Material Safety Data Sheet

Material Name: TETRAHYDROFURAN (THF) INDUSTRIAL GRADE **ID: 82802**

* * * Section 1 - Chemical Product and Company Identification * * *

Product Code: 1021795, 1024795

Product Use: Chemical intermediate and vehicle for specialty coatings. If this product is used in combination with other products, refer to the Material Safety Data Sheets for those products.

Synonyms: Diethylene Oxide, Tetramethylene Oxide

Safety-Kleen Systems, Inc.
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Phone: 1-800-669-5740

Emergency # 1-800-468-1760
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PREPARED BY: Product MSDS Coordinator APPROVED BY: MSDS Task Force

* * * Section 2 - Hazardous Identification * * *

EMERGENCY OVERVIEW

Appearance

Clear and colorless liquid with an ether-like odor.

Signal Word

DANGER!

Physical Hazards

Extremely flammable liquid and vapor. Vapor may cause flash fire.

Health Hazards

May irritate the respiratory tract (nose, throat, and lungs), eyes, and skin.
May be harmful or fatal if inhaled.
May be harmful or fatal if swallowed.
May be harmful if absorbed through the skin.
Contains material which may cause central nervous system effects.

POTENTIAL HEALTH EFFECTS

Inhalation (Breathing)

High concentrations of vapor or mist may irritate the respiratory tract (nose, throat, and lungs). High concentrations of vapor or mist may cause nausea, vomiting, headaches, dizziness, loss of coordination, numbness, and other central nervous system effects. Massive acute overexposure may cause rapid central nervous system depression, sudden collapse, coma, and/or death.

Eyes

May cause irritation.

Skin

May cause irritation. Hexane may be absorbed through the skin and cause harm as noted under **INHALATION (BREATHING)**.

Ingestion (Swallowing)

This product may be harmful or fatal if swallowed. Swallowing hexane may cause death. May cause throat irritation, nausea, vomiting, and central nervous system effects as noted under **INHALATION (BREATHING)**. Breathing product into the lungs during ingestion or vomiting may cause lung injury and possible death.

Medical Conditions Aggravated by Exposure

Individuals with pre-existing liver, kidney, respiratory tract (nose, throat, and lungs), central nervous system, eye, and/or skin disorders may have increased susceptibility to the effects of exposure.

Chronic

Prolonged or repeated inhalation and/or ingestion may cause liver, kidney, brain, and central nervous system damage. Prolonged or repeated inhalation may cause toxic effects as noted under **INHALATION (BREATHING)**. Prolonged or repeated eye contact may cause inflammation of the membrane lining the eyelids and covering the eyeball (conjunctivitis). Prolonged or repeated skin contact may cause drying, cracking, redness, itching, and/or swelling (dermatitis). Prolonged or reapeated exposure may cause mutagenicity and/or reproductive toxicity.

Cancer Information

No known carcinogenicity. For more information, see **SECTION 11: CARCINOGENICITY**.

Environmental Hazards

This product may be harmful to aquatic life based upon components. Also see **SECTION 12: ECOLOGICAL INFORMATION**.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
109-99-9	Tetrahydrofuran	98-100
110-54-3	Hexane	0-5

* * * Section 4 - First Aid Measures * * *

Inhalation (Breathing)

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Oxygen should only be administered by qualified personnel. Someone should stay with victim. Get medical attention if breathing difficulty persists.

Eyes

If irritation or redness from exposure to vapor develops, move away from exposure into fresh air. Upon contact, immediately flush eyes with plenty of lukewarm water, holding eyelids apart, for 15 minutes. Get medical attention.

Skin

Remove affected clothing and shoes. Wash skin thoroughly with soap and water. Get medical attention if irritation or pain develops or persists. Wash contaminated clothing before reuse.

Ingestion (Swallowing)

Do NOT induce vomiting. Immediately get medical attention. Call 1-800-468-1760 for additional information. If spontaneous vomiting occurs, keep head below hips to avoid breathing the product into the lungs. Never give anything by mouth to an unconscious person.

Notes to Physicians

Treat symptomatically and supportively. Do not administer Adrenaline (epinephrine) or similar drugs following product overexposure. Increased sensitivity of the heart to such drugs may be caused by overexposure to product. Treatment may vary with condition of victim and specifics of incident. Call 1-800-468-1760 for additional information.

* * * Section 5 - Fire Fighting Measures * * *

Hazardous Combustion Products

Decomposition and combustion materials may be toxic., Burning may produce carbon monoxide and unidentified organic compounds.

Conditions of Flammability

Heat, sparks, or flame.

Extinguishing Media

Carbon dioxide, alcohol-resistant foam, dry chemical, water spray, or water fog.

Protective Equipment For Firefighting

A positive-pressure, self-contained breathing apparatus (SCBA) and full-body protective equipment are required for fire emergencies.

Fire Fighting Equipment/Instructions

Keep storage containers cool with water spray.

NFPA Ratings: Health: 2 **Fire:** 3 **Reactivity:** 1

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Fire and Explosion Hazards

Vapor explosion hazard indoors, outdoors, or in sewers. Vapor may travel to ignition source and flashback. Vapors will spread along the ground and collect in low or confined areas. Run-off to sewer may create a fire or explosion hazard. Heated containers may rupture, explode, or be thrown into the air. "Empty" containers may retain residue and can be dangerous. Product is not sensitive to mechanical impact. Product may be sensitive to static discharge, which could result in fire or explosion.

* * * Section 6 - Accidental Release Measures * * *

Remove all ignition sources. Do not touch or walk through spilled product. Stop leak if you can do it without risk. Wear protective equipment and provide engineering controls as specified in **SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Ventilate area and avoid breathing vapor or mist. Contain spill away from surface water and sewers. Contain spill as a liquid for possible recovery, or sorb with compatible sorbent material and shovel with a clean, sparkproof tool into a sealable container for disposal.

Additionally, for large spills: Water spray may reduce vapor, but may not prevent ignition in closed spaces. Dike far ahead of liquid spill for collection and later disposal.

There may be specific regulatory reporting requirements associated with spills, leaks, or releases of this product. Also see **SECTION 15: REGULATORY INFORMATION.**

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Keep away from heat, sparks, or flame. Do not evaporate to dryness or distill, an explosion may occur. Stored tetrahydrofuran must be tested for peroxides before using. Use clean, sparkproof tools and explosion-proof equipment. When transferring product, metal containers, including trucks and tank cars, should be grounded and bonded. Do not breathe vapor or mist. Use in a well ventilated area. Avoid contact with eyes, skin, clothing, and shoes. Do not smoke when using this product.

Shipping and Storing

Keep container tightly closed when not in use and during transport. Stored tetrahydrofuran must be tested for peroxides before using. Do not pressurize, cut, weld, braze, solder, drill, or grind containers. Keep containers away from heat, flame, sparks, static electricity, or other sources of ignition; containers may explode and cause injury or death. Empty product containers may retain product residue and can be dangerous. See **SECTION 14: TRANSPORTATION INFORMATION** for Packing Group information.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Exposure Guidelines

Component Exposure Limits

Tetrahydrofuran (109-99-9)

ACGIH: 50 ppm TWA
100 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route

OSHA Final: 200 ppm TWA; 590 mg/m3 TWA

OSHA Vacated: 200 ppm TWA; 590 mg/m3 TWA
250 ppm STEL; 735 mg/m3 STEL

NIOSH: 200 ppm TWA; 590 mg/m3 TWA
250 ppm STEL; 735 mg/m3 STEL

Hexane (110-54-3)

ACGIH: 50 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route

OSHA Final: 500 ppm TWA; 1800 mg/m3 TWA

OSHA Vacated: 50 ppm TWA; 180 mg/m3 TWA

NIOSH: 50 ppm TWA; 180 mg/m3 TWA

Engineering Controls

Provide general ventilation needed to maintain concentration of vapor or mist below applicable exposure limits. Where adequate general ventilation is unavailable, use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below applicable exposure limits. Where explosive mixtures may be present, equipment safe for such locations should be used.

Personal Protective Equipment: Respiratory

Use NIOSH-certified, air-supplied respirators (self-contained breathing apparatus or air-line) respiratory protective equipment when concentration of vapor or mist exceeds applicable exposure limits. Selection and use of respiratory protective equipment should be in accordance in the USA with OSHA General Industry Standard 29 CFR 1910.134; or in Canada with CSA Standard Z94.4.

Personal Protective Equipment: Eyes/Face

Where eye contact is likely, wear chemical goggles; contact lens use is not recommended.

Personal Protective Equipment: Skin

Where skin contact is likely, wear chemical impervious protective gloves; use of natural rubber (latex) or equivalent gloves is not recommended.

To avoid prolonged or repeated contact where spills and splashes are likely, wear appropriate chemical-resistant faceshield, boots, apron, whole body suits, or other protective clothing.

Personal Protective Equipment: Personal Hygiene

Use good personal hygiene. Wash thoroughly with soap and water after handling product and before eating, drinking, or using tobacco products. Clean affected clothing, shoes, and protective equipment before reuse. Discard affected clothing, shoes, and/or protective equipment if they cannot be thoroughly cleaned. Discard leather articles, such as shoes, saturated with this product.

Other Personal Protective Equipment

Where spills and splashes are likely, facilities storing or using this product should be equipped with an emergency eyewash and shower, both equipped with clean water, in the immediate work area.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance/Odor :	Liquid, clear and colorless, ether-like odor. Ether-like	**pH:**	Not applicable
Boiling Point:	153ºF (67ºC)	**Melting Point:**	-162ºF (-108ºC)
Solubility (H2O):	Complete	**Specific Gravity:**	0.89 (water = 1)
Density:	7.4 LB/US gal (890 g/l)	**Octanol/H2O Coeff.:**	Log Pow = 0.46
Evaporation Rate:	14.5 (butyl acetate = 1)	**Molecular Weight:**	72.1
Odor Threshold:	20 ppm	**Auto Ignition Temperature:**	610ºF (321ºC) (based on THF)
LFL:	2.0 VOL% (based on THF)	**Flash Point:**	7ºF (-14ºC) Closed Cup (based on THF)
UFL:	11.8 VOL% (based on THF)	**Vapor Density:**	2.5 (air = 1)
Vapor Pressure:	145 mm Hg at 68ºF (20ºC)		
Flammability Class:	Class IB		

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Stability

This product is inhibited to prevent peroxide formation; therefore, it is stable under normal temperatures and pressures. However, an explosion may occur if evaporated to dryness or distilled.

Incompatibility

Avoid acids, alkalies, oxidizing agents, reducing agents, reactive halogens, or reactive metals.

Reactivity

This product is inhibited to prevent peroxide formation; therefore, polymerization is not known to occur under normal temperatures and pressures, except when in contact with acids, heat or amines. Not reactive with water.

Hazardous Decomposition Products

Due to presence of inhibitor, none under normal temperatures and pressures. See also **SECTION 5: HAZARDOUS COMBUSTION PRODUCTS**.

Conditions To Avoid

Keep away from heat, ignition sources and incompatible materials. Do not allow product to evaporate to dryness.

* * * Section 11 - Toxicological Information * * *

Toxicity Data

Component Analysis - LD50/LC50

Tetrahydrofuran (109-99-9)

Inhalation LC50 Rat 53.9 mg/L 4 h; Oral LD50 Rat 1650 mg/kg

Hexane (110-54-3)

Dermal LD50 Rabbit 3000 mg/kg; Inhalation LC50 Rat 48000 ppm 4 h

Acute Effects

May irritate the respiratory tract (nose, throat, and lungs), eyes, and skin. May be harmful or fatal if swallowed. High concentrations of vapor or mist may irritate the respiratory tract (nose, throat, and lungs). High concentrations of vapor or mist may cause nausea, vomiting, headaches, dizziness, loss of coordination, numbness, and other central nervous system effects. Massive acute overexposure may cause rapid central nervous system depression, sudden collapse, coma, and/or death. Breathing product into the lungs during ingestion or vomiting may cause lung injury and possible death.

Repeated Dose Effects

Based on best current information, there is no known human sensitization associated with this product.

Hexane has demonstrated experimental effects of mutagenicity.
Based on best current information, the other component listed in **SECTION 2** is not a mutagen.
Tetrahydrofuran and hexane have demonstrated animal effects of reproductive toxicity.
Based on best current information, there is no known teratogenicity associated with this product.

Component Carcinogenicity

Tetrahydrofuran (109-99-9)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Target Organ Effects

Prolonged or repeated inhalation and/or ingestion may cause liver, kidney, brain, and central nervous system damage.

Mutagenicity

Hexane has demonstrated experimental effects of mutagenicity.
Based on best current information, the other component listed in **SECTION 2** is not a mutagen.

Teratogenicity

Based on best current information, there is no known teratogenicity associated with this product.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

Hexane is toxic to aquatic life.

Component Analysis - Ecotoxicity - Aquatic Toxicity

Tetrahydrofuran (109-99-9)

Duration/Test/Species	Concentration/Conditions	Notes
96 Hr LC50 Pimephales promelas	1970 - 2360 mg/L [flow-through]	
96 Hr LC50 Pimephales promelas	2700 - 3600 mg/L [static]	

Hexane (110-54-3)

Duration/Test/Species	Concentration/Conditions	Notes
96 Hr LC50 Pimephales promelas	2.1 - 2.98 mg/L [flow-through]	

Persistence/Degradability

No information available for the product.

Bioaccumulation/Accumulation

No information available for the product.

Mobility in Environmental Media

No information available for the product.

Other Adverse Effects

No information available for the product.

* * * Section 13 - Disposal Considerations * * *

Disposal Instructions

Dispose in accordance with federal, state, provincial, and local regulations. Regulations may also apply to empty containers. The responsibility for proper waste disposal lies with the owner of the waste. Contact Safety-Kleen regarding proper recycling or disposal.

US EPA Waste Number & Descriptions

U213 Based on available data, this information applies to the product as supplied to the user. Processing, use, or contamination by the user may change the waste code applicable to the disposal of this product.
If this product is used or spent prior to discard, the following waste code may apply: D001.

* * * Section 14 - Transportation Information * * *

Emergency Response Guide Number

127

Reference *.North American Emergency Response Guidebook*

DOT **Shipping Name:** Tetrahydrofuran
UN/NA #: UN2056 **Hazard Class:** 3 **Packing Group:** II
Required Label(s): FLAMMABLE LIQUID

TDG **Shipping Name:** Tetrahydrofuran
UN/NA #: UN2056 **Hazard Class:** 3 **Packing Group:** II
Required Label(s): FLAMMABLE LIQUID

IATA Information

No Classification Assigned.

IMDG Information

No Classification Assigned.

* * * Section 15 - Regulatory Information * * *

Volatile Organic Compounds (As regulated)

100 WT%; 7.4 LB/US gal; 890 g/L; As per 40 CFR Part 51.100(s)

SARA Sections 311/312

This product poses the following health hazard(s) as defined in 40 CFR Part 370 and is subject to the requirements of sections 311 and 312 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA):
Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard

SARA 302/304

Component Analysis

Based on the ingredient(s) listed in SECTION 3, this product does not contain any "extremely hazardous substances" listed pursuant to Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) Section 302 or Section 304 as identified in 40 CFR Part 355, Appendix A and B.

SARA Section 313

Component Analysis

This product contains a "toxic" chemical subject to the requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40 CFR Part 372.

Hexane (110-54-3)	1.0 % de minimis concentration

CERCLA

Component Analysis

Based on the ingredient(s) listed in SECTION 3, this product contains the following "hazardous substance" listed under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) in 40 CFR Part 302, Table 302.4 with the following reportable quantities (RQ):

Tetrahydrofuran (109-99-9)	1000 lb final RQ; 454 kg final RQ
Hexane (110-54-3)	5000 lb final RQ; 2270 kg final RQ

TSCA

All the components of this product are listed on, or are automatically included as "naturally occurring chemical substances" on, or are exempted from the requirement to be listed on, the TSCA Inventory.

Component Analysis

Component	CAS #	TSCA
Tetrahydrofuran	109-99-9	Yes
Hexane	110-54-3	Yes

State Regulations

This product does not contain detectable amounts of any chemical known to the State of California to cause cancer.

This product does not contain detectable amounts of any chemical known to the State of California to cause birth defects or other reproductive harm.

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	MA	MN	NJ	PA	CA
Tetrahydrofuran	109-99-9	Yes	Yes	Yes	Yes	Yes
Hexane	110-54-3	No	Yes	Yes	Yes	Yes

No component(s) are listed under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).

Canadian Regulations

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all information required by the CPR.

Component Analysis

Component	CAS #	CAN
Tetrahydrofuran	109-99-9	DSL
Hexane	110-54-3	DSL

Canadian WHMIS Information

Class B2 - Flammable Liquid Class D2B - Irritating to eyes and skin. Class D2A - Chronic toxic effects.

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Tetrahydrofuran (109-99-9) 1 %

Hexane (110-54-3) 1 %

Canadian Environmental Protection Act (CEPA)

All the components of this product are listed on, or are automatically included as "substance occurring in nature" on, or are exempted from the requirements to be listed on, the Canadian Domestic Substances List (DSL).

* * * Section 16 - Other Information * * *

Label/Other Information

Not available.

Revision Information

Regulatory Update. Regulatory update, updated to ANSI Z400.1-2004 format. This MSDS has been revised in the following sections: Section 1 (Dates), Section 2 (Composition updated), Section 3 (switched to Emergency Overview), Section 4 (Phone Numbers), Section 5 (Fire Fields), Section 8 (Exposure Limits added), Section 11 (Toxicology fields updated), Section 12 (Ecotoxicity , fields updated), Section 16 (Revision Information).

Disclaimer

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either expressed or implied, of merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to the information or the product to which the information refers. The data contained on this sheet apply to the product as supplier to the user.

End of Sheet 82802