-linked and water-based paints. As the base of furniture moves more toward the newer coating types, the flammable and combustible products may prove even less effective overall.

In order to conduct a good comparative analysis of non-METH alternative strippers, IRTA tested three combustible strippers in the SCAQMD/NIOSH project. The first of these contained NMP as the primary component, the second contained DBE and the third contained a terpene. The specific formulations are discussed in more detail below.

NMP Product. This product consisted of 65 to 75 percent NMP and 20 to 30 percent naphtha solvent. The balance, monoethanolamine, present at 0 to 10 percent, is a surfactant. Under the EPA Test Method #24, the product contains 8.1 to 8.3 pounds per gallon VOC. Except perhaps for the monoethanolamine, the product is virtually all VOC. The MSDS indicates that the vapor pressure of the stripper has not been established. The vapor pressure of NMP and naphtha solvent are less than 1 mm Hg and 2 mm Hg respectively. The vapor pressure of the mixture is probably no higher than 2 mm Hg which meets the Rule 1136 cutoff level of 2 mm Hg.

NMP is a reproductive and developmental toxin. Over the last few years, it has been added to EPA's Toxic Release Inventory list because of its toxicity. Naphtha solvent contains aromatic fractions. This means there are probably trace quantities of components like benzene which is an established human carcinogen, toluene which causes central nervous system damage and xylene which can cause birth defects.

NMP, because it is established as a reproductive and developmental toxin, may be as toxic or even more toxic than the standard METH strippers used today. Because the stripper based on NMP was thought likely to be the best alternative non-METH stripper, the project team decided it should be tested for completeness. It was always clear, however, that the toxicity of NMP was an issue.

DBE Product. The DBE product that was tested is called Safest Stripper Paint and Varnish Remover. It is made by 3M and is available commercially in hardware stores. It contains two of the three components of the class of DBEs. These are dimethyl adipate and dimethyl glutarate. Between about 21 and 35% of the stripper consists of these materials. From 65 to 75% of the stripper is water. The VOC content of the stripper, at 325 grams per liter, meets the Rule 1136 VOC level. The vapor pressure of the stripper is less than 1 mm Hg which also meets the 2 mm Hg cutoff level of Rule 1136.

DBE has been found to cause eye problems at high concentrations. DBE also has suspected neurotoxicity problems. The exposure levels of 1.5 ppm for each of the two DBE components in the stripper reflect the toxicity. It's worth noting that this level could be difficult to meet in a large-scale stripping application.

Terpene Product. This stripper is 100% d-limonene, a type of orange terpene. D-limonene is 100% VOC with a VOC content of 7.1 pounds per gallon (852 grams per liter). The vapor pressure of the stripper is 1 mm Hg which meets the vapor pressure cutoff level of Rule 1136.

Compared to METH, NMP and DBE, the d-limonene product has relatively low toxicity. The odor of d-limonene is very strong, however, and is considered intolerable by some workers after a period of use. In some applications, the chemical has been found to polymerize and leave a residue that is difficult to remove. D-limonene is not soluble in water. The chemical is very photochemically reactive and it has a fairly low flash point of 117 degrees F.

Low-METH Content Strippers. The other category of strippers that were tested during the SCAQMD/NIOSH project contain lower METH concentrations than the stripper used widely today. Two different formulations were tested. One of these, called Benco #B50 Industrial Paint Remover, contains between 55 and 65% METH which can be compared with the 80 to 85% in the stripper commonly used today. The balance of the stripper is various VOC solvents. The stripper, at 335 grams per liter VOC content, meets the 350 grams per liter cutoff level of Rule 1136.

In addition to the 55 to 65% METH, the B50 stripper contains 8 to 15% methanol. The balance is aromatic petroleum distillates which again can include trace quantities of benzene, toluene and xylene; a branched acetate ester at 5 to 12%; two glycol ethers at 1 to 5% each; a cresol at less than 1%; and various wetting agents and wax at 1 to 5%. The chemicals in the B50 that have replaced METH in the standard stripper are all fairly toxic. Because METH is an animal carcinogen, however, the toxicity of the new B50 blend is judged to be the same as or less than that of the stripper used today.

The second low-METH stripper tested during the SCAQMD/NIOSH project is called Benco Invert Industrial Paint Remover. This is a very different type of stripper. It is based on a microemulsion developed by Dow Chemical that allows METH and water, which are normally insoluble in one another, to be blended uniformly. This stripper also requires some VOC solvents to enhance the stripping capability. Because one of the components is water and because METH is exempt from VOC regulations, the stripper contains only 204 grams per liter VOC. It obviously meets the Rule 1136 VOC requirements.

Best Performing Strippers in SCAQMD/NIOSH Project. The stripper that performed best during the project was the traditional stripper containing about 82 percent METH. The next best performing stripper was the low-METH blend called B50 containing about 55% METH. The third best performing stripper was the NMP formulation; this latter stripper, however, was effective only on certain coating types.

Benco Sales, the stripper formulator that sells stripper to most facilities in Southern California, conducted more extensive longer-term testing of the low-METH blend after the project testing was completed. Over the longer-term, the stripper was not viable because the METH--which has a much higher vapor pressure than the other stripper components--preferentially evaporated. The remaining components in the stripper were not effective alone in stripping the coatings. This meant that the remaining liquid stripper had to be

discarded. More METH could have been added to the liquid stripper as it was depleted but this would defeat the purpose of starting out with a low-METH stripper.

Alternative Strippers in CARB Project. The failure of the low-METH stripper in the SCAQMD/NIOSH tests offered lessons on how to formulate other low-METH strippers with a METH concentration that should be more constant over time. IRTA and Benco Sales will test several additional alternatives during the CARB project. Seven preliminary formulations, some non-METH and some low-METH strippers, will be investigated and those that perform reasonably well in the laboratory tests will be tested in furniture stripping facilities and over the longer-term. IRTA will provide SCAQMD with the results of the stripper testing as soon as it is available.

Ventilation Systems

Most furniture stripping facilities have ineffective ventilation systems if they are used at all. The District conducted a source test at a furniture stripping facility called T&M Strip Shop to investigate losses and to examine the standard type of ventilation system. The ventilation system had a measured rating of 311 cfm in the flow tray area and 362 cfm in the water wash booth. The findings indicated that about 45% of the METH was captured by the ventilation system on the flow tray during stripping. The water wash booth was only marginally effective in capturing additional METH. This indicates that, with a standard ventilation system operating, less than half the METH is captured and emitted from the stack. The balance of the METH is emitted from the facility as a volume source.

During the SCAQMD/NIOSH project, IRTA arranged for a vendor to build and install two higher air flow ventilation systems for the flow tray and water wash booth to determine if the capture efficiency could be improved. The District performed source tests at The Strip Joint in Redondo Beach and Los Angeles Stripping & Finishing Center in Los Angeles.

At The Strip Joint, the measured flow tray ventilation rating was 1,596 cfm and the water wash booth ventilation was 1,650 cfm with the new ventilation system. This can be compared with the measured standard flow tray ventilation rate of 114 cfm; the rinse area had no ventilation. The capture efficiency with the improved ventilation system at the flow tray was 64% with the standard stripper. The capture efficiency with the standard flow tray ventilation system was only 21.6%.

At Los Angeles Stripping & Finishing Center, the flow tray ventilation rating was measured at 1,096 cfm and the water wash booth ventilation was measured at 1,189 cfm with the new ventilation system. The standard ventilation system provided 207 cfm at the flow tray and the water wash booth had no ventilation. Using the baseline stripper, the capture efficiency with the improved ventilation system was 57.3% which is somewhat higher than the capture efficiency of 46.7% achieved with the standard ventilation system.

In the CARB project, IRTA has arranged for an even higher air flow ventilation system to be installed in a stripping facility. The District will source test at The Strip Joint and at the facility where the new higher air flow ventilation system is installed. The results should indicate whether and how much high air flow ventilation systems can reduce the risk posed by stripping firms.

Control Devices

In principle, furniture strippers could install control devices to reduce METH emissions from the facility. From a technical standpoint, the best control device option would be either a dual bed carbon adsorption/desorption system or a fluidized bed carbon adsorption

system. Destruction devices would pose technical problems because one of the decomposition products of METH is HCl. The system would require a scrubber to neutralize the HCl and large amounts of hazardous waste would be generated.

The cost of a carbon adsorption control device would be very high for a furniture stripper. Shops must now meet the new lower OSHA exposure level for METH which requires them to install higher air flow ventilation systems. The higher air flow systems increase the volume of air that would have to be treated by a control device. The higher the volume of air that must be treated, the higher the cost of the control device.

A carbon adsorption system for stripping shops might require a capital investment of $100,000 to $200,000; a scrubbing system would require an even higher investment. As indicated above, operating costs for shipping the hazardous waste off-site would also be high. As discussed in the next section, stripping shops are very small and unsophisticated businesses and they would not have the capital to pay for a control system or the funds to pay the operating costs. Use of a control device is not a reasonable option for this industry and it is not analyzed further.

Cost Analysis of Alternative Technologies

Most furniture strippers' yearly income after expenses ranges from $20,000 to $30,000. These low income levels limit the ability of stripping companies to pay for alternative technologies.

If a low-METH content alternative stripping formulation that is effective can be identified during IRTA's CARB project, its cost is estimated to be 10 to 20 percent higher than the cost of the stripper used today. The cost of the stripper used today is about $7.80 per gallon. Taking the case of a stripper using 1,000 gallons of stripper per year, substituting a new stripping formulation that is 10 percent higher in cost, the company's annual cost would increase by $780. If the new stripping formulation were 20 percent more costly, the company's annual cost would increase by $1,560.

This analysis does not include any additional costs that might be incurred through the substitution. A larger quantity of the new stripper could be required to do the same amount of stripping the company does today. The new stripper could require additional labor which would increase the labor cost paid by the company.

IRTA has arranged for the installation of higher air flow ventilation systems at certain furniture stripping companies in the Basin. The vendor that built these systems estimates the cost of the ventilation systems at between $3,000 and $6,000, depending on the air flow and design. If a furniture stripper had to purchase a ventilation system, the cost would be significant for these small companies. Assuming the cost of a system is $5,000, that the system has a useful life of 10 years and that the cost of capital is five percent, the annualized cost to a stripping company would amount to $815.

The total cost to a stripping company for adopting a low-METH content stripper and a ventilation system could be in the range of $2,000 per year. This excludes the company's permit renewal fee which is about $600 per permitted unit. Many facilities that have equipment have both a flow tray and a dip tank so the permit renewal fee could total $1,200. Emission fees for METH paid to the District are five cents per pound. For a stripper using 1,000 gallons of stripper containing 82 percent METH, this fee would amount to $410 annually. For a company using 1,000 gallons of a low-METH content stripper with 55 percent METH, the emission fee would amount to $275 annually.

A typical larger stripping company pays about $1,610 annually in fees to the District. Requiring the use of a low METH stripper and a ventilation system could increase the fees by between $1,460 and $2,250. For a company with an income of $30,000 after expenses, the cost of the fees represents about five percent of their income. The new costs for controls represent about seven percent of their income. For a stripper with a $20,000 income after expenses, the fees and controls would account for 18 percent of the stripping company's income.

III. OTHER FULL TELEPHONE SURVEY INDUSTRIES

This section focuses on the industries other than furniture stripping that use or may use METH where IRTA performed full telephone surveys. These include:

- foam fabrication
- counter top manufacturing
- aircraft stripping
- metal cleaning
- storage tanks
- other tank operations

In each case, the survey that was used is presented and discussed and the results of the survey are summarized. IRTA generally also used industry sources to comment on the number of companies in the industry group and their practices and the information gathered from these sources is also provided. In each case, IRTA provides an assessment of the industry that focuses on the accuracy of the survey results and IRTA's estimate of the METH used by each of the industry groups. Finally, methods of reducing emissions or the risk posed by companies in each industry group are presented and discussed.

FOAM FABRICATION

There are four companies with five pouring plants in the Basin that manufacture flexible slabstock polyurethane foam. All of the foam that is manufactured is fabricated, a term that refers to cutting up the foam into pieces that are an important component in carpet underlay, furniture, bedding, packaging, transportation seating and other products where a durable and resilient cushioning material is required.

Some of the foam is fabricated in foam manufacturing facilities or in fabrication facilities owned by foam manufacturers. Other foam is fabricated by independent fabrication facilities. Some of the foam is fabricated using adhesives and some is not. In many cases, the foam requires a particular shape or a particular feel. During fabrication, several different densities of foam or other materials like polyester fiber are bonded together to form a particular shape with specific characteristics. The foam used in sofa arms, for example, does not require adhesive. Different shaped pieces of foam are bonded together to achieve a particular shape for sofa cushions. It is estimated that about one-third of the foam used in furniture manufacture and five percent of the foam used in bedding manufacture requires adhesive in the fabrication operation.

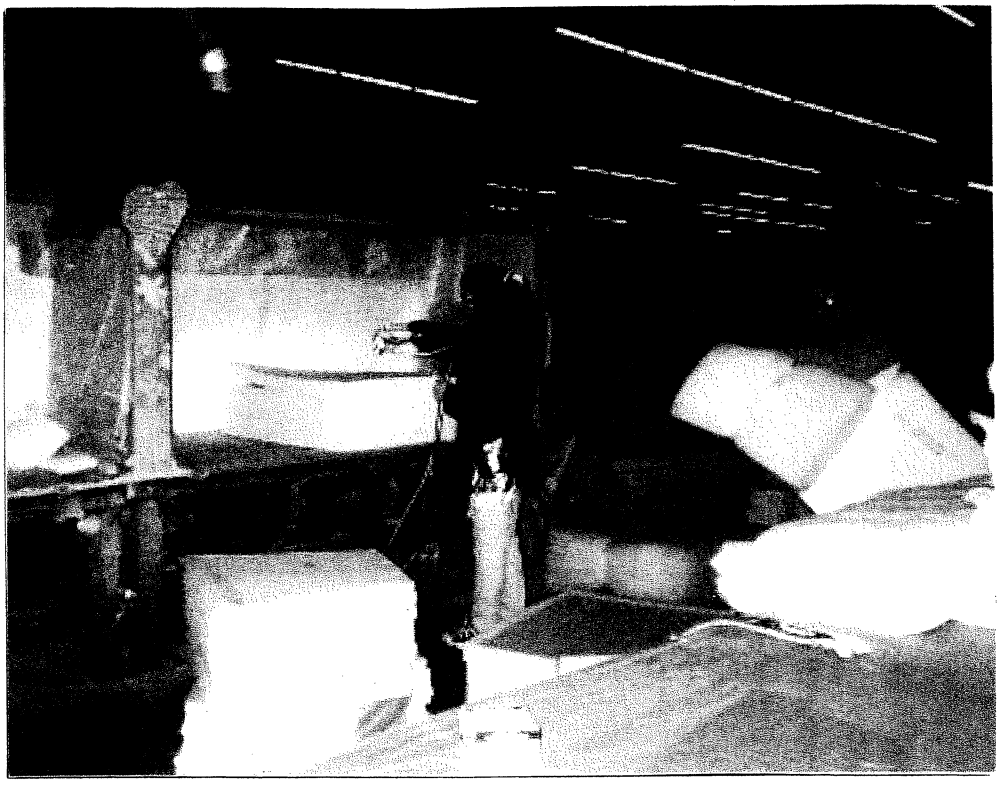
Independent foam fabricators purchase foam from foam manufacturers. Many foam manufacturers with on- or off-site foam fabrication operations use the foam they manufacture. All of these fabricators perform fabrication services for other companies that manufacture bedding, upholstered furniture and other products. They generally bond foam-to-foam and foam-to-fiber.

Figure 3-1 shows a saw used for cutting the foam into pieces. Figure 3-2 shows a facility operator applying adhesive to the cut foam.

In the 1980s and early 1990s, most of the adhesive used by foam fabricators was based on 1,1,1-trichloroethane (TCA). In the 1990s, TCA was designated as a ozone depleting substance and, in 1996, its production was banned for that reason. Although TCA inventory was still available, the chemical had become very expensive because of a

Figure 3-1 Cutting Foam in a Foam Fabrication Facility

Figure 3-2 Applying Adhesive to Foam



congressional tax on ozone depleting substances. Virtually all adhesive formulators stopped making TCA adhesives.

The formulators began offering adhesives based on METH but many of the larger companies in the Basin continued to use TCA. The formulators also developed water-based adhesives and several of the larger firms in the Basin have tested and optimized the water-based adhesives and are using them today. A few of the smaller firms in the Basin are using METH based adhesives. These companies are operating without a District permit. If they were to apply for a permit, they would likely be denied or their use would be drastically limited under the provisions of Rule 1401.

Survey Approach

IRTA is currently working on an EPA project to examine alternatives to METH adhesives used in several industries including foam fabrication. Discussions with vendors indicate that some foam fabricators in Southern California are using METH-based adhesives.

The list of foam fabricators was developed from a Yahoo list and from listings in the Yellow Pages USA Deluxe under the following SIC codes:

- 3086-01 Plastics--Foam (manufacturers)
- 3089--02 Plastics & Plastic Products (manufacturers)

IRTA staff performed a telephone survey of all of the facilities on the list.

Survey Questions

Exhibit 3-1 presents the survey that was used for the foam fabrication industry. The first section of the survey requests the name, address, telephone number and SCAQMD I.D. number.

The second section asks for information on the facility's use of adhesive. It asks whether the facility uses adhesive and, if so, whether the facility uses METH based adhesive. It asks for the amount of METH adhesive used and the frequency of spraying.

The third section requests information on the application equipment used by the facility and whether the facility has a ventilation system.

The fourth section asks for information on whether the facility uses METH to clean the application equipment and, if so, how much METH is used for this purpose.

The fifth and final section asks how much METH the facility emits.

Survey Results

IRTA performed a full telephone survey of 121 foam fabricators in the four county area including Los Angeles, Orange, San Bernardino and Riverside counties. Sixty-nine of the 121 facilities or 57 percent responded to the survey. Of the 69 facilities that responded, 63 indicated that they used adhesive. Table 3-1 shows the number of facilities that responded to the survey and used adhesives in each county.

EXHIBIT 3-1

IRTA FOAM FABRICATOR SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

AQMD I.D. Number: _____

Facility Use of Adhesives

circle one

Do you use adhesive to fabricate foam? yes no

If no, survey is completed. If yes,

Do you use methylene chloride adhesives? yes no

If no, what kind of adhesive do you use? _____

If yes, how much methylene chloride adhesive do you use?
_____ gal/wk _____ gal/mo _____ gal/yr

How often do you spray adhesives? _____ hrs/day

Facility Adhesive Application Equipment

What kind of spray gun do you use? HVLP _____ Other _____

Do you have a ventilation system? _____

If so, what is the cubic feet per minute air flow of the system? _____ cfm

If so, what is the size of the blower? _____

Spray Equipment Cleaning

Do you use methylene chloride to clean your spray equipment? _____

If yes, how much methylene chloride do you use for cleaning?
_____ gal/wk _____ gal/mo _____ gal/yr

If no, what do you use to clean your spray equipment? _____

Methylene Chloride Emissions

How much methylene chloride do you emit?
_____ gal/year _____ #/yr _____ tons/yr

Table 3-1
Survey Results--Location of Responding Fabrication Facilities

County	Number of Facilities	Percent of Total Facilities
Los Angeles	43	68
Orange	10	16
Riverside	2	3
San Bernardino	8	13
Total	63	100

Thirty-one of the 63 facilities that used adhesives have less than 100 employees and annual receipts of less than $10 million. One facility has more than 500 employees and annual receipts of more than $50 million. Five facilities have annual receipts between $20 and $50 million; three of these have between 100 and 249 employees and the other two have fewer than 100 employees. Another three facilities have fewer than 100 employees and annual receipts between $10 and $20 million. The information on receipts and number of employees is not available for the remaining 23 facilities.

All 63 of the facilities that responded to the survey and used adhesive indicated that they used water-based adhesives. As discussed later, IRTA believes that this information is not accurate.

Extension of Survey Results to Other Foam Fabricators

If the results are extended to all of the 121 foam fabrication facilities identified in the four-county area, 110 of the facilities use adhesives. All 110 facilities use water-based adhesives. This is obviously not a meaningful extension.

Other Information on Foam Fabrication

For the last 18 months, IRTA has been conducting a project for U.S. EPA to examine alternatives to METH based adhesives in the foam fabrication, mattress manufacturing and upholstered furniture manufacturing industries. During that project, IRTA has received information from the adhesive formulators that there are a number of foam fabrication facilities in the Basin that are operating without SCAQMD permits. These facilities are using METH based adhesives.

IRTA contacted industry sources for input to assess whether the information collected in the survey was accurate. IRTA is aware that several facilities in the Basin are using acetone based adhesives, not water-based adhesives. They survey information is obviously inaccurate because none of the surveyed facilities indicated they were using acetone adhesives. The industry sources IRTA contacted indicate that between five and 15 foam fabricators are likely using METH based adhesives and are operating without a District permit. The industry sources also indicate that there are probably no more than 65 foam fabricators in the Basin and that the additional companies on the survey list might be upholstery shops.

Industry sources estimate that the companies using METH adhesives use an average of one drum or 55 gallons per day of METH adhesive. In an EPA adhesives project, IRTA gathered data on solvent adhesive use from fabricators in various parts of the country including Southern California. Using the usage data from 12 facilities, both large and small, the average adhesives use amounts to 13,407 gallons per year. Assuming the facilities operate 260 days per year, the daily usage from IRTA's adhesives project would amount to 51.6 gallons. This estimate and the industry source's estimate agree fairly well.

Exhibit 3-2 shows the MSDS for a typical METH based adhesive used by the foam fabrication industry. It contains 62 percent METH, six percent mineral spirits and the balance, solids. The density of this formulation is 9.65 pounds per gallon. Formulations used in this application can contain up to 70 percent METH.

Assuming that there are 10 foam fabricators in the Basin using METH based adhesives, and that each uses 13,400 gallons annually, the total use of METH adhesives by the 10 foam fabricators together amounts to 134,000 gallons of adhesive annually.

Emission Factor for Foam Fabrication

Foam fabricators that use METH based adhesives also probably use METH as a cleanup solvent for their application equipment. Some of the METH would be emitted to the atmosphere in this operation and some would be shipped off-site as hazardous waste. Since many of these facilities are already operating illegally without a District permit, they might not be concerned with proper handling of the METH waste. As a result, it is likely that much of the METH used for cleanup is emitted. This cleanup solvent would have to be added to the METH emitted from the application of the adhesives.

The cleanup solvent emissions are likely to be much less than the emissions from the adhesive. IRTA collected information from adhesive users in California, North Carolina and the Southeast. As part of the data collection, IRTA received data from several manufacturers using solventborne adhesives on their use of adhesives and cleanup solvent. Out of 10 fabricators using between 917 and 49,500 gallons of adhesive annually, six claimed they used 200 gallons of cleanup solvent per year. One used 100 gallons of cleanup solvent per year and two said they used no cleanup solvent at all. There was no relationship between the level of adhesive use and the level of cleanup solvent used. For purposes of analysis here, it was assumed that the average fabricator uses 150 gallons of cleanup solvent annually.

Assuming that all the cleanup solvent is emitted and none is shipped offsite as hazardous waste, the emissions of METH from cleanup solvent for one facility would amount to 150 gallons annually. This totals 16,500 pounds or 8.3 tons of METH emissions per year for the 10 facilities combined.

Adhesives used in the foam fabrication application are virtually all emitted to the atmosphere and cleanup solvent emissions are determined as described above. Under these assumptions, the emission factor for the METH is:

EMISMETHFAB (pounds/year) = ADHESUSE (gallons/year) X 9.65 (pounds/gallon)
X 0.62 + 1,650 (pounds/year)

where
EMISMETHFAB is the emissions of METH in pounds per year
ADHESUSE is the facility's adhesive use in gallons per year
the factor 9.65 is the density of the adhesive
the factor 0.62 is the percent of METH in the adhesive
the factor 1,650 is the amount of METH used in equipment cleanup

Applying this emission factor to a foam fabrication facility that uses 13,400 gallons of METH based adhesives per year, the total METH emissions would amount to 81,822 pounds or about 41 tons per year. Again assuming that there are 10 facilities using METH adhesives, the total METH emissions would be 818,220 pounds or about 409 tons annually.

Exhibit 3-2 Typical MSDS Adhesive

MATERIAL SAFETY DATA SHEET

IMPERIAL ADHESIVES, INC.
6315 WIEHE RD. CINCINNATI, OHIO 45237 030

FORMATION & EMERGENCY NOS: IMPERIAL (513) 351-1300; CHEMTREC (800) 424-9300

PRODUCT IDENTITY 104305 WHISPER SPRAY

PLANT MANAGER/SAFETY DIRECTOR
LEGGETT & PLATT
1001 UTAH
LEBANON, MO 65536

INVOICE NO: 616898
ORDER DATE: 12/13/94
LAST REVISION DATE: 12/01/94
REVISION NUMBER: 002

HMIS RATING

ACUTE HEALTH: 2* FLAMMABILITY: 1 REACTIVITY: 0

HAZARD RATING: 0-MINIMAL 1-SLIGHT 2-MODERATE 3-HIGH 4-EXTREME *-CHRONIC

SECTION I - PRODUCT IDENTIFICATION

PRODUCT IDENTITY: 104305 WHISPER SPRAY

CHEMICAL NAME: N/A - MIXTURE

SECTION II - HAZARDOUS COMPONENTS

HAZARDOUS COMPONENTS ARE LISTED IN THIS SECTION IF THEY ARE PRESENT AT OR ABOVE 1% IN THE MIXTURE. NTP, IARC AND OSHA CARCINOGENS ARE LISTED AND FOOTNOTED IF THEY ARE PRESENT AT OR ABOVE 0.1% IN THE MIXTURE. ADDITIONAL INFORMATION MAY BE FOUND IN SECTION VI. OTHER COMPONENTS MAY BE LISTED IF DEEMED APPROPRIATE. THE PERCENT BY WEIGHT GIVEN IS AN APPROXIMATE FORMULATION VALUE FOR THE COMPONENT IN THE FINISHED PRODUCT AND NOT A SPECIFICATION. COMPONENTS NOT LISTED ARE DEEMED TO BE NON-HAZARDOUS UNDER THE CRITERIA OF THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200. COMPONENTS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 AND 40 CFR PART 372 ARE IDENTIFIED IN THIS SECTION.

CODES: N/R = NOT REQUIRED, N/A = NOT APPLICABLE, N/D = NOT DETERMINED, < = LESS THAN, > = GREATER THAN, MG/CUM = MILLIGRAMS PER CUBIC METER OF AIR

		A C G I H		O S H A		
COMPONENTS	% WT.	TLV-TWA	TLV-STEL	PEL-TWA	PEL-STEL	NOTES
METHYLENE CHLORIDE SYNONYM: DICHLOROMETHANE CAS NO. 75-09-2	62	50 PPM	N/D	500 PPM	N/D	(1,2,3)
ALIPHATIC HYDROCARBONS COMMON NAME: MINERAL SPIRITS CAS NO. 8052-41-3	6	100 PPM	N/D	100 PPM	N/D	(4)
ROSIN-BASED RESIN CAS NO. 8050-26-8	N/R	N/D	N/D	N/D	N/D	
TERPENE-PHENOLIC RESIN CAS NO. 68083-03-4	N/R	N/D	N/D	N/D	N/D	

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NOTES:
THIS PRODUCT CONTAINS THE FOLLOWING COMPONENTS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III SECTION 313 AND 40 CFR PART 372 IN QUANTITIES GREATER THAN THE "de minimis" LEVEL: METHYLENE CHLORIDE AND

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SECTION II - HAZARDOUS COMPONENTS (CONTINUED)

NOTES: (CONT'D)
(1) THE OSHA ACCEPTABLE CEILING CONCENTRATION IS 1000 PPM. THE OSHA ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTABLE CEILING CONCENTRATION FOR AN 8-HOUR SHIFT IS 2000 PPM FOR A MAXIMUM DURATION OF 5 MINUTES IN ANY 2 HOURS. NIOSH RECOMMENDS TREATING METHYLENE CHLORIDE AS A POTENTIAL HUMAN CARCINOGEN AND REDUCING EXPOSURE TO THE LOWEST FEASIBLE LIMIT.

(2) CONTAINS 0.5% PROPYLENE OXIDE CAS NO. 75-56-9. PROPYLENE OXIDE HAS A PEL-TWA OF 20 PPM AND A TLV-TWA OF 20 PPM, NIOSH RECOMMENDS TREATING PROPYLENE OXIDE AS A POTENTIAL HUMAN CARCINOGEN AND REDUCING EXPOSURE TO THE LOWEST FEASIBLE LIMIT. THE AMOUNT OF PROPYLENE OXIDE IN THE FINAL PRODUCT IS APPROXIMATELY 0.3% BY WEIGHT.

(3) BOTH METHYLENE CHLORIDE AND PROPYLENE OXIDE HAVE BEEN LISTED AS POTENTIAL HUMAN CARCINOGENS BY IARC AND NTP (SEE SECTION VI). THE ACGIH LISTS METHYLENE CHLORIDE AS A SUSPECTED HUMAN CARCINOGEN.

(4) EXPOSURE LIMITS AS FOR STODDARD SOLVENT. NIOSH RECOMMENDS LIMITS OF 350 MG/CUM, 8-HOUR TWA, 1800 MG/CUM 15-MIN TWA CEILING.

SECTION III - PHYSICAL DATA

APPEARANCE: CLEAR AMBER LIQUID

APPROXIMATE BOILING POINT/RANGE (DEG.F): 104-315

APPROXIMATE DENSITY: 9.65 LBS/GAL

APPROXIMATE PERCENT VOLATILE BY WEIGHT: 68

SOLUBILITY IN WATER:
FOR PRODUCT: N/D
FOR METHYLENE CHLORIDE: 2% @ 76 DEG.F.
FOR MINERAL SPIRITS: NEGLIGIBLE
FOR OTHER COMPONENTS: NEGLIGIBLE

VAPOR DENSITY (AIR = 1):
FOR PRODUCT: N/D
FOR METHYLENE CHLORIDE: 2.9
FOR MINERAL SPIRITS: 4.9
FOR OTHER COMPONENTS: N/A

VAPOR PRESSURE (MM HG @ 68 DEG.F):
FOR PRODUCT: N/D
FOR METHYLENE CHLORIDE: 355
FOR MINERAL SPIRITS: 2.0
FOR OTHER COMPONENTS: NEGLIGIBLE

EVAPORATION RATE (N-BUTYL ACETATE = 1):
FOR PRODUCT: N/D
FOR METHYLENE CHLORIDE: 14.5
FOR MINERAL SPIRITS: 0.12
FOR OTHER COMPONENTS: NEGLIGIBLE

FLASH POINT (DEG.F): FOR PRODUCT: NONE SETA - SEE SECTION IV
FOR METHYLENE CHLORIDE: NONE SETA - HOWEVER HIGH INTENSITY IGNITION SOURCES MAY IGNITE CONCENTRATED VAPORS. SEE SECTION IV
FOR MINERAL SPIRITS: 105 TAGLIABUE CLOSED CUP

FLAMMABLE/EXPLOSIVE LIMITS (% VOLUME IN AIR):
LOWER: 1.0 UPPER: 22.0

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:
THE SOLVENT IN THIS PRODUCT IS A MIXTURE OF NON-FLAMMABLE CHLORINATED SOLVENT (METHYLENE CHLORIDE) AND A MINOR AMOUNT OF COMBUSTIBLE SOLVENT AND SHOWS NO FLASH POINT BELOW 200 DEG.F IN THE SETA FLASH CLOSED TESTER.

CAUTION! THE FLASH POINT CHARACTERISTICS MAY CHANGE UPON PARTIAL EVAPORATION DUE TO THE HIGHER EVAPORATION RATE OF THE CHLORINATED SOLVENT(S).

FLAMMABLE LIMITS:
SEE BELOW UNDER "UNUSUAL FIRE AND EXPLOSION HAZARDS."

EXTINGUISHING MEDIA:
WATER FOG

SPECIAL FIRE FIGHTING PROCEDURES:
WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES. WATER MAY BE USED TO KEEP FIRE EXPOSED CONTAINERS COOL UNTIL FIRE IS OUT. AVOID SPREADING BURNING LIQUIDS WITH WATER USED FOR COOLING PURPOSES.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
AS PRODUCED THIS MATERIAL IS NOT FLAMMABLE. HOWEVER, IF EXPOSED TO AIR FOR EXTENDED PERIODS OF TIME, THE SOLVENT MAY EVAPORATE TO LEAVE MATERIAL WHICH WILL FLASH AND/OR BURN WHEN INTRODUCED TO OPEN FLAME.

THIS PRODUCT SHOULD NOT BE USED WHERE INADEQUATE VENTILATION IS LIKELY OR WHERE VAPOR CONCENTRATIONS MAY BECOME FLAMMABLE.

ALTHOUGH METHYLENE CHLORIDE HAS NO FLASH POINT OR FIRE POINT WHEN TESTED BY CONVENTIONAL MEANS, VAPORS CONCENTRATED IN A CONFINED OR POORLY VENTILATED AREA CAN BE IGNITED UPON CONTACT WITH A HIGH ENERGY SPARK, FLAME OR HIGH INTENSITY SOURCE OF HEAT. **THIS CAN OCCUR AT CONCENTRATIONS RANGING FROM 13% TO 22% BY VOLUME.**

THE SOLIDS PORTION OF PRODUCT IS COMBUSTIBLE AND WILL DECOMPOSE DURING COMBUSTION OR UNDER PYROLYSIS CONDITIONS GIVING OFF TOXIC FUMES.

CLOSED CONTAINERS MAY BURST DUE TO PRESSURE BUILD-UP IF EXPOSED TO TEMPERATURES AT OR NEAR THE BOILING POINT OF THE PRODUCT; CLOSED CONTAINERS MAY RUPTURE EXPLOSIVELY IF EXPOSED TO EXTREME HEAT OR FIRE.

NEVER USE WELDING OR CUTTING TORCH ON OR NEAR DRUM (EVEN EMPTY) BECAUSE PRODUCT (EVEN JUST RESIDUE) MAY IGNITE EXPLOSIVELY.

SECTION V - REACTIVITY DATA

STABILITY:
STABLE UNDER NORMAL CONDITIONS

CONDITIONS TO AVOID:
AVOID CONTACT WITH OPEN FLAME, ELECTRIC ARCS, HOT GLOWING SURFACE OR OTHER HIGH TEMPERATURE SOURCES WHICH INDUCE THERMAL DECOMPOSITION.

INCOMPATABILITY (MATERIALS TO AVOID):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, STRONG ALKALIES; STRONG ACIDS, AND CHEMICALLY ACTIVE METALS SUCH AS SODIUM, POTASSIUM, BARIUM, POWDERED ALUMINUM, MAGNESIUM, ZINC. AVOID PROLONGED CONTACT WITH, OR STORAGE IN, ALUMINUM OR ITS ALLOYS. AVOID WATER CONTAMINATION.

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SECTION V - REACTIVITY DATA (CONTINU

HAZARDOUS POLYMERIZATION:
WILL NOT OCCUR

HAZARDOUS COMBUSTION AND DECOMPOSITION PRODUCTS:
CARBON MONOXIDE, CARBON DIOXIDE, ACRID (CHOKING) SMOKE AND FUMES, HYDROGEN CHLORIDE, SMALL AMOUNTS OF PHOSGENE AND CHLORINE, PHENOLIC COMPOUNDS, VARIOUS HYDROCARBONS, OTHER UNIDENTIFIED TOXIC MATERIALS

SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY:
INHALATION, EYE CONTACT, SKIN CONTACT

EFFECTS OF ACUTE OVEREXPOSURE:
FOR EACH POTENTIAL ROUTE OF EXPOSURE TO PRODUCT MIXTURE BASED ON EFFECTS OF INDIVIDUAL HAZARDOUS COMPONENTS PRESENT IN OSHA REPORTABLE AMOUNTS

EYE CONTACT:
VAPORS ARE IRRITATING. DIRECT CONTACT WITH THE LIQUID OR OVEREXPOSURE TO ITS VAPORS OR MISTS CAN CAUSE MODERATE IRRITATION, PAIN, BURNING, TEARING, REDNESS. MAY CAUSE SLIGHT CORNEAL INJURY. EYE EFFECTS MAY BE ACCENTUATED IF MATERIAL IS NOT PROMPTLY REMOVED.

SKIN CONTACT:
CONTACT MAY CAUSE IRRITATION, PROLONGED OR REPEATED CONTACT CAN CAUS IRRITATION, PAIN, BURNING, REDNESS, DEFATTING (DRYING, CRACKING OR FLAKING OF SKIN), DERMATITIS (INFLAMMATION OF SKIN) AND POSSIBLE BURNS. SKIN EFFECTS MAY BE ACCENTUATED BY LIQUID BECOMING TRAPPED AGAINST THE **SKIN BY CONTAMINATED CLOTHING AND SHOES. PERSONS WITH PRE-EXISTING SKIN DISORDERS MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THIS MATERIAL.**

SKIN ABSORPTION:
ALTHOUGH ABSORPTION OF LIQUID THROUGH INTACT SKIN IS POSSIBLE, RESULTING IN SYSTEMIC EFFECTS (INJURY TO OTHER BODY SYSTEMS), A SINGLE PROLONGED EXPOSURE IS NOT LIKELY TO RESULT IN THE ABSORPTION OF HARMFUL AMOUNTS OF MATERIAL.

INHALATION:
EXCESSIVE INHALATION OF VAPORS OR MISTS CAN CAUSE NASAL AND RESPIRATORY IRRITATION, HEADACHE, NAUSEA, SIGNS OF NERVOUS SYSTEM DEPRESSION (SUCH AS LIGHTHEADEDNESS, DIZZINESS, LOSS OF COORDINATION AND EQUILIBRIUM, DROWSINESS, WEAKNESS, FATIGUE), POSSIBLE UNCONSCIOUSNESS, AND EVEN DEATH IN CONFINED OR POORLY VENTILATED AREAS. OVEREXPOSURE MAY CAUSE CARDIAC ARRHYTHMIAS (IRREGULAR HEARTBEATS).

OVEREXPOSURE TO METHYLENE CHLORIDE MAY CAUSE CARBOXYHEMOGLOBINEMIA, THEREBY IMPAIRING THE BLOOD'S ABILITY TO TRANSPORT OXYGEN. CONCENTRATIONS OF METHYLENE CHLORIDE IN THE 500 PPM TO 1000 PPM RANGE MAY PRODUCE MINIMAL ANESTHETIC OR NARCOTIC EFFECTS. PROGRESSIVELY HIGHER CONCENTRATIONS OVER 1000 PPM CAN CAUSE DIZZINESS OR DRUNKENNESS. CONCENTRATIONS AS LOW AS 10,000 PPM CAN CAUSE UNCONSCIOUSNESS AND DEATH. THESE HIGH CONCENTRATIONS MAY ALSO CAUSE CARDIAC ARRHYTHMIAS (IRREGULAR HEARTBEATS).

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SECTION VI - HEALTH HAZARD DATA (CONTINUED

INGESTION:
MAY CAUSE IRRITATION OF THE DIGESTIVE TRACT, HEADACHE, NAUSEA, VOMITING, DIARRHEA AND SIGNS OF NERVOUS SYSTEM DEPRESSION AS FOR INHALATION. ASPIRATION OF MATERIAL INTO THE LUNGS DURING SWALLOWING OR VOMITING CAN CAUSE CHEMICAL PNEUMONITIS (LUNG INFLAMMATION AND DAMAGE) WHICH CAN BE FATAL, IF ASPIRATED, MAY BE RAPIDLY ABSORBED THROUGH THE LUNGS AND RESULT IN INJURY TO OTHER BODY SYSTEMS.

THE SINGLE DOSE ORAL TOXICITY OF METHYLENE CHLORIDE IS LOW. THE LD50 FOR RATS IS IN THE RANGE OF 1500-2500 MG/KG.

ADDITIONAL EFFECTS OF ACUTE OVEREXPOSURE:
INHALATION OF AEROSOL OR SPRAY MIST MAY CAUSE SEVERE IRRITATION OF THE RESPIRATORY SYSTEM (NOSE, THROAT, LUNGS, ETC.), CHEMICAL PNEUMONITIS (LUNG INFLAMMATION AND DAMAGE), AND INJURY TO OTHER BODY SYSTEMS FROM ABSORPTION OF SOLVENT THROUGH LUNGS.

EMERGENCY AND FIRST AID PROCEDURES:
GET IMMEDIATE MEDICAL ATTENTION IF ANY SYMPTOMS OF OVEREXPOSURE OCCUR.

IF IN EYES:
IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER AND LOWER EYELIDS OCCASIONALLY. GET IMMEDIATE MEDICAL ATTENTION.

IF ON SKIN:
REMOVE CONTAMINATED CLOTHING. THOROUGHLY WASH EXPOSED SKIN AREA WITH SOAP AND WATER. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED SHOES. SEE A PHYSICIAN IF IRRITATION OR INJURY DEVELOPS.

IF BREATHED:
IF AFFECTED, REMOVE INDIVIDUAL TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP PERSON WARM, QUIET AND GET MEDICAL ATTENTION. DO NOT GIVE STIMULANTS. EPINEPHRINE (ADRENALIN), OR EPHEDRINE MAY ADVERSELY AFFECT THE HEART WITH FATAL RESULTS.

IF SWALLOWED:
IF MATERIAL HAS BEEN CONFINED TO MOUTH, RINSE OUT MOUTH WITH WATER. DO NOT SWALLOW WATER USED FOR RINSING PURPOSES.
IF MATERIAL HAS BEEN SWALLOWED, IMMEDIATELY DRINK TWO GLASSES OF WATER. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. DO NOT INDUCE VOMITING. ASPIRATION OF MATERIAL INTO THE LUNGS DUE TO VOMITING CAN CAUSE CHEMICAL PNEUMONITIS AND/OR SYSTEMIC EFFECTS WHICH CAN BE FATAL. KEEP PERSON WARM, QUIET AND GET MEDICAL ATTENTION.

NOTE(S) TO PHYSICIAN:
BECAUSE RAPID ABSORPTION MAY OCCUR THROUGH LUNGS IF ASPIRATED AND CAUSE SYSTEMIC EFFECTS, THE DECISION OF WHETHER TO INDUCE VOMITING OR NOT SHOULD BE MADE BY AN ATTENDING PHYSICIAN. IF LAVAGE IS PERFORMED, SUGGEST ENDOTRACHEAL AND/OR ESOPHAGEAL CONTROL. DANGER FROM LUNG ASPIRATION MUST BE WEIGHED AGAINST TOXICITY WHEN CONSIDERING EMPTYING THE STOMACH. EXPOSURE MAY INCREASE "MYOCARDIAL IRRITABILITY." DO NOT ADMINISTER SYMPATHOMIMETIC DRUGS UNLESS ABSOLUTELY NECESSARY. IF BURN IS PRESENT, TREAT AS ANY THERMAL BURN, AFTER DECONTAMINATION. NO SPECIFIC ANTIDOTE. SUPPORTIVE CARE. TREATMENT BASED ON JUDGMENT OF THE PHYSICIAN IN RESPONSE TO REACTIONS OF THE PATIENT.

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SECTION VI - HEALTH HAZARD DATA (CONTINUED

EFFECTS OF CHRONIC OVEREXPOSURE:
OVEREXPOSURE TO METHYLENE CHLORIDE CAN RAISE THE LEVEL OF CARBON MONOXIDE IN THE BLOOD CAUSING CARDIOVASCULAR STRESS. METHYLENE CHLORIDE HAS BEEN SHOWN TO CAUSE CANCER IN LABORATORY ANIMALS. METHYLENE CHLORIDE HAS BEEN LISTED AS A POSSIBLE HUMAN CARCINOGEN (GROUP 2B) BY IARC (INTERNATIONAL AGENCY FOR RESEARCH ON CANCER) AND AS A SUBSTANCE THAT "MAY REASONABLY BE ANTICIPATED TO BE A CARCINOGEN" BY NTP (NATIONAL TOXICOLOGY PROGRAM). THERE IS INADEQUATE INFORMATION TO ASSOCIATE METHYLENE CHLORIDE EXPOSURE DURING PREGNANCY WITH HARM TO THE FETUS.

OVEREXPOSURE TO METHYLENE CHLORIDE HAS APPARENTLY BEEN FOUND TO CAUSE LIVER ABNORMALITIES, KIDNEY DAMAGE AND LUNG DAMAGE IN LABORATORY ANIMALS.

THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS CLASSIFIED PROPYLENE OXIDE AS A PROBABLE HUMAN CARCINOGEN (GROUP 2A) BASED UPON SUFFICIENT EVIDENCE FROM LABORATORY ANIMAL TEST DATA. THE NATIONAL TOXICOLOGY PROGRAM (NTP) HAS LISTED PROPYLENE OXIDE AS A SUBSTANCE THAT "MAY REASONABLY BE ANTICIPATED TO BE A CARCINOGEN."

OVEREXPOSURE TO ALIPHATIC HYDROCARBONS CAS NO.8052-41-3 (MINERAL SPIRITS) HAS BEEN SUGGESTED AS A CAUSE OF CENTRAL NERVOUS SYSTEM EFFECTS IN HUMANS

OVEREXPOSURE TO ROSIN-BASED RESINS: ROSIN AND SOME OF ITS DERIVATIVES HAVE BEEN REPORTED TO CAUSE SKIN SENSITIZATION OR AN ALLERGIC SKIN REACTION SUCH AS A RASH IN SUSCEPTIBLE INDIVIDUALS AFTER REPEATED OR PROLONGED SKIN CONTACT. SKIN CONTACT WITH THIS OR OTHER ROSIN DERIVATI AFTER SENSITIZATION MAY CAUSE AN ALLERGIC SKIN REACTION.

OVEREXPOSURE TO TERPENE-PHENOLIC RESIN(S): NONE KNOWN

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
RESPIRATORY SYMPTOMS ASSOCIATED WITH PRE-EXISTING LUNG DISORDERS (e.g., ASTHMA-LIKE CONDITIONS) MAY BE AGGRAVATED BY EXPOSURE TO THIS MATERIAL. SKIN CONTACT MAY AGGRAVATE AN EXISTING DERMATITIS.

PRE-EXISTING ABNORMAL CONDITIONS OF THE EYES, SKIN AND RESPIRATORY SYSTEM (NOSE, THROAT, LUNGS, ETC.) MAY BE AGGRAVATED BY EXPOSURE TO TERPENE-PHENOLIC RESINS OR THE FUMES EVOLVED WHEN HEATED.

OTHER HEALTH INFORMATION:
REPORTS HAVE ASSOCIATED REPEATED AND PROLONGED OCCUPATIONAL OVEREXPOSURE TO ORGANIC SOLVENTS WITH VARIOUS NEUROTOXIC EFFECTS INCLUDING PERMANENT BRAIN AND NERVOUS SYSTEM DAMAGE. SYMPTOMS INCLUDE LOSS OF MEMORY, LOSS OF INTELLECTUAL ABILITY AND LOSS OF COORDINATION. CHRONIC SKIN EXPOSURE TO SOLVENTS MAY CAUSE SIMILAR EFFECTS. INTENTIONAL MISUSE BY DELIBERATELY CONCENTRATING AND INHALING THE CONTENTS OF THIS PRODUCT MAY BE HARMFUL OR FATAL.

IF THIS MATERIAL IS USED IN A MANNER THAT COULD GENERATE PARTICULATES (DUST) AFTER SOLVENT EVAPORATION, IT IS RECOMMENDED THAT THE DUST BE TREATED AS A NUISANCE PARTICULATE ACCORDING TO THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH). TLV--TWA 10 MG/CUM OF TOTAL DUST.

ANY PROPOSED USE OF THIS PRODUCT IN ELEVATED-TEMPERATURE PROCESSES OR IN SPRAY APPLICATIONS SHOULD BE THOROUGHLY EVALUATED TO ASSURE THAT SAFE OPERATING CONDITIONS ARE ESTABLISHED AND MAINTAINED.

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SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
WEAR APPROPRIATE SKIN AND EYE PROTECTION DURING CLEANUP. USE RESPIRATORY PROTECTION IF NEEDED.

SMALL SPILLS:
ABSORB LIQUID ON PAPER, RAGS, VERMICULITE, FLOOR ABSORBENT OR OTHER ABSORBENT MATERIAL AND TRANSFER TO HOOD. ALLOW VOLATILE PORTION TO EVAPORATE IN HOOD. ALLOW SUFFICIENT TIME FOR VAPORS TO COMPLETELY CLEAR HOOD DUCT WORK. AFTER VOLATILE PORTION HAS EVAPORATED, TRANSFER REMAINING MATERIAL TO APPROPRIATELY MARKED CONTAINER.

LARGE SPILLS:
ELIMINATE ALL IGNITION SOURCES (FLARES, FLAMES INCLUDING PILOT LIGHTS, ELECTRICAL SPARKS). PERSONS NOT WEARING PROTECTIVE EQUIPMENT SHOULD BE EXCLUDED FROM AREA OF SPILL UNTIL CLEAN-UP HAS BEEN COMPLETED. STOP SPILL AT SOURCE. DIKE AREA OF SPILL TO PREVENT SPREADING. PUMP LIQUID TO SALVAGE CONTAINER. REMAINING LIQUID MAY BE TAKEN UP ON SAND, CLAY, EARTH, FLOOR ABSORBENT, OR OTHER ABSORBENT MATERIAL AND SHOVELED INTO CONTAINERS. PREVENT RUN-OFF TO SEWERS, STREAMS OR OTHER BODIES OF WATER. IF RUN-OFF OCCURS, NOTIFY PROPER AUTHORITIES AS REQUIRED, THAT A SPILL HAS OCCURRED.

WASTE DISPOSAL METHOD:
DISPOSE OF MATERIAL IN ACCORDANCE WITH APPLICABLE LOCAL, COUNTY, STATE AND FEDERAL REGULATIONS. AS PRODUCED, THIS MATERIAL IS A PRODUCT AND NOT A WASTE.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:
IF THE TLV OF THE PRODUCT OR ANY COMPONENT IS EXCEEDED, OR IF THE PRODUCT IS USED IN SUCH A MANNER AS TO GENERATE PARTICULATES (FUME, DUST, MIST), A NIOSH APPROVED RESPIRATOR IS ADVISED IN THE ABSENCE OF PROPER ENVIRONMENTAL CONTROL (SEE YOUR SAFETY EQUIPMENT SUPPLIER). ENGINEERING OR ADMINISTRATIVE CONTROLS SHOULD BE IMPLEMENTED TO REDUCE EXPOSURE.

VENTILATION:
GENERAL MECHANICAL VENTILATION MAY BE SUFFICIENT TO KEEP PRODUCT VAPOR AND/OR MIST CONCENTRATIONS WITHIN SPECIFIED TLV RANGES. IF GENERAL VENTILATION PROVES INADEQUATE TO MAINTAIN SAFE VAPOR AND/OR MIST CONCENTRATIONS, SUPPLEMENTAL LOCAL EXHAUST MAY BE REQUIRED.

PROTECTIVE GLOVES:
THE USE OF IMPERMEABLE GLOVES ARE ADVISED TO PREVENT SKIN IRRITATION IN SENSITIVE INDIVIDUALS (SEE YOUR SAFETY EQUIPMENT SUPPLIER).

EYE PROTECTION:
CHEMICAL SPLASH GOGGLES IN COMPLIANCE WITH OSHA REGULATIONS ARE RECOMMENDED TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION OR INJURY. HOWEVER, OSHA REGULATIONS ALSO PERMIT OTHER TYPE SAFETY GLASSES (CONSULT YOUR SAFETY EQUIPMENT SUPPLIER).

OTHER PROTECTIVE EQUIPMENT:
FOR OPERATIONS WHERE CONTACT CAN OCCUR, COVERALLS, APRON AND RUBBER FOOT COVERING ARE RECOMMENDED. A SAFETY SHOWER AND EYEWASH FACILITY SHOULD BE AVAILABLE.

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SECTION IX - SPECIAL PRECAUTIONS AND OTHER COMMENTS

STORAGE AND HANDLING PRECAUTIONS:
PRACTICE SAFE WORKING PROCEDURES AND GOOD PERSONAL HYGIENE. USE PROTECTIVE EQUIPMENT WHEN NECESSARY. WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING, DRINKING, SMOKING OR USING TOILET FACILITIES.

HANDLE WITH REASONABLE CARE. STORE IN A COOL, DRY, VENTILATED AREA. KEEP AWAY FROM HEAT AND OPEN FLAME. KEEP CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE. USE WITH ADEQUATE VENTILATION. AVOID BREATHING VAPORS AND SPRAY MIST. AVOID EYE CONTACT AND REPEATED OR PROLONGED SKIN CONTACT. MATERIAL IS HIGHLY VOLATILE. IN CONFINED OR POORLY VENTILATED AREAS, VAPORS WHICH READILY ACCUMULATE CAN CAUSE UNCONSCIOUSNESS AND DEATH. CONCENTRATED VAPORS OF THIS PRODUCT ARE HEAVIER THAN AIR AND WILL COLLECT IN LOW AREAS SUCH AS PITS, DEGREASERS, STORAGE TANKS AND OTHER CONFINED AREAS. DO NOT ENTER AREAS WHERE VAPORS OF THIS PRODUCT ARE SUSPECTED UNLESS SPECIAL BREATHING APPARATUS IS USED AND AN OBSERVER IS PRESENT FOR ASSISTANCE. WHEN OPENING CONTAINERS, REMOVE TOP SLOWLY TO RELIEVE ANY PRESSURE BUILD-UP. DO NOT TRANSFER TO UNMARKED CONTAINER. FOR INDUSTRIAL USE ONLY.

ALUMINUM, MAGNESIUM AND THEIR ALLOYS ARE NOT ACCEPTABLE MATERIALS OF CONSTRUCTION FOR PUMPS, MIXERS, FITTINGS OR STORAGE TANKS BECAUSE SOLVENT DECOMPOSITION MAY OCCUR (ESPECIALLY IN PRESSURIZED OR ENCLOSED SYSTEMS) GENERATING HEAT, PRESSURE AND CORROSIVE GASES.

WHEN EXPOSED TO DIRECT HEAT, CHLORINATED SOLVENT LIQUID AND VAPORS FORM HYDROGEN CHLORIDE AND OTHER TOXIC AND CORROSIVE GASES WHICH WILL CORROD METALS AND IRRITATE EYES, SKIN AND RESPIRATORY SYSTEM. LONG TERM CONTAC WITH WATER CAN DEPLETE STABILIZERS FOLLOWED BY SLOW HYDROLYSIS PRODUCIN CORROSIVE ACID.

OTHER PRECAUTIONS:
PRODUCT MAY CORRODE, DEGRADE, OR OTHERWISE REACT WITH SOME METALS AND PLASTICS UPON PROLONGED CONTACT. CONSULT WITH EQUIPMENT SUPPLIER FOR PROPER CONSTRUCTION MATERIALS FOR STORAGE TANKS, MIXERS, FITTINGS, PIPES AND OTHER STORAGE AND HANDLING EQUIPMENT.

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED. BECAUSE EMPTIED CONTAINERS RETAIN RESIDUES (VAPORS, LIQUIDS AND/OR SOLIDS), ALL HAZARD PRECAUTIONS GIVEN IN THIS DATA SHEET MUST BE OBSERVED.

OTHER COMMENTS:
THE RESPONSIBILITY TO PROVIDE A SAFE WORKPLACE REMAINS WITH THE USER. THE USER SHOULD CONSIDER THE HEALTH HAZARDS AND SAFETY INFORMATION CONTAINED HEREIN AS A GUIDE AND SHOULD TAKE THOSE PRECAUTIONS REQUIRED IN AN INDIVIDUAL OPERATION TO INSTRUCT EMPLOYEES AND TO DEVELOP WORK PRACTICE PROCEDURES FOR A SAFE WORK ENVIRONMENT.

THE INFORMATION CONTAINED HEREIN IS, TO THE BEST OF OUR KNOWLEDGE AND BELIEF, ACCURATE. HOWEVER, BECAUSE THE CONDITIONS OF HANDLING AND USE ARE BEYOND OUR CONTROL, WE MAKE NO GUARANTEE OF RESULTS, AND ASSUME NO LIABILITY FOR DAMAGES INCURRED BY THE USE OF THIS MATERIAL. IT IS THE RESPONSIBILITY OF THE USER TO COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS.

THE RECOMMENDED PERMISSIBLE EXPOSURE LIMITS (PEL-TWA AND PEL-STEL) INDICATED IN SECTION II REFLECT THE LEVELS AS REVISED BY OSHA IN 1989. THE 1989 LEVELS HAVE BEEN REPEALED BY THE ELEVENTH CIRCUIT COURT OF APPEALS. IT IS RECOMMENDED THAT THE LOWER (1989) PERMISSIBLE EXPOSURE LIMITS ARE OBSERVED TO ENSURE WORKER PROTECTION.

Technologies for Reducing METH Use/Emissions/Risk in Foam Fabrication

IRTA is conducting a project funded by EPA to evaluate alternatives to METH based adhesives in foam fabrication. The results of the project will be available within the next few months and IRTA will provide the information to the District.

As discussed earlier, when TCA production was banned and the congressional tax made it much more expensive to use the chemical, many formulators began substituting METH for TCA. Many companies in the South Coast Basin adopted METH based adhesives for bonding foam-to-foam and foam-to-fiber. In January, 1997, OSHA passed a regulation on METH lowering the Permissible Exposure Level (PEL) of the chemical in the workplace from 500 ppm to 25 ppm. The regulation became effective on large fabricators in April 1999 and on smaller fabricators in April 2000. The regulation spurred the formulators to develop other alternatives.

There are three major alternatives to METH based adhesives for foam fabrication facilities in the Basin. The first alternative is one-part latex water-based adhesives. These adhesives have been adopted by many of the larger foam fabricators. They take longer to tack up than the solventborne adhesives but workers have found they can spray several pieces of foam at a time before they bond the pieces together. Many companies pay their workers for piece work and they quickly figure out how to optimize the process. In fact, several companies have reported using less time to apply the water-based adhesives.

Two-part water-based adhesives based on synthetics were also used to some extent in this industry. Like the solventborne adhesives, they tacked instantly but they proved to clog application equipment. They are also more expensive than the one-part latex adhesives. Over the last year, the formulators have developed one-part water-based adhesives that have latex and some synthetic in them and this is the second alternative that is being used today. These adhesives tack more readily than the one-part latex adhesives and they do not have the application equipment problems of the two-parts. These combination adhesives are about the same cost as the one-part latex adhesives. Many foam fabricators are using these combination water-based adhesives now.

The third alternative is an adhesive based on acetone. Formulators are offering several different types of acetone adhesives. The acetone that is used in Southern California is based on acetone alone as the solvent carrier. In other parts of the country, formulators blend the acetone with VOC solvents like mineral spirits, heptane and hexane. Several companies in Southern California have converted to acetone adhesives. Acetone is extremely flammable and companies must take measures required by the fire department to use these adhesives. Requirements include storage limitations, explosion proofing motors and installing ventilation and sprinkler systems. As long as these measures are taken, insurance rates do not appear to increase.

Virtually all of the foam fabricators using METH based adhesives are not in compliance with the OSHA regulation. To comply with that regulation, they would have to install a ventilation system which would be costly. Ventilation systems are required for acetone based adhesives as well because the chemical requires dilution so the lower explosion level is not exceeded. Ventilation systems are also required for water-based adhesives; these adhesives form aerosols that permeate the workplace.

As part of the EPA study, IRTA has compared the costs of water-based, acetone, METH and TCA adhesives for a number of users. Three case studies for facilities located in the Basin are included in Attachment A. The case studies describe the conversions of three large foam fabricators: Foam Craft, Latex International and Hickory Springs. The case

studies also include the costs of the conversion. Foam Craft used TCA adhesive and converted to water-based one-part adhesives in the early 1990s. The company reduced their costs through the conversion. Latex International used METH adhesives in the past, first converted to acetone adhesives and today uses water-based adhesives. The cost of the water-based adhesives for the company are slightly lower than the cost of the acetone adhesives. Hickory Springs used TCA adhesives in the early 1990s. The company converted to water-based adhesives and then to acetone adhesives. The cost to Hickory Springs of using the acetone adhesives is lower than the cost of using the water-based adhesives. The more detailed assumptions for the costs are available from IRTA upon request.

COUNTER TOP MANUFACTURE AND INSTALLATION

This industry uses adhesives to bond plastic to counter tops during a post forming operation. Some of these companies are using METH-based adhesives. As was the case for foam fabricators, TCA-based adhesives were used in the past in this market. In the early 1990s, when the production ban on TCA was announced and the congressional tax substantially increased the cost of using TCA adhesives, the formulators began developing alternatives.

METH was essentially a "drop-in" for TCA in the adhesives and many formulators began offering it. Other products that were developed include water-based adhesives and adhesives based on VOCs.

Survey Approach

IRTA talked to District inspectors who indicated they had cited counter top manufacturers for using contact adhesives that contained METH. This suggested that there may be several counter top manufacturers using METH-based adhesives in the Basin.

The list of counter top manufacturers was developed using the listings in the Yellow Pages USA Deluxe under the following SIC codes:

- 2541-01 Counter Tops--Manufacturers
- 5712-13 Counter Tops

IRTA staff performed a full telephone survey of the counter top manufacturers. The list of the surveyed companies is provided in Attachment D and on the disks submitted with this report.

Survey Questions

Exhibit 3-3 shows the survey that was used for the counter top manufacturing industry. The first section of the survey requests the name, address, telephone number and SCAQMD facility I.D. number.

The second section asks for information on the facility's use of METH. It asks if the facility uses adhesives, if the adhesives are METH based, how much METH based adhesive is used and how often it is applied.

The third section requests information on the adhesive application equipment and whether the facility has a ventilation system and its characteristics.

EXHIBIT 3-3

IRTA COUNTER TOP MANUFACTURE/INSTALLATION SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

AQMD I.D. Number: _____

Facility Use of Methylene Chloride

circle one

Do you use adhesive? yes no

If no, survey is completed. If yes,

Do you use methylene chloride adhesives? yes no

If no, what kind of adhesive do you use? _____

If yes, how much methylene chloride adhesive do you use?
_____ gal/wk _____ gal/mo _____ gal/yr

How often do you apply adhesives?
_____in plant _____at installation location

Facility Adhesive Application Equipment

What kind of application equipment do you use? HVLP _____ Other _____

Do you have a ventilation system? _____

If so, what is the cubic feet per minute air flow of the system? _____

If so, what is the size of the blower? _____

Spray Equipment Cleaning

Do you use methylene chloride to clean your application equipment? _____

If yes, how much methylene chloride do you use for cleaning?
_____ gal/wk _____ gal/mo _____ gal/yr

If no, what do you use to clean your spray equipment? _____

Methylene Chloride Emissions

How much methylene chloride do you emit?
_____ gal/yr _____#/yr _____tons/yr

The fourth section asks for information on whether METH is used as a cleanup solvent for the application equipment. It asks how much METH is used for this purpose.

The fifth and final section asks how much METH the facility emits annually.

Survey Results

IRTA performed a full telephone survey of 145 counter top manufacturers in the four county area including Los Angeles, Orange, San Bernardino and Riverside counties. One hundred and twenty of the companies, or 83 percent, responded to the survey. Of the 120 companies that responded, all indicated they used adhesive. Table 3-2 shows the number of facilities that responded to the survey and used adhesive in each county.

Table 3-2
Survey Results--Location of Responding Fabrication Facilities

County	Number of Facilities	Percent of Total Facilities
Los Angeles	53	44
Orange	35	29
Riverside	16	13
San Bernardino	16	13
Total	120	99

All but two of the 120 facilities that were surveyed have fewer than 100 employees and receipts of less than $10 million annually. One of the surveyed facilities has between 250 and 499 employees and receipts between $20 and $50 million per year. Another facility has fewer than 100 employees and receipts between $10 and $20 million annually.

All of the facilities responding to the survey and used adhesive indicated that they used water-based adhesives.

Extension of Survey Results to Other Counter Top Manufacturers

If the results for the survey respondents are extended to all of the counter top manufacturers, the results indicate that all 145 shops use water-based adhesives. IRTA does not believe this extension is reasonable. In generating the list of counter top manufacturers that would be surveyed, IRTA tried to list every facility that might be involved in counter top manufacturing. After the survey was conducted, IRTA staff studied the list of 145 facilities carefully and eliminated those facilities that probably did not use adhesive in counter top manufacture. This resulted in a list of 73 counter top manufacturers that probably use adhesive.

Other Information on Counter Top Manufacturing

IRTA discussed the counter top manufacturing industry with adhesive formulators. The suppliers indicated that there are about 50 manufacturers in the Basin. Note that this number agrees better with the list of 73 facilities remaining after facilities that are not likely to be counter top manufacturers using adhesive are eliminated. Of the 50 counter top manufacturers, there are 10 or 15 large manufacturers that make 20 to 30 counter tops per day. Only a few manufacturers use METH based adhesives. Most of them use water-based or VOC based adhesives. IRTA's discussions with the District inspectors that cited a few manufacturers could be consistent with the profile described by the industry sources.

There is really little information on how many counter top manufacturers there might be that use METH based adhesives. It would not be reasonable to make estimates of the number of facilities using METH adhesives or the amount of adhesive they emit given the limited data from the survey and the industry source. As a consequence, IRTA did not develop an emission factor for this industry.

AIRCRAFT STRIPPING

Many facilities in the U.S. use METH-based strippers to remove the coating from commercial and military aircraft to prepare them for maintenance work and repainting. In general, the METH stripper formulation is sprayed onto the aircraft and allowed to act until it blisters. The paint is then removed with a squeegee, a rubber edged scraping tool. Often the excess waste paint sludge is shoveled into drums for disposal as hazardous waste. The paint and METH sludge remaining on the aircraft is then washed down with water which is sent to a central drain.

Survey Approach

Aircraft stripping could be a source of METH emissions in the Basin. IRTA was aware of three facilities that conduct aircraft stripping in the four county area over which the District has jurisdiction. IRTA staff conducted a full telephone survey of these three facilities.

Survey Questions

Exhibit 3-4 shows the survey that was used for the aircraft strippers. The first section of the survey requests the name, address, telephone number and SCAQMD facility I.D. number. The second section of the survey requests information on whether the facility uses METH based stripper, the METH content of the stripper and how much stripper the facility uses. The third section asks for information on whether the facility has a control device and what kind. The fourth section asks for the frequency of stripping. The fifth section requests information on the hazardous waste generation during the stripping process. The sixth section asks how much METH the facility emits.

Survey Results

IRTA performed a full telephone survey of two of the three facilities that perform aircraft stripping. One of the respondents performs aircraft stripping but not with a METH based stripper; the company uses a water-based stripper. IRTA placed three calls to the second facility that was surveyed and they were not returned. IRTA did not survey the third facility because the company is vacating the premises shortly because they have declared bankruptcy. Another facility has leased the property and plans to use METH based strippers with a control device.

Other Information on Aircraft Stripping

IRTA has independent knowledge of the stripping practices of two of the stripping facilities. Both companies have UV/Ozone control devices. One of these facilities uses a METH based stripper but has not yet conducted a source test for the UV/Ozone control device for METH. The District source testing staff are aware of this facility and their operations. This facility did not respond to the survey but information on METH emissions could be obtained for the control device permit and the company's annual emission fee billing report. The second facility also used a METH based stripper but is no longer stripping. A new company is taking over the operation and that company will have

EXHIBIT 3-4

IRTA AIRCRAFT STRIPPER SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

AQMD I.D. Number: _____

Facility Use of Stripper

circle one

Do you strip aircraft? yes no

If no, survey is completed. If yes,

Do you use methylene chloride stripper? yes no

If yes, what is the methylene chloride content of your stripper? _____ %

If yes, how much methylene chloride stripper do you use?
_____ gal/wk _____ gal/mo _____ gal/yr

If no, what kind of stripper do you use? _____

Control Devices

circle one

Do you have a control device? yes no

If yes, what kind of control device is it?
carbon adsorber _____ UV/Ozone _____ other _____

Facility Stripping Frequency

How often do you strip? _____ days/wk

How many hours each day? _____

Hazardous Waste Generation

How much stripper waste do you generate?
_____ gal/wk _____ gal/mo _____ gal/yr

What is the methylene chloride content of the waste? _____ %

Methylene Chloride Emissions

How much methylene chloride do you emit?
_____ gal/yr _____ #/yr _____tons/yr

to re-permit the UV/Ozone control device. At that time, the District can obtain information on the METH emissions.

Technologies for Reducing METH Use/Emissions/Risk in Aircraft Stripping

The strippers used in this industry have lower METH concentration than the stripping formulations used by furniture strippers. Instead of 82 percent METH, aircraft stripping formulations contain between about 50 and 70 percent METH. They often contain other toxics like phenol or other chemicals like formic acid.

One of the companies in the Basin, Garrett Aviation, is using a non-METH alternative stripper and eliminating the METH in the strippers is one option for eliminating the risk. Although this stripper takes much longer than METH to work, it is apparently acceptable to the company. Most of the METH alternative strippers contain high levels of VOC solvents. The District would have to evaluate whether these VOC strippers are acceptable.

Other low-METH strippers that also take much longer to strip are also available as alternatives for this industry. Instead of the 50 to 70 percent METH, they contain about 30 percent METH.

The other company that is stripping aircraft in the Basin uses a control device to reduce the METH emissions. This company has a UV/Ozone destruction device. This District has conducted a source test on this device for control of the coatings but not for control of the METH. When that test is conducted, the District will be able to judge the effectiveness of the device.

The company that declared bankruptcy also used a UV/Ozone device. This device was originally used when Lockheed used the facility. A permit to operate was never issued for either company. A new company has decided to lease the facilities. The UV/Ozone device is in disrepair and will have to be repaired and re-permitted. At that time, the District could perform a source test to determine if the device is suitable for destruction of METH emitted from aircraft stripping.

There are many other alternatives to METH based strippers that have been investigated over the last decade or so. Plastic media blasting is an abrasive stripping method. Most companies now believe that plastic media can damage the skin of the aircraft. Wheat starch is a less damaging stripping method and has been adopted by some aircraft maintenance companies. Laser stripping methods of different types have been investigated and may be adopted by some maintenance companies in the next several years.

METAL CLEANING

METH has been used widely in the U.S. in vapor degreasing processes. The solvent is heated to its boiling point in the degreaser. This forms a vapor zone of METH above the liquid in the degreaser. The degreaser has cooling coils around the top which condenses the solvent vapors back into the degreaser. METH is also used in cold cleaning processes, generally in dip tanks.

Survey Approach

IRTA performed a full telephone survey of three facilities that have District vapor degreaser permits for METH.

Survey Questions

The cleaning survey IRTA used is shown in Exhibit 3-5. The first section requests information on the company name, address, telephone number and SCAQMD I.D. number. The second section of the survey asks for information on the type of cleaning process and the amount of METH the company uses. The third section requests information on the characteristics of the cleaning equipment. The fourth section asks for information on how often the facility cleans. The fifth section asks about the company's hazardous waste generation. The sixth section asks how much METH the facility emits.

Survey Results

The two facilities that responded to the survey indicated that their degreasers were permitted to use trichloroethylene (TCE), not METH. Both are airless/airtight degreasers which have very low emissions. One of the facilities, Tiyoda, is a manufacturer of airless/airtight degreasers and the permit is for a degreaser used for showroom demonstrations. The second facility, Kaga, uses a Tiyoda degreaser for running production but the solvent used is TCE not METH. The third facility that did not respond to the survey may use METH in their degreaser but that company did not report emissions to the District for 1996/97.

Extension of Survey Results to Other Cleaning Users

The District requires a permit for cold cleaning units using METH. There may be other facilities in the Basin that use METH for these purposes but the District has no record of any other METH cleaning permits.

Other Information on Cleaning Operations

From the survey data, very few, if any, companies are using METH in vapor degreasing or cold cleaning applications. Vapor degreasers and cold cleaners using METH require a District permit and the District should have a record of such permits. IRTA is aware, however, of a few units in the Basin that are using METH but the companies using this equipment are not listed in the permit system as METH users. This could be because an incorrect BCAT was assigned during the permitting process. This was the case with the two vapor degreasing permits that use TCE but were assigned a METH BCAT.

Technologies for Reducing METH Use/Emissions/Risk in Cleaning Applications

The fact that there are so few METH vapor degreasers or cold cleaners in the Basin is evidence that alternatives are readily available. IRTA has assisted hundreds of facilities in the Basin in converting from chlorinated solvents in cleaning operations to water-based cleaners. In cases where the parts are water intolerant, acetone might prove to be a good alternative. Acetone's solvency is very similar to the solvency of METH. In cases where the company is committed to using METH, an airless/airtight degreaser could be used.

STORAGE TANKS

Companies that distribute, formulate or pack solvent based products often have storage tanks that are used to store the chemicals they require. IRTA surveyed 11 facilities that the District records indicated had storage tanks used to store METH.

EXHIBIT 3-5

IRTA CLEANING SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

AQMD I.D. Number: _____

Facility Use of Methylene Chloride

circle one

Do you use methylene chloride in a cleaning process? yes no

If no, survey is completed. If yes,

Do you use methylene chloride in a vapor degreaser? yes no

If not, what kind of equipment do you have? _____

How much methylene chloride do you use?
_____ gal/wk _____ gal/mo _____ gal/yr

Facility Equipment

Does your vapor degreaser have a refrigerated freeboard chiller? ____ yes _____no

What is the freeboard ratio of the vapor degreaser? ____ 0.5 ____ 0.75 ____ 1.0

Do you have other emission control equipment on your degreaser? _____yes _____no

If yes, describe it _____

Facility Cleaning Frequency

How often do you clean? _____ days/wk

How many hours each day? _____

Hazardous Waste Generation

How much hazardous waste do you generate? _____ gal/mo _____ gal/yr

What is the methylene chloride content of your waste? _____ %

Facility Emissions

How much methylene chloride do you emit?

_____ gal/yr _____ #/yr _____ tons/yr

Survey Approach

The list of companies that were surveyed was provided to IRTA by SCAQMD. It represents companies that have the METH storage tank BCAT. The list of the surveyed companies is provided in Attachment H and on the disks submitted with this report.

Survey Questions

The survey form used for the facilities with storage tanks is shown in Exhibit 3-6. The first section requests information on the facility including the facility name, address telephone number and SCAQMD I.D. number. The second section asks whether the facility has a storage tank containing METH, what the METH is used for, whether the facility has controls on their storage tanks and how much METH the facility emits annually.

Survey Results

IRTA surveyed 11 facilities with District permits that indicated they had one or more METH storage tanks. Of the 11 facilities surveyed, IRTA received 10 responses; one of the respondents refused to answer any questions. Table 3-3 summarizes the survey responses.

Table 3-3
Storage Tanks--Summary of Survey Responses

Number of Facilities Surveyed	11
Number of Facilities Responding	10
Number of Facilities With Tanks No Longer In Use	2
Number of Facilities With Tanks No Longer Using METH	3
Number of Facilities With Tanks Using METH	5

Of the 10 facilities responding to the survey, only 5, or 50 percent indicated they still had tanks containing METH. Two no longer used their tanks and three no longer stored METH in their tanks. Two of the facilities--Dow Chemical USA and Holchem, Inc--that have METH tanks reported emissions to the District for the 1996/1997 year. One facility--Jasco Chemical Corp.--recently removed an underground tank and has submitted a permit to install an above ground tank. Another facility--Soco-Lynch Corp.--has a fairly new system with an unusual chemical absorption control method. Acto Kleen did not report emissions for 1996/1997. The facility that refused to respond to the survey--OSL Inc.--did not report emissions for 1996/1997.

Extension of Survey Results to Other Storage Tank Facilities

Because each facility with a storage tank has a unique system, it is not possible to extend the emissions of the facilities that reported to the District to other facilities. Dow Chemical USA reported emissions of 11.245 pounds or about 1,000 gallons of METH for the 1996/1997 reporting year. Holchem Inc. reported emissions of 1,116 pounds or about 100 gallons for the 1996/1997 reporting year. Emissions are dependent on the size and type of storage tank and the type of controls on the tank. A case-by-case analysis would be necessary to determine emissions from the other tanks in the Basin. Two of the facilities

EXHIBIT 3-6

IRTA STORAGE TANK SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

AQMD I.D. Number: _____

Permit # _____

Facility Use/Emissions of Methylene Chloride

	circle one	
Do you have a storage tank containing methylene chloride?	yes	no
Do you use methylene chloride for blending?	yes	no

If no, survey is completed. If yes,

Do you have controls on your tanks?	yes	no

If yes, specify _____

How much methylene chloride do you emit annually?
_____ gal/yr _____ pounds/year

Do you report your annual emissions to the District?	yes	no

with new tanks, Jasco and Soco-Lynch Corp., likely have permit limits for their emissions and both will probably report emissions for the 1997/98 or 1998/99 reporting year.

Other Information on Storage Tanks

IRTA has no other information on storage tank emissions since emissions must be determined on a case-by-case basis.

Emission Factor for Storage Tanks

IRTA cannot estimate an emission factor for the storage tanks in the Basin because each of the facility's with storage tanks is unique. It would be more straightforward to simply determine the emissions from the five facilities with storage tanks to access the contribution to total METH emissions from this category. It is worth noting, however, that the facilities that store METH use it in products that they sell. Their incentive is to lose as little METH as possible.

Technologies for Reducing METH Use/Emissions/Risk in Storage Tank Facilities

One of the surveyed facilities that no longer stored METH had converted their formulated products to acetone. This is one option for the companies that have METH storage tanks. Another option involves adding controls to the storage tanks. Traditional controls include refrigerated condensers, carbon adsorption and perhaps the new absorption method employed by Soco-Lynch.

OTHER TANK OPERATIONS

Three facilities have District permits for tanks that contain METH. These facilities use METH for processing operations of various types.

Survey Approach

IRTA performed a full telephone survey of the facilities with other tank operations.

Survey Questions

IRTA relied on the storage tank questionnaire and the aircraft stripping survey to collect information from the three facilities in this category.

Survey Results

Out of the three facilities surveyed, there were two responses. One of the facilities has not used the METH tank in two years. The department is currently being shut down. The second facility uses the METH tank as part of an enclosed system with a proprietary process. This facility reported emissions of 6,075 pounds or about 550 gallons of METH for the 1996/1997 reporting year. The third facility did not respond to the survey and did not report emissions for the 1996/1997 reporting year.

Extension of Results to Other Tank Operations

From the District systems, there is no evidence that other facilities in the Basin have similar operations.

Other Information on Other Tank Operations

IRTA is aware of a few facilities that may have cold METH tank operations which, in principle, require permits. Apparently the permits are not listed under the METH BCAT.

Emission Factor For Other Tank Operations

Since there are only two operations of this type in the Basin, IRTA did not develop an emission factor for the industry. The District could use reported data for the two facilities to estimate emissions from this category.

IV. PARTIAL SURVEYS, LIMITED SURVEYS AND OTHER DATA COLLECTION

For the industries described in this section, IRTA did not conduct full telephone surveys. For kitchen cabinet manufacturers, IRTA telephoned a subset of the full industry. For five other categories--printing, furniture and plastics--IRTA investigated the categories further by telephoning some members of the industries and obtaining information from industry sources. For the consumer products category, IRTA obtained data from a government source. The methods, in each case, are described in more detail below.

KITCHEN CABINET MANUFACTURERS AND REFINISHERS

IRTA believed that kitchen cabinet manufacturers and refinishers may use METH based products. Two applications of METH were investigated, including use of METH adhesives for bonding veneer to wood or MDF used in cabinet manufacture and strippers to strip cabinets in homes.

Survey Approach

IRTA developed a list of cabinet manufacturers and refinishers by using the listings in the Yellow Pages USA Deluxe under the following SIC codes:

- 1521-23 Cabinets--Resurfacing & Refinishing
- 1751-03 Cabinet Makers
- 2434-01 Cabinets--Manufacturers
- 7641-07 Kitchen Cabinets--Refinishing

This list of the 442 companies falling into these SIC codes is provided in Attachment J and on the disks submitted with this report. IRTA staff performed a partial telephone survey of some of the companies on this list. A partial survey form was developed for the surveys in this industry; it is shown as Exhibit 4-1.

Survey Results

Of the 442 companies in the four-county area under the SCAQMD jurisdiction, IRTA surveyed 51 companies by telephone. Of the 51 companies surveyed, IRTA received 12 responses which represents 24 percent of the total surveyed. Of the 12 facilities that responded, five or 42 percent indicated they do not use adhesive. Eleven or 92 percent indicated they do not use stripper.

Of the seven facilities that responded and do use adhesive, all have less than 100 employees and all have receipts of less than $10 million annually. Six of the seven companies are located in Los Angeles County and one is located in Riverside.

One of the companies uses more than five gallons per week of adhesive. One of the companies uses about five gallons per week. Four of the facilities use one gallon per week and one facility uses less than one gallon per week. The overall average volume for the seven facilities is 2.4 gallons per week. The two largest adhesive users indicated they used water-based adhesives. Three of the companies using one gallon of adhesive per week indicated they used METH based adhesives. The two remaining facilities--a one gallon per week user and the less than one gallon per week user--indicated they used water-based adhesives. Overall, 57 percent of the companies used water-based adhesives and 43 percent used METH based adhesives.

EXHIBIT 4-1

IRTA KITCHEN CABINET MANUFACTURER PARTIAL SURVEY

Facility Information

Name of facility: _____

Address of facility: _____

_____

Facility Phone Number: _____

AQMD I.D. Number: _____

Facility Use of Methylene Chloride

circle one

Do you use methylene chloride in an adhesive process? yes no

If yes, how much adhesive do you use?

_____ gal/wk _____ gal/mo _____ gal/yr

Do you use methylene chloride for stripping cabinets yes no

How much methylene chloride stripper do you use?

_____ gal/wk _____ gal/mo _____ gal/yr

Other questions will depend on answers

One of the surveyed companies indicated that the company strips coating off kitchen cabinets. This company uses 0.5 gallons per week of acetone to perform the stripping. No other survey respondent indicated they did stripping.

Extension of Analysis to Other Kitchen Cabinet Companies

With five exceptions, all of the kitchen cabinet manufacturers have receipts of less than $10 million annually and employ fewer than 100 people. Two facilities have between 250 and 500 employees with receipts of $20 to $50 million. Two facilities have between 100 and 250 employees and receipts of $10 to $20 million. One shop has fewer than 100 employees and receipts of $10 to $20 million.

If the results of the survey are extended to the total population of kitchen cabinet manufacturers, of the 442 facilities identified, 186 or 42 percent do not use adhesives and 407 or 92 percent do not strip. That leaves 58 percent that use adhesives and eight percent that strip.

Of the remaining 256 facilities that use adhesives, 146 use water-based adhesives. One hundred and ten facilities or 43 percent of the facilities using adhesives use METH based adhesives. They use an average of 2.4 gallons per week. On this basis, the total amount of METH based adhesives used in this industry is 264 gallons per week or 13,728 gallons annually.

The survey results indicated that the largest users of adhesive use water-based adhesive products while some of the smaller facilities used the METH based adhesives. If the extension to the rest of the industry is made on this basis, of the 256 facilities that use adhesives, 73 or 29 percent are large users who do not use METH based adhesives. One hundred and eighty-three or 71 percent are small users and 60 percent of them use METH based adhesives. The small users average 0.85 gallons per week and the total METH based adhesive use for these small facilities is 93.3 gallons per week or 4,853 gallons per year.

The two methods of extending the survey results to the rest of the industry give very different estimates of the annual METH based adhesive use for the industry. Using the average of the two estimates, 13,728 and 4,853 gallons, the industrywide use of METH based adhesive would amount to 9,318 gallons annually.

Using the same assumptions as for the foam fabrication industry, a typical METH based adhesive contains 62 percent METH and has a density of 9.65 pounds per gallon. On this basis, METH emissions from adhesive use for the industry amount to 55,750 pounds or about 27.9 tons of METH annually. METH is also likely used for cleanup of application equipment by many of the facilities using METH based adhesives. Because of the uncertainty of this use, emissions from cleanup are ignored here.

Since no companies were identified that use METH strippers, the survey results cannot reasonably be extended to the industry as a whole.

Other Information on Kitchen Cabinet Manufacturers

One industry source indicates that of the kitchen cabinet manufacturers that manufacture cabinet tops, about half use contact cements. He estimates that about one-half of these manufacturers use traditional VOC solventborne products. Thirty to thirty-five percent use METH based adhesives and the remaining facilities use water-based adhesives. This number is somewhat lower than the 43 percent estimated from the survey results.

This industry source also indicates that a popular METH adhesive is used widely by kitchen cabinet manufacturers. The METH adhesive is sold in the form of a canister that can be attached to a spray gun and discharged easily.

One furniture stripper discussed the use of METH strippers with IRTA. This stripper indicated that there are a number of companies that paint houses that also offer services for kitchen cabinet stripping and refinishing. The stripper also claimed that there are at least 10 companies in the South Bay area that he is familiar with that perform this kind of service. He also indicates that a typical cabinet stripper might use 100 gallons per year of stripper. These companies purchase consumer product strippers from hardware and paint stores. The strippers these companies use are paste strippers that remain on vertical surfaces like kitchen cabinets. Exhibit 4-1 shows an MSDS for one of these strippers that is sold in paint stores. It does not specify the amount of METH the adhesive contains but, because the adhesive has a fairly low flash point, it is likely to be below 50 percent.

Assuming that there are 50 companies that strip cabinets in homes in the Basin, that each company uses 100 gallons of stripper each year, that the stripper contains 40 percent of METH, the use of METH for this purpose could be 2,000 gallons annually. This translates to 22,000 pounds or 11 tons annually.

Emission Factor for Kitchen Cabinet Manufacturing and Refinishing

The emission factor for cabinet manufacturers using METH based adhesives is similar to the emission factor for adhesives in the foam fabrication industry. The same assumptions about adhesive density were made. In this case, however, no emissions from METH cleanup solvent is included. On this basis, the emission factor is:

EMISMETHCAB (pounds/year) = ADHESUSE (gallons/year) X 9.65 (pounds/gallon)
X 0.62

where
EMISMETHCAB is the emissions of METH in pounds per year
ADHESUSE is the facility's adhesive use in gallons per year
the factor 9.65 is the density of the adhesive
the factor 0.62 is the percent of METH in the adhesive

IRTA did not determine an emission factor for cabinet refinishing. As discussed earlier, the companies that refinish cabinets purchase the METH stripper in paint or hardware stores and the METH they use is classified as a consumer product. This issue is discussed in more detail below under consumer products.

OTHER INDUSTRIES

The District provided IRTA with a list of various companies, their SIC codes and the level of METH emissions for the 1996/1997 reporting period. The specified companies are those that report their emissions to SCAQMD. IRTA analyzed the list and grouped together facilities in the same SIC code and aggregated their emissions. Table 4-1 summarizes the industry category, the associated SIC code and the level of emissions.

Table 4-1
Industry Category Reported METH Emissions

Category	SIC Code(s)	Emissions (lb/yr.)
Printing	2741, 2752-2759, 9803	30,940
Furniture	2517-2599, 3651	183,532
Mobile Homes	2451	10,051
Pharmaceutical	2834	4,929
Paint Manufacturing	2851	5,433
Adhesive Manufacturing	2891	2,764
Ink Manufacturing	2899	1,271
Plastics	3082-3089	241,936
Metalworking	3412-3451	63,097
Plating	3471	12,384
Metal Coating	3479	6,021
Electronics	3670-3679	2,724
Motor Vehicles	3714	7,551
Medical Instruments and Goods	3812-3851, 5047	29,585
Sewerage	4941, 4952, 4954	5,864
Chemical	2823, 5169	17,011
Furniture Repair	2823, 7641, 7699	32,715
Research	8071, 8221, 8731	9,265
Carpeting	2273, 5023	19,990
Other		140,829
Total		827,892

IRTA examined the list of industry categories and eliminated those categories that included companies that were probably all fully reporting to the District. The reasoning behind this approach was that, if all the companies were reporting, then the District already knows which companies are emitting METH and the level of the METH emissions. IRTA wanted to focus the investigation on categories that would have several member companies that might be using METH products. The categories that were eliminated according to this strategy were:

- Mobile Homes
- Pharmaceutical
- Paint Manufacturing
- Adhesive Manufacturing
- Ink Manufacturing
- Medical Instruments and Goods
- Sewerage
- Chemical
- Research
- Carpeting

Several other categories were eliminated because IRTA had knowledge that METH was no longer used by most companies in the categories. In some cases, IRTA consulted industry sources for their opinions on whether METH was still used. For example, most platers no longer use METH for stripping or cleaning and METH is no longer used in metal coatings and paints. The categories that were eliminated for this reason were:

- Metalworking
- Plating
- Metal Coating
- Electronics
- Motor Vehicles

The categories remaining after these eliminations were:

- Printing
- Furniture
- Plastics
- Furniture Repair

The companies that fall into the furniture repair category were surveyed with the furniture strippers and the results are included there.

Survey Approach

For the categories of printing, furniture and plastics, IRTA surveyed the companies that reported emissions to the District in the 1996/97 year. There were seven facilities each in the printing and plastics category and six furniture manufacturers.

IRTA requested information on what types of products or processes they used METH in. IRTA also asked if the companies were still using the METH based products. If the company indicated they no longer used the product, IRTA asked when they switched to an alternative and what the alternative was.

Survey Results

For printing, three out of the seven companies that were surveyed responded. None of the responding companies uses METH at this time. All three at one time used METH based products for blanket and roller wash. Two of the companies converted to VOC solvent products and the third moved their operation to Mexico.

For furniture (non-kitchen cabinet manufacturers), five of the six companies that were surveyed responded. Two of the companies used METH in contact cements, two used METH for cleaning molds and one used METH in an adhesive. Only one of the five was still using a METH based product. This company, an office chair manufacturer, is using a METH based adhesive. The companies using contact cement converted to a VOC contact adhesive. The companies using METH as a mold cleaner did not specify what types of products they converted to.

For plastics, five out of seven companies that were surveyed responded. Two of the companies used METH to clean foam blowing equipment. One company used METH to clean resin tanks. One company used METH to clean floors. The last company used METH for plastic weld bonding. Only the company using the plastic weld bonding product still uses METH and they use 10 to 20 percent METH than in the past; the company is investigating acetone and vibratory welding as alternative to the METH. The companies using METH for cleaning foam blowing equipment switched to acetone. The company using METH for cleaning the resin tank did not specify what product they now used. The company using METH for floor cleaning switched to a water-based cleaner.

Extension of Analysis to Other Companies in the Other Category

In the printing sector, it is doubtful that METH is used any longer in blanket and roller washes by any printing company in the Basin. At this stage, the ink and blanket/roller wash suppliers are not using METH in their formulations.

In the furniture sector, the limited survey revealed that only one company is still using METH in an adhesive product. IRTA identified 845 furniture manufacturers in the Basin from the Yellow Pages USA Deluxe. Eighteen furniture manufacturers reported METH emissions to the District in 1996/97. Of the five of these manufacturers IRTA talked with, only one was still using a METH product. Although this indicates that there may be many furniture manufacturers using METH products, there is no reliable method of estimating how many companies might be using such products.

In the plastics sector, the limited survey revealed that only one facility was still using METH. IRTA identified 1,272 plastics manufacturers in the Basin from the Yellow Pages USA Deluxe. There may be some plastics manufacturers still using METH products. As was the case for the furniture sector, there is no reliable way of estimating the number of companies in this sector still using METH.

Other Information on Other Industries

As mentioned earlier, IRTA is conducting an EPA sponsored project on METH adhesive alternatives in the foam fabrication, upholstered furniture manufacturing and mattress manufacturing sectors. IRTA's industry contacts indicate there are some furniture manufacturers still using METH based products. The number of these manufacturers is unknown.

Technologies for Reducing METH Use/Emissions/Risk in the Other Category

In the printing industry, the alternatives to METH based inks, blanket washes and roller washes are VOC based products. Its worth noting that the District's recent Rule 1171 modifications require blanket and roller washes to contain no more than 100 grams per liter VOC by 2005.

In the furniture industry, there are water-based and VOC mold release agents and water-based and VOC adhesives that are available.

In the plastics industry, acetone is a viable alternative to METH in many applications including plastic welding and mixing head and tank cleaning.

CONSUMER PRODUCTS

There are many consumer products sold in California that contain METH. Table 4-2 summarizes these products and the amount of METH in tons per day emitted from each of these products. The information in the table was obtained from CARB.

The consumer product that contributes most significantly to emissions is the category of paint removers or strippers. These strippers are sold in paint stores and in hardware stores. They account for 84.7 percent of emissions from METH containing consumer products. Note that these products are purchased by the companies that perform on-site cabinet stripping in residences.

Table 4-2
METH Consumer Product Emissions in California

Category Name	METH Emissions (tons/day)
Arts and Crafts Adhesives	0.04
Contact Adhesive	0.40
Aerosol Adhesive (including industrial)	0.03
Tire Cleaners	0.03
Automotive Brake Cleaners	0.29
Carburetor, Choke Cleaners	0.31
Engine Degreasers	0.02
Solvent Parts Cleaner	0.02
Undercoatings	0.02
Paint Removers or Strippers	7.19
Multipurpose Solvents	0.05
Adhesive Remover	0.03
General Purpose Degreasers	0.01
Multi-purpose Lubricant	0.02
Silicone-Based Multi-purpose Lubricant	0.01
Specialty Lubricant	0.01
Total	8.49

The CARB Board recently adopted a ban on chlorinated solvents--including perchloroethylene (PERC), trichloroethylene (TCE) and METH--in automotive aerosol products. The products in Table 4-2 that would be covered by this ban include Tire Cleaners, Automotive Brake Cleaners, Carburetor and Choke Cleaners and Engine Degreasers. The ban will be effective at the point of use on December 31, 2002. These products represent 7.7 percent of the total METH emissions from consumer products.

CARB also recently adopted a ban on METH, PERC and TCE use in adhesive consumer products. The ban is effective on January 1, 2002 in aerosol adhesives manufactured for use in California. These products represent 5.5 percent of the METH used in consumer products.

When the CARB bans on METH in automotive aerosol products and adhesive aerosol products are effective, it will reduce emissions of METH from consumer products by 13.2 percent. These uses, together with the paint stripping products represent nearly 98 percent of all METH based consumer products emissions.

V. SUMMARY OF RESULTS AND CONCLUSIONS

METH EMISSIONS INVENTORY

Table 5-1 summarizes the results of the surveys and other investigations of METH emissions from various applications where the chemical is used.

The values in Table 5-1 are not necessarily additive. As an example, consider the METH emissions from kitchen cabinet manufacture. Since the companies involved in this industry purchase their METH based stripper from paint shops and hardware stores, the 11 tons per year of emissions from this category are also included in the emissions of 1,312 tons per year under the consumer products paint strippers category.

In the furniture stripping category, the survey results, when translated to the industry as a whole, indicated a METH emissions level of 72 tons per year. Industry sources and IRTA's experience suggest that the actual emissions level is higher, at 146 tons per year.

Using information from industry sources and from an IRTA EPA project, METH emissions from foam fabrication operations in the Basin are estimated at 409 tons per year. This is nearly three times the higher METH emissions estimates for the furniture stripping industry.

The surveys and industry source information did not allow a reliable estimate of METH emissions from counter top manufacturers. The industry source information suggests that companies in this industry may not be using METH based adhesives.

Emissions of METH in aircraft stripping are unknown but likely small. Only one company in the Basin is using METH strippers for stripping aircraft.

Similarly, emissions of METH from metal cleaning operations are unknown but likely to be very small. One company that was surveyed did not respond and may be using a METH vapor degreaser. IRTA is aware of two additional cleaning operations that may have been misclassified by the District.

Storage tank emissions in the Basin are greater than 6 tons per year. There are two companies with storage tanks with emissions that have not been included in this total.

Other tank operations are greater than 3 tons per year. One company with a tank operation did not respond to the survey so the emissions may be more than the 3 ton per year level.

Emissions from kitchen cabinet manufacturers using adhesive are estimated at between 15 and 41 tons per year. Two different methods of extending the limited survey results to the industry as a whole were used.

METH emissions from kitchen cabinet refinishing are estimated at 11 tons per year based upon industry input.

Total METH emissions from other sources that reported to the District for the year 1996/97 are estimated at 414 tons per year. These categories of sources are shown in Table 4-1. From industry input and IRTA knowledge, it was assumed that companies in the categories of metalworking, plating, coating, electronics and motor vehicles no longer use METH products. This reduced the total annual emissions in Table 4-1 from 827,892 pounds to 736,115 pounds.

Table 5-1
METH Emissions by Category in the South Coast Basin

Category	Total Number of Facilities	Number Using METH	Emissions (tons/year)	Source
Furniture Stripping	407	88	72 to 146	Survey Industry/IRTA
Foam Fabrication	121	10	409	Industry
Counter Top Manufacture	73	few	unknown (small)	Industry
Aircraft Stripping	3	2	unknown (small)	-
Metal Cleaning	-	>1	unknown (small)	-
Storage Tanks	-	5	> 6	Reported Emissions
Other Tank Operations	-	3	> 3	Reported Emissions
Kitchen Cabinet Manufacture	442	110	15 to 41	Limited Survey; Industry
Kitchen Cabinet Refinishing	50	50	11	Industry
Furniture Manufacture	845	unknown	unknown (possibly high)	Limited Survey
Plastics Manufacture	1,272	unknown	unknown (possibly high)	Limited Survey
Other Industries	-	-	201	Reported Emissions
Consumer Products				
Paint Strippers	-	-	1,312	CARB
Automotive Products	-	-	119	CARB
Adhesives	-	-	86	CARB
Other	-	-	33	CARB

IRTA further investigated several other categories and concluded that printing and ink manufacturing no longer use METH based products. Excluding these categories reduces emissions in Table 4-1 further, to 703,904 pounds. METH emissions from furniture repair are estimated separately in the category of furniture stripping in Table 5-1 so those emissions were subtracted out of the total as well, leaving 671,189 pounds.

Furniture manufacturing emissions are in a separate category in Table 5-1. The 183,532 pounds of emissions annually were subtracted from the total. Emissions from plastics were determined by subtracting the emissions of the five companies that responded to the survey; these amounted to 86,084 pounds per year.

Emissions of METH from the remaining categories in Table 4-1 amount to 401,573 pounds or 201 tons per year. It is likely that the METH emissions in the other categories have declined since the 1996/97 reporting year so the actual emissions may be lower than the value in Table 5-1. Note that the value for this category is approximately 1.4 times the higher estimate of METH emissions from furniture stripping.

METH emissions from consumer products in the South Coast Basin amount to 1,550 tons per year, more than ten times the emissions from the furniture stripping industry.

CONCLUSIONS OF THE ANALYSIS

The largest category of METH emissions in Table 5-1 is consumer products. CARB has adopted a ban on chlorinated solvent use, including METH, in automotive and adhesive consumer products. Even when these bans are implemented, however, the consumer product paint stripper category will still be extremely large. The District could begin discussions with CARB on instituting a ban on METH based consumer product paint strippers. There are alternative strippers on the market today. Although these strippers are not as effective as METH strippers and take longer to strip, the consumer market, unlike furniture strippers, does not have rigorous time constraints and performance standards. The alternative strippers may be adequate for consumer stripping. Note that a ban on METH consumer product strippers would also eliminate the emissions from the kitchen cabinet refinishing category.

The second largest emitting category in Table 5-1 is foam fabricators. Two other categories where there are known or suspected emissions are kitchen cabinet manufacturing and counter top manufacturing. In all three of these categories, the source of the emissions is METH based adhesives. Companies in these categories that are using METH adhesives are generally using the adhesives without the required permit.

The District policies and regulations that discourage or prevent the use of METH based adhesives are already in place. If a company in one of these categories submitted an application for the spray equipment to use METH adhesives, it is very likely that the screening risk assessment required under SCAQMD Rule 1401 would reveal a risk above 1 in a million. T-BACT for this category would likely be use of a control device or conversion to water-based or acetone based adhesives. Other companies in these industries are using these adhesives. The issue then is not a change in District policies and regulations but rather enforcement of the existing District regulations. Enforcement in these categories would lead to the violating companies converting to alternative non-METH adhesives.

One method of strengthening District regulations would be to explicitly amend Rule 1168 to consider METH a VOC. The Bay Area's Rule 51 "Adhesive and Sealant Products" defines METH as a VOC. This means there is a limit to the amount of METH that can be sold in

the Bay Area in adhesive products. A second method would be to amend Rule 1168 to include a prohibition of sale of METH based adhesives. This is probably the best option because it eliminates the use of METH in adhesives altogether. CARB is proposing to ban METH (and perchloroethylene and trichloroethylene) in the formulation of aerosol adhesives. The regulation will be considered by the CARB Board in May, 2000.

The third largest category of emissions in Table 5-1 is the Other Industries categories. After eliminating those categories where METH use is now unlikely, the companies that reported emissions to the District in the 1996/97 reporting year are in the following categories:

- Furniture manufacturing
- Mobile Homes
- Pharmaceutical
- Paint Manufacturing
- Adhesive Manufacturing
- Plastics
- Medical Instruments and Goods
- Sewerage
- Chemical Manufacturing
- Research
- Carpeting
- Other

The District should carefully examine the companies in this category. In some cases, the companies may have converted away from METH but in others, the companies may still be emitting significant quantities of METH.

The fourth largest category of emissions in Table 5-1 is furniture stripping. Most furniture strippers do not have equipment for stripping. There may be no more than about 40 strippers that use flow trays and/or dip tanks that require permits. Some of the strippers using equipment probably do not have the required permits. The District could rely on enforcement to identify these strippers.

Virtually all of the strippers with equipment that do not have permits exceed the 1 in a million risk cutoff level specified in Rule 1401. At this stage, the District has not identified T-BACT for this industry. IRTA's project with CARB should help to define T-BACT which may be low-METH strippers, ventilation systems or a combination of the two. Even with the implementation of T-BACT, however, the unpermitted facilities may not meet the 10 in a million risk cutoff level of Rule 1401.

If T-BACT does prove to be a ventilation system, such systems are very costly. Many furniture strippers, given their income as discussed earlier, would have difficulty purchasing them. Some furniture strippers that have obtained permits in the last few years have even had difficulty paying the permit fee, the annual renewal fee and their emission fees.

The industry response to more rigorous enforcement could be twofold. First, some of the businesses may close down and start up elsewhere under another name. These companies would again start up without permits. Second, some of the companies might decide to do their stripping without equipment. If there is no piece of equipment to permit, the company is not subject to Rule 1401.

The District will have an opportunity to consider all of these issues surrounding furniture strippers when the industry specific rule is developed for the industry. Rule 1402 amendments require development of such a rule within three years. The results of the IRTA CARB project should indicate which technologies are effective in reducing emissions and the costs associated with them.

Attachment A
Foam Fabrication Case Studies

Foam Fabricator Helps Push Water-Based Adhesive Technology

"The ban on TCA was a good thing. It forced us to examine our process and find a better alternative for workers and the environment," says Bob Nylander.

Foam Craft Inc., located in Cerritos, California, employs 160 people. The firm started operation in 1965 and was bought by Future Foam, a flexible slabstock foam manufacturer, in 1994. Foam Craft fabricates foam for use in packaging, furniture and bedding. Products like futons, recreation vehicles, trucks, tractors and dog beds use the foam fabricated by Foam Craft.

Several years ago, like most of the industry, Foam Craft used methylene chloride (METH)-based adhesives for bonding foam-to-foam in their fabrication operations. Because of air regulations put in place by the South Coast Air Quality Management District, Foam Craft converted their processes from METH to 1,1,1-trichloroethane (TCA)-based adhesives. Like other companies in Southern California, Foam Craft used TCA-based adhesives until the cost of the chemical became prohibitive. TCA contributes to stratospheric ozone depletion and production was banned in 1996. A Federal tax placed on the chemical made it extremely expensive to use.

"We have completely converted to water at this stage," says Bob Nylander, Foam Craft's plant manager. The company began investigating water-based adhesive alternatives about six years ago when it became clear that TCA would be phased out. At that time, the water-based products were new to the market and Foam Craft went through a long learning curve to optimize their use. Foam Craft and the vendors, in a partnership, were able to solve all the problems that arose during a long testing phase.

Foam Craft emerged as one of the industry pioneers for water-based foam bonding

adhesives. The company spent two years of intensive testing to determine the best methods of using the new adhesives. They began work with a one-part adhesive made by Upaco. Foam Craft found that the adhesive did not dry as fast as the solvent-borne adhesives so they tested different application techniques. Instead of spraying two pieces of foam and putting them together for an instant bond, the workers now spray a stack of foam pieces and then join them. Worker application time is virtually identical now to what it was before the conversion.

Foam Craft had to work out several other problems over the two-year period. They had difficulty developing an adhesive feed system for their eight stations that had a total of 32 spray booths and guns. Going to a gravity feed system eliminated shearing issues.

They also found that at first they used about 1.6 times more of the water-based adhesive than the solvent-borne adhesive. With experience, they were able to optimize the application process and now they use about three-fourths as much of the water-based adhesives. This reduction in materials use means that the cost of doing business for Foam Craft was reduced by the switch to water-based adhesives.

Foam Craft is now testing new water-based products to see if they can reduce their costs further. The company is also investigating new cutting processes that could help eliminate some of the requirements for adhesive use altogether.

"The ban on TCA was a good thing. It forced us to examine our process and find a better alternative for workers and the environment," says Bob Nylander. "We've provided information to the other Future Foam plants in the country. They are planning to use our example to convert now that methylene chloride can't be used. We're investigating other methods to reduce our costs further."

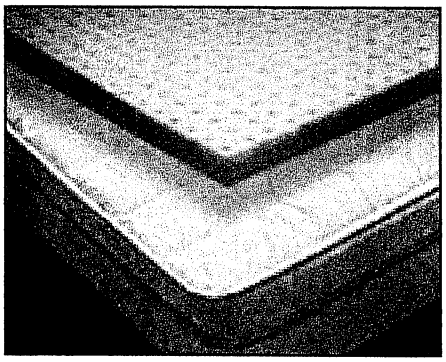
Santa Fe Springs Foam Fabricator Converts to Water-Based Adhesives

"We did a lot of testing and converted away from solvent-based adhesives entirely," Roger Coffey says. "The water-based adhesives work effectively and they are better for the workers and the community."

Latex International, a large manufacturer of latex foam, has two manufacturing plants worldwide. The company has a fabrication plant in Santa Fe Springs, California with 50 employees where they fabricate foam used primarily in the bedding industry.

In the 1980s, like other companies in the country, Latex International used methylene chloride-based adhesives in their fabrication operation. More recently, as methylene chloride was more heavily regulated by the local air district, the company converted to an acetone-based adhesive. Latex International did not want to continue to use solvent-borne adhesives and initiated work on water-based products. Today, the company is exclusively using water-based adhesives.

The latex foam cores that are used in mattresses are manufactured in Latex International's plant in Conneticut. The ingredients are poured into molds of various types. Two twin molded cores are glued together to form a king sized core. The plant in Santa Fe Springs receives latex foam cores from the Conneticut plant and bonds two types of foam products. In one operation, latex is bonded to latex to form the foam core of a high end mattress. The latex foam takes the place of springs that are commonly used in lower end mattresses. The company also uses glue to attach aluminized "cigarette tape" to the edges of the mattress to prevent cigarette fires. In the second operation, Latex International uses



Latex is bonded to latex to form the foam core of a high-end mattress.

adhesives to bond "racetracks" which are smaller cores of latex foam with an outer perimeter of polyurethane. These cores are used in less expensive bedding.

In the polyurethane foam-to-latex operation, Latex International uses a one-part latex water-based adhesive which does not have an immediate tack. In the latex-to-latex operation, a different one-part water-based adhesive which has a shorter tack time is used. The latex is less porous than polyurethane foam so a faster tack adhesive is required.

Says Ron Bruneau, Plant Manager at Latex International West, "our adhesive use has been reduced by about 30 percent since we converted from acetone to water-based adhesives." The cost of using the water-based adhesives is roughly the same as the cost of the acetone adhesives. "We are testing other water-based adhesives to see if we can lower our costs," says Ron Bruneau.

Roger Coffey, President of Latex International West, is pleased with the conversion and continued work to find lower cost adhesives. "We're an environmentally conscious company. "We did a lot of testing and converted away from solvent-based adhesives entirely," he says. "The water-based adhesives work effectively and they are better for the workers and the community."

Annual Cost Comparison for Latex International

Cost	Acetone Adhesive	Water-Based Adhesive
Capital Cost	$400	—
Adhesive Cost	$34,188	$27,360
Labor Cost	$196,000	$196,000
Maintenance Cost	$490	$372
Electricity Cost	$1,440	$1,440
Training Cost	—	$470
Regulatory Cost	$352	$352
Total Cost	**$232,870**	**$225,994**

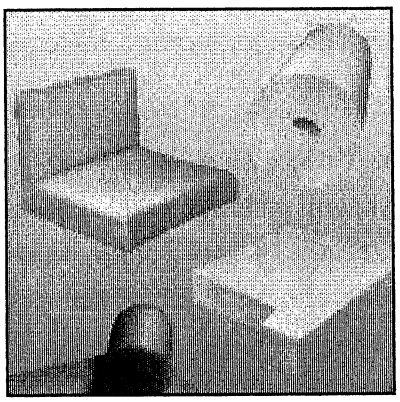
Hickory Springs Decides on Acetone

"Acetone is low in toxicity and it's as effective as METH as a blowing agent and in the glues," says Bobby Bush. "We think it's the best overall solution."

Hickory Springs is a major manufacturer of flexible slabstock polyurethane foam. The company has six pouring plants in the country, including Conover, North Carolina and City of Commerce in California. The foam is used in diverse applications like packaging, bedding, furniture and recreational vehicles.

In addition to manufacturing the polyurethane foam, Hickory Springs also has a number of fabrication operations. The company has fabrication operations in all of their foam pouring plants; in addition, Hickory Springs owns about 30 separate fabricating companies. About half the foam the company produces is used in their own fabrication operations. In all, the company has about 2,000 employees who manufacture and fabricate foam.

Hickory Springs historically used methylene chloride (METH) as an auxiliary blowing agent in their slabstock foam production operations. Because of more stringent toxic regulations on METH, the company began investigating alternatives in the early 1990s. In 1993, Hickory Springs patented a new blowing agent process that used acetone as



The foam is used in diverse applications including packaging, bedding, furniture, and recreational vehicles.

the auxiliary blowing agent in foam manufacture in place of METH. A few years, later, when acetone was deemed exempt from VOC regulations, the company converted all of their pouring plants from METH to acetone.

Like other companies, Hickory Springs used TCA-based adhesives in the early 1990s. When the production ban on TCA was announced and the price of TCA increased, the company converted to METH-based adhesives for their fabrication operations.

In 1990, the pouring plant in City of Commerce used TCA-based adhesives. From 1991 to 1998, the company decided not to continue fabrication at that site. In 1998, the company decided to reenter the fabrication market. At that stage, METH was heavily regulated by the local air district and Hickory Springs investigated and adopted water-based adhesives. "We tried for about a year to make the water-based adhesives work for us but we were unsuccessful," says Steve Isenhour, Plant Manager at the City of Commerce plant. "We're using acetone adhesives now and we've had no problems," he says.

When the Occupational Safety and Health Administration (OSHA) regulated METH more stringently, Hickory Springs decided to convert away from METH in their fabrication operations throughout the country. In the Conover plant, the company converted to water-based adhesives for a short time. In 1998, the company began testing acetone-based adhesives in their fabrication operation at the pouring plant. "The company was very familiar with acetone because it was used as a blowing agent in our pouring plants," says Bobby Bush, Vice President of the Foam Products Division at Hickory Springs. "People are nervous about acetone because of its combustibility," he remarks. "Our insurance rates did not go up; we had to install a ventilation system but we would have had to do that with water or METH adhesives too."

The Conover plant has 16 stations where adhesive is applied. With the conversion to acetone, the company installed ventilation systems that collect from the floor at 11 of the stations; at the remaining five stations, a fan pulls the air outside. At the City of Commerce plant, which has a much smaller fabrication operation, the company has always had one spray booth and no additional ventilation was necessary for the conversion to acetone adhesives.

In the Conover plant, the company uses an adhesive formulation that is a blend of acetone and heptane. In the City of Commerce plant, the company uses a straight acetone-based adhesive because of the more stringent local air district regulations on VOCs. "Acetone is low in toxicity and it's as effective as METH as a blowing agent and in the glues," says Bobby Bush. "We think it's the best overall solution."

At the City of Commerce plant, the company reduced their costs in converting from

water-based to acetone adhesives. The company's production efficiency is much greater with the acetone-based adhesive. The table below shows that the production adjusted cost of using acetone adhesives is about 43 percent less than the cost of using the water-based adhesives.

Annual Cost Comparison for Hickory Springs, Conover Plant

Cost	METH Adhesive	Acetone Adhesive
Capital Cost	—	$1,793
Adhesive Cost	$55,000	$66,000
Labor Cost	$288,000	$288,000
Maintenance Cost	$2,403	$2,403
Electricity Cost	—	$1,260
Total Cost	**$345,403**	**$359,456**

Annual Cost Comparison for Hickory Springs, City of Commerce Plant

Cost	Water-Based Adhesive	Acetone Adhesive
Capital Cost	—	$100
Adhesive Cost	$7,560	$7,800
Labor/Maintenance Cost	$23,833	$15,889
Electricity Cost	$215	$143
Total Cost	$31,608	$23,932
Production-Adjusted Total Cost	**$31,608**	**$17,949**