Dynalene HF and Dynalene MV
ENGINEERING GUIDE

Contents

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Product Overview

Dynalene HF and Dynalene MV are environmentally acceptable low temperature heat transfer fluids. They were developed to extend the "low end" operating temperature range far below the boundaries of most competitive brands.

Dynalene HF heat transfer fluid is biodegradable and CFC free. All ingredients are recognized by the Food and Drug Administration as food additives permitted for direct addition to food for human consumption. The specific sections of 21 CFR Part 172 applicable to this product are 21 CFR 172.515 (see Appendix A, pages 18–22). Dynalene HF has a recommended use temperature range of –112°F to 325°F.

Dynalene MV heat transfer fluid has a limited toxicity; it is also biodegradable and CFC free. Dynalene MV has a recommended use temperature range of –170°F to 325°F.

All Dynalene HF and Dynalene MV fluid must surpass stringent quality inspections prior to shipment. It is essential that all personnel handling this product review and understand this manual that includes the Dynalene HF or Dynalene MV material safety data sheet (MSDS). Do not hesitate to contact the Dynalene Technical Support Group or your local representative for more information.

Freeze & Melt Point

Dynalene HF and Dynalene MV have freeze and melt points below –200°F, allowing broader application to systems using both cryogenic liquids or ultra-low temperature mechanical refrigeration equipment. This results in greater tolerance when lowering the heat transfer of surface film temperatures.

Flash Point

Dynalene HF heat transfer fluid has a closed cup flash point of 141°F (61°C) as per method ASTM-D56, and an open cup flash point of no less than 155°F (68°C) as per method ASTM-D1310.

Dynalene MV heat transfer fluid has a closed cup flash point of 127°F (53°C) as per method ASTM-D56, and an open cup flash point of no less than 141°F (60°C) as per method of ASTM-D1310.

Like other hydrocarbon based heat transfer fluids, Dynalene HF and Dynalene MV fluids or their vapors may ignite if released into the environment by being exposed to hot surfaces, sparks, open flames, or any other source of ignition.

Vapor Pressure

Vapor pressure is a critical property to be considered when calculating Net Positive Suction Head (NPSH), a major factor in the sizing of fluid handling equipment.

"Air Tight" containment is recommended to limit the escape of Dynalene HF and Dynalene MV vapors. See the table below for vapor pressures of Dynalene HF and Dynalene MV at various temperatures.

Vapor pressures for Dynalene HF and Dynalene MV.

*Dynalene HF**	*Dynalene MV**
at 32°F (0°C): <1 mm, Hg	at 32°F (0°C): 1 mm, Hg
at 77°F (25°C): <1 mm, Hg	at 77°F (25°C): 1.9 mm, Hg
at 212°F (100°C): 37 mm, Hg	at 212°F (100°C): 63.7 mm, Hg

*A vapor graph for this fluid is shown on page 16.

Odor Evaluation

Both Dynalene HF and Dynalene MV heat transfer fluids are produced using hydrocarbon liquid blends. Proper safety procedures must be practiced at all times.

Dynalene HF has a mild hydrocarbon odor that will become evident in the surrounding area if the fluid or its vapors are released into the environment.

Do not handle or otherwise expose personnel to Dynalene HF or Dynalene MV liquid without reviewing and understanding the Material Safety Data Sheet (MSDS). Always handle the fluid in well ventilated areas; the area should be free from sparks, open flames, or lit tobacco. Use respiratory protection consistent with the recommendations in the MSDS. If you require a copy of a MSDS for any Dynalene heat transfer fluid, consult your local authorized representative, or the Dynalene Customer Service Department in the USA at (610) 262-9686 or fax (610) 262-7437.

Packaging & Shipping

Dynalene HF and Dynalene MV heat transfer fluids are available in 5 gallon pails, 55 gallon drums, and bulk quantities.

Dynalene HF heat transfer fluid has a shipping hazard classification of number 2 in the USA. By current definition of 49CFR173.120 and 173.150, Dynalene HF can be listed as a *Combustible* or *Flammable Liquid* when transported by highway or rail, but must be listed as a *Flammable Liquid* when shipped by air or waterway.

Dynalene MV heat transfer fluid has a shipping hazard classification of number 3 in the USA. By current definition of 49CFR173.120 and 173.150, Dynalene MV can be listed as a *Combustible* or *Flammable Liquid* when transported by highway or rail, but must be listed as a *Flammable Liquid* when shipped by air or waterway.

All Dynalene heat transfer fluid 5 gallon pail(s) can be shipped using most ground or air delivery services including, but not limited to: UPS, Federal Express, Emery, and Roadway Packaging Systems.

Generally this material is shipped the same day the order is placed. Multiple quantity 5 gallon pails or 55 gallon drum orders can be shipped via most common carrier trucking companies, select air or dedicated ground freight services. If bulk quantities are required, please consult your local authorized representative, or Dynalene in the USA at (610) 262-9686 or fax (610) 262-7437. Special delivery requirements will be accommodated, if possible. All standard ground shipments are freight prepaid and billed with invoice, unless otherwise specified.

Storage & Thermal Stability

Dynalene HF and Dynalene MV heat transfer fluids will remain thermophysically stable for a period of at least one year if (1) it is stored in the original unopened pail or drum, and (2) the storage area is a dry environment below 100°F. Partially full pails and drums should be purged with an inert gas such as nitrogen, prior to resealing to insure the exclusion of oxygen in the head space of the container. Do not exceed an inert gas pressure rating of 2 psig in the original Dynalene container during the purge process.

In addition, results from extensive field and laboratory testing performed on both Dynalene HF/MV heat transfer fluids indicate thermal stability should remain consistent for a period of more than one year when (1) the fluids are used in a vapor tight fluid containment system, and (2) all system operating practices remain in compliance with the information in this manual.

Metal Compatibility

Dynalene HF and Dynalene MV heat transfer fluids have an acceptable compatibility rating when installed in vapor tight systems constructed within the temperature, pressure, and structural limitations of the following metals:

- Aluminum
- Brass
- Bronze (All)
- Carbon Steel
- Cast Steel
- Copper
- Copper Nickel (All)
- Hasteloy (All)
- Inconel
- Incoloy 825
- Monel
- Nickel
- Stainless Steel (All)
- Stainless Steel Clad
- Tantalum
- Titanium

For a compatibility review on the materials listed above, or other materials not mentioned in this section, consult the Dynalene Engineering Department in the USA at (610) 262-9686 or fax (610) 262-7437

Polymer and Gasket Compatibility

Dynalene HF and Dynalene MV heat transfer fluids have an acceptable compatibility when used within the temperature and pressure limitation of the following polymers or gasketing material.

- Acetal
- Aramid Fiber
- Chemraz (FFKM)
- Epoxy
- Fluorocarbon (FILM)

- Fluoroelastomer
- Glass Fiber
- Gylon Style 3500, 3504, & 3510
- Kalrez
- Kel-F (CTFE)
- Peek
- Polytetrafluoro-ethylene
- Teflon (All)
- Teflon Encapsulated Silicone
- Teflon Encapsulated Viton
- Telfon Impregnated Fiberglass
- Viton
- Resin Impregnated Carbon Graphite

For a compatibility review on the materials listed above, or other materials not mentioned in this section, consult the Dynalene Engineering Department in the USA at (610) 262-9686 or fax (610) 262-7437

General Installation Guidelines

The following recommendations are provided by the Dynalene Technical Field Support Group to assist the Dynalene HF/MV heat transfer fluid installer or user in achieving an incident free installation. It should be understood that installation procedures other than those described by Dynalene may need to be followed by the engineer, installer, or end user involved in the design, construction, or operation of a heat transfer fluid system to insure ultimate safety and cost effective efficiency.

1. The manual Prior to purchasing any Dynalene HF or Dynalene MV, review and understand all of the information contained in this manual—especially the sections titled *Retrofitting for Dynalene HF/MV* and *Preparing New Systems Using Dynalene HF/MV.* Only qualified personnel with expertise in safe handling of potentially hazardous liquids (in compliance with local, state, and federal regulations) should be involved with work processes of this nature.

2. Oxygen Limit the presence of oxygen within the wetted areas of a piped system. An inert gas, such as nitrogen, is the favored substitute to air in the vapor space. A replenishable supply of air or oxygen in contact with Dynalene HF or Dynalene MV will promote premature fluid degradation.

The basic fluid system sketch illustrated in Figure 1 (page 10), is an example of a typical Dynalene HF/MV heat transfer fluid system using an inert gas purge as a method of excluding oxygen. The inert gas pressure regulator BPV set point should be approximately 50% higher than the maximum Dynalene HF/MV vapor pressure value anticipated with the system.

WARNING: At no time shall the overall operating pressure, which includes the inerting gas pressure, exceed the design pressure rating of any individual component within a system. Consult the Dynalene Engineering Department prior to use in open bath applications or where the heat transfer fluid is not in vapor tight containment.

3. Moisture Moisture content within Dynalene HF/MV heat transfer fluids in system operation is recommended to be less than 100 parts per million (.01% H_20 in Dynalene HF/MV). The freezing point, viscosity, and heat transfer coefficient of Dynalene HF/MV may be adversely affected if moisture content is above recommended levels. Moisture is heavier than Dynalene HF/MV and will drop out of the solution at approximately 400 to 500 PPM, depending upon liquid temperature.

In low temperature applications, excessive moisture in Dynalene HF/MV will impair heat transfer; this may result in frozen heat exchangers, seized regulators, etc. Desiccating Dynalene HF/MV as shown in Figure 2 (page 11) is one recommended method of removing moisture from non-aqueous fluids. Routinely monitoring the moisture absorption rate into the desiccant to determine when the saturation of moisture is reached (generally 10% by 15% by weight) is critical to effective moisture removal. Sample analysis utilizing a Karl Fischer Coulomatic Titrimeter is one method used to obtain an accurate moisture measurement in Dynalene HF/MV.

If a moisture analysis is required on your Dynalene HF/MV, call your local authorized representative, or contact Dynalene in the USA at (610) 262-9686 or fax (610) 262-7437.

4. Maximum surface temperature Surface temperature of heat source components in low flow velocity systems using Dynalene HF/MV heat transfer fluid should not exceed 340°F. Fluid velocity should maintain a minimum of 8 feet per second.

5. Using electric resistance heaters Electric resistance heaters used in Dynalene HF or Dynalene MV heat transfer fluid applications are recommended to use a maximum watt density of 28 watts per square inch. Enclosures containing resistive element and wire termination that are in thermal contact with the cold surfaces of a system must be protected from the effects of moisture. Excessive moisture could accumulate inside the electrical enclosure. Given the appropriate conditions, this will eventually corrode the wiring connection points and may oversaturate the insulation, creating a possible "dead short" in the circuitry on the element.

Limiting moisture in the areas stated above can be accomplished by inerting the inner areas of the electric enclosure(s) with low pressure (1psig) gaseous nitrogen or carbon dioxide, or by protecting the electrical connections and element termination points with a non-conductive, moisture resistive compound such as rated epoxies or RTV gasket sealing material.

If you require a review on the heating equipment you have considered, consult the Dynalene Engineering Department at (610) 262-9686 or fax (610) 262-7437.

6. Pump equipment Pump equipment that handles Dynalene HF/MV, especially those using mechanical seals, should have adequate net suction head pressure in the piping up to the pump inlet, including the pump housing. Inadequate net suction head pressure may hinder anticipated pump performance by creating a negative pressure within the pump cavity areas, allowing for moisture infiltration through the sealing surfaces into the fluid being pumped.

Dynalene HF/MV vapor pressure must be considered when estimating the required Net Positive Suction head (NPSH). Specially designed pumps capable of operating at less than normal suction head pressures should be used if inadequate suction pressure is encountered. Sealless pumps that are totally encapsulated or magnetically driven are recommended for use with Dynalene HF/MV when used with-in the temperature pressure and structural limitations set by the pump manufacturer. To prevent the freeze up or stalling of a magnetic pump, it may be necessary to inert the chamber(s) where the rotor and magnet interact.

7. Ancillary equipment Ancillary equipment designed with mechanically jointed sealing surfaces including, but not limited to, packing gland valves, regulators, air vents, bellowed parts, and relief valves must be able to withstand a vapor tight seal when exposed to positive and/or negative pressures. This is commonly performed by subjecting the system or individual component to a one hour leak test.

Prior to initiating a one hour leak test, the surrounding ambient temperature must remain consistent throughout the test to limit the pressure fluctuations due to thermal expansion and contraction within the containment space. Be sure the system is dry and no liquid has been added. Charge the system with an inert gas such as nitrogen, not exceeding the maximum working pressure of any system component. In smaller systems, allow approximately 10 minutes for pressure to equalize; larger systems may require more time. System inert gas pressure should remain consistent for one hour. Inconsistencies in pressure during the leak test may indicate one or more leaks. Repairs should be made as needed and a new leak test be performed until satisfactory results are obtained. Pumping equipment shall also comply with this guideline.

WARNING: Volumetric expansion and/or contraction of Dynalene HF/MV must be taken into consideration when calculating the overall fluid volume within the entire system. Determine the maximum operating temperature difference of the Dynalene HF/MV that could be realized within the system, including intermittent temperature excursions. Refer to the *Dynalene HF/MV Volumetric Expansion Chart* on page 17 to determine the estimated fluid volume change in percent. The Dynalene HF/MV volume change, plus a minimum additional safety factor of 10%, must be allowed for head or vapor space within the system. Should no additional head space be available, installation of a pressure rated expansion tank of adequate volume into an existing piped system is required.

8. System Safety. Systems using Dynalene HF/MV should be designed and constructed with integrally safe methods of removing air or vapor from areas within the system, requiring all liquid phase duty. Insuring adequate pump velocities, providing automatic air/vapor collection areas within the system, and strategically installing approved air/vapor elimination devices are commonly used practices.

For precautionary measures, all metal components used in the manufacture of heat transfer fluid systems with the intent to use Dynalene HF, Dynalene MV, or other potentially combustible or flammable liquids should be properly grounded as per the governing electrical codes within the geographical region of the installation. Proper engineering practices should also endorse methods to prevent sparks generated by energy such as eddy current, Foucault current, static discharges, etc., as the liquids mentioned above flow in the system.

Retrofitting for Dynalene HF or Dynalene MV

Dynalene HF and Dynalene MV heat transfer fluid has excellent capabilities when used in place of fluids listed below, if the retrofit process conforms to good engineering practices that includes information contained in this manual.

- CFC Refrigerant
- Chlorinated Solvent
- HFC Refrigerant
- Hydrocarbon Based
- Organic Based
- Perfluorocarbon
- Silicone Based Liquid
- Terpene Derived Liquid

Review and understand all of the information contained in this manual prior to purchasing Dynalene HF/MV for use as a replacement heat transfer fluid in an existing system.

Care must be taken when preparing an existing process system for installation of Dynalene HF/MV heat transfer fluid. Once the original liquid is removed, it is not unusual for systems to retain small amounts of residual liquid in low lying areas such as piping traps, inverted coils, pump housings, valve housings, drain pipes, etc. The residual

liquids must be removed adequately if the Dynalene HF/MV heat transfer fluid is to function properly as specified.

The following recommendations are provided by the Dynalene Technical Field Support Group to assist the installer or end user in achieving a successful retrofit.

- Determine the actual volume of the heat transfer liquid used during the original system charge. Compare against the volume of liquid removed during the retrofit process to determine the amount of residual liquid remaining in the system.
- To remove residual liquids, purge the existing system with an inert gas such as nitrogen. For best results, purge intermittently with disruptions to zero pressure once every two minutes. For example, purge with pressure for one minute, then disrupt purge to zero pressure in system for the next minute. Switch back to purge, then zero pressure minute by minute. Place a bucket, drum, or other method of vented containment at the selected discharge connection of the purge process to accommodate sporadic flows of residual liquid while performing the purging procedure. Environmental regulations may prohibit volatile vapors from being discharged into the atmosphere. Carbon adsorption pods, refrigeration condensation, or other environmentally safe methods of removing residual liquids may be more feasible if the system incorporates low lying areas or liquid traps.

WARNING: The purging of any system should be performed in a well ventilated environment and not in a confined space. Purge gases, such as nitrogen or carbon dioxide, used in a confined space will quickly deplete the oxygen supply necessary to sustain human life, and will cause unconsciousness and death.

Residual liquid that remains in an existing system after thorough inert gas purging can be removed by the following methods:

1. Systems Evacuation
2. Air and Inert Gas Evaporation
3. Dilution

1. Systems Evacuation Systems evacuation is performed by creating a vacuum, usually more than 20" Hg, within the existing system containing the residual liquid at room temperature. As the vacuum within the system increases, the boiling point of the residual liquid will decrease and evaporate. The intent is to evaporate the residual liquid completely by lowering its boiling point to below the internal temperature of the system.

WARNING: Care must be taken in selecting the vacuum pump and vapor abatement equipment. Improperly selected or sized vapor combustion, carbon adsorption, refrigeration condensation, or other vapor abatement systems may result in premature equipment failure, fire, or explosion, all of which may cause bodily injury or death. Proper container static grounding practices must be used when transferring potentially hazardous or combustible liquids.

Consult the Dynalene Engineering Department in the USA at (610) 262-9686 or fax (610) 262-7437 if you require assistance.

2. Air and Inert Gas Evaporation Liquid evaporation using air or an inert gas may be another feasible method of removing residual liquid from an existing piped system. This is performed by allowing an adequate volume of dry compressed air or inert gas, such as nitrogen, to enter the existing system and flow through the inner piped wetted areas, including low points. The intent is to evaporate the residual liquid and allow the effluent to exit the piped system at a point that is generally opposite the inlet air or inert gas connection. Compressed air or inert gas is recommended to have a dew point lower than –95°F, and sufficiently below the evaporation point of liquid being removed. An engineering study should be performed to determine if the residual liquid can be safely removed using this procedure.

WARNING: Do not exceed the working pressure or temperature limitations of any component within the containment system being prepared for retrofitting. If the residual liquid has combustible properties, use inert gas—not compressed air—as the carrying medium.

3. Dilution Dilution of residual liquid can be performed in conjunction with the system evacuation or evaporation methods listed in the previous page. Dilution of the residual liquid can be performed by selecting a dilution solvent that has acceptable cleaning capabilities but is also miscible with the residual liquid, and has a low vapor pressure.

Insure that most of the residual liquid is removed from the existing system by draining and purging. Introduce an adequate amount of dilution solvent until full miscibility with the residual liquid is obtained. Safely drain, and adequately purge the dilution solvent from the system.

Dynalene HF/MV heat transfer fluid may be used as a dilution solvent in select applications. For more information, consult your local authorized representative or the Dynalene Engineering Department in the USA at (610) 262-9686 or fax (610) 262-7437. Dynalene HF/MV used as a dilution solvent should not be reused as a heat transfer fluid.

- When removing aqueous based liquids such as a glycol/water solution, every precaution must be taken to eliminate all moisture prior to introducing Dynalene HF/MV into the system.

- Dynalene HF/MV is miscible with most commonly used hydrocarbon, silicone, and terpene based fluids in the event of unintentional contamination. However, the modification of Dynalene HF/MV by the addition of any material, such as listed above, may alter the characteristics of the liquid.

Preparing New Systems Using Dynalene HF or Dynalene MV

The following recommendations are provided by the Dynalene Technical Support Group to assist the installer or end user in achieving a proper installation. Only qualified personnel with expertise in safely handling potentially hazardous liquids within the compliance of all local, state, and federal regulations should be involved in the work process.

1. Flush the System Systems intending to use Dynalene HF/MV heat transfer fluid should be properly flushed clean after installing components such as pipes, valves, pumps, etc. Materials from welding operations, excess pipe joint compound, oils, and other unwanted contaminants must be removed completely prior to installing Dynalene HF/MV. Using a dilution solvent that is completely miscible with the contaminants generated during an installation is one recommended method of flushing a system clean. Review section related to "Dilution of Residual Liquid" for more information concerning this method.

2. Do A Moisture Analysis A moisture analysis should be performed after the fluid has circulated with the system for about one hour. This is to insure the moisture content is within the recommended level, especially when operating Dynalene HF/MV below ≈35°F. Review *General Installation Guidelines, #3* (page 5), which covers moisture laden fluid, before proceeding.

3. Install Line Filtration Dynalene HF/MV heat transfer fluid and its containment should remain free of debris throughout the operational life of the liquid. An appropriately sized in-line strainer assembly using a perforation size (1/32") or less, is recommended to be installed directly in the flow of fluid to allow the most effective particulate removal from the fluid. Providing filtration down to approximately 5 microns nominal, combined with an in-line strainer as a prefilter, is the best method of conditioning Dynalene HF/MV. Redundant strainer/filtration equipment with temporary bypass piping should be installed in a system that cannot tolerate disruptions.

4. Install Drain Valves Drain valves should be installed on all low points within a piped system to allow complete drainage of trapped liquids such as water, with a higher specific gravity than Dynalene HF/MV.

Representative Sample Analysis

If, during the course of maintenance, a deterioration in performance is detected which indicates that fluid integrity has been compromised, analysis of Dynalene HF/MV heat transfer fluid from a user's system is available. Representative samples of Dynalene HF/MV should be obtained from an active liquid stream at room temperature.

If the samples cannot be obtained from an active liquid stream at room temperature, locate a collection container that is air tight, clean, and its materials of construction are compatible with Dynalene HF/MV. Obtain a sample from an area within the active system and allow the liquid to achieve room temperature. After the sample has attained room temperature, pour the liquid contents from the collection canister into an approved shipping container. Make every effort to limit the liquid's exposure to the surrounding atmosphere.

This free service is offered through the Dynalene Analytical Department. Arrangements can be made by contacting the Dynalene Customer Service Department in the USA at (610) 262-9686 or fax (610) 262-7437 to obtain shipping instructions and a Return Authorization Number (RAN) for the sample requiring analysis. Do not ship Dynalene HF/MV sample(s) without legibly printing a the RAN on the shipping label *and* on the actual sample container being shipped. *Do not ship Dynalene HF/MV sample(s) without fully understanding the shipping and labeling procedures.*

Typical Properties Chart of Dynalene HF and Dynalene MV

Revised 3-15-99

Property[*]	*Dynalene HF®*	*Dynalene MV®*
Appearance	Transparent[†]	Transparent[†]
Color	Clear to Slight Yellow[†]	Clear to Slight Yellow[†]
Composition	Aliphatic Hydrocarbon Blend	Hydrocarbon Blend
Viscosity	11.1 cP @ –57°C (–70°F)	6.0 cP @ –73°C (–100°F)
Density	52.25 lb/ft^3 @ –29°C (–20°F)	56.6 lb/ft^3 @ –84°C (–120°F)
Specific Gravity	0.803 at 20°C (68°F)	0.838 at 20°C (68°F)
Heat Capacity	(0.425 BTU/(lb)(°F) @ –29°C (–20°F)	0.34 BTU/(lb)(°F) @ –84°C (–120°F)
Thermal Conductivity	0.0755 BTU/(hr)(ft^2)(°F/ft) @ –29°C (–20°F)	0.0915 BTU/(hr)(ft^2)(°F/ft) @ –84°C (–120°F)
Boiling Point	>175°C (>347°F)	176–179°C (340–354°F)
Freeze & Melt Point	<–129°C (<–200°F)	<–129°C (<–200°F)
Flash Point (closed cup)	60.5°C (141°F)	53°C (127°F)
Flash Point (open cup)	68.8°C (156°F)	61°C (142°F)
Autoignition Temperature	>337°C (>640°F)	≈388°C (≈730°F)
Fire Point	72°C (162°F)	64°C (147°F)
Recommended Use Range	–80°C to 163°C (–112°F to325°F)[‡]	–115 to 163°C (–170 to325°F)[‡]
Critical Temperature	394°C (741°F)	387°C (729°F)
Critical Pressure	27 bar	34 bar
Dielectric Constant	2.1 to 2.2	2.3
Average Molecular Weight	150	135

> = greater than; < = less than

[*] Like other hydrocarbon-based heat transfer fluids, Dynalene HF/MV fluid or its vapor may ignite if released into the environment and exposed to hot surfaces, sparks, open flames, or other source of ignition.

[†] Appearance and color will be altered if dye is added to satisfy vendor or customer requirements.

[‡] For use in sealed systems only.

Figure 1 Basic Heat Transfer Fluid System

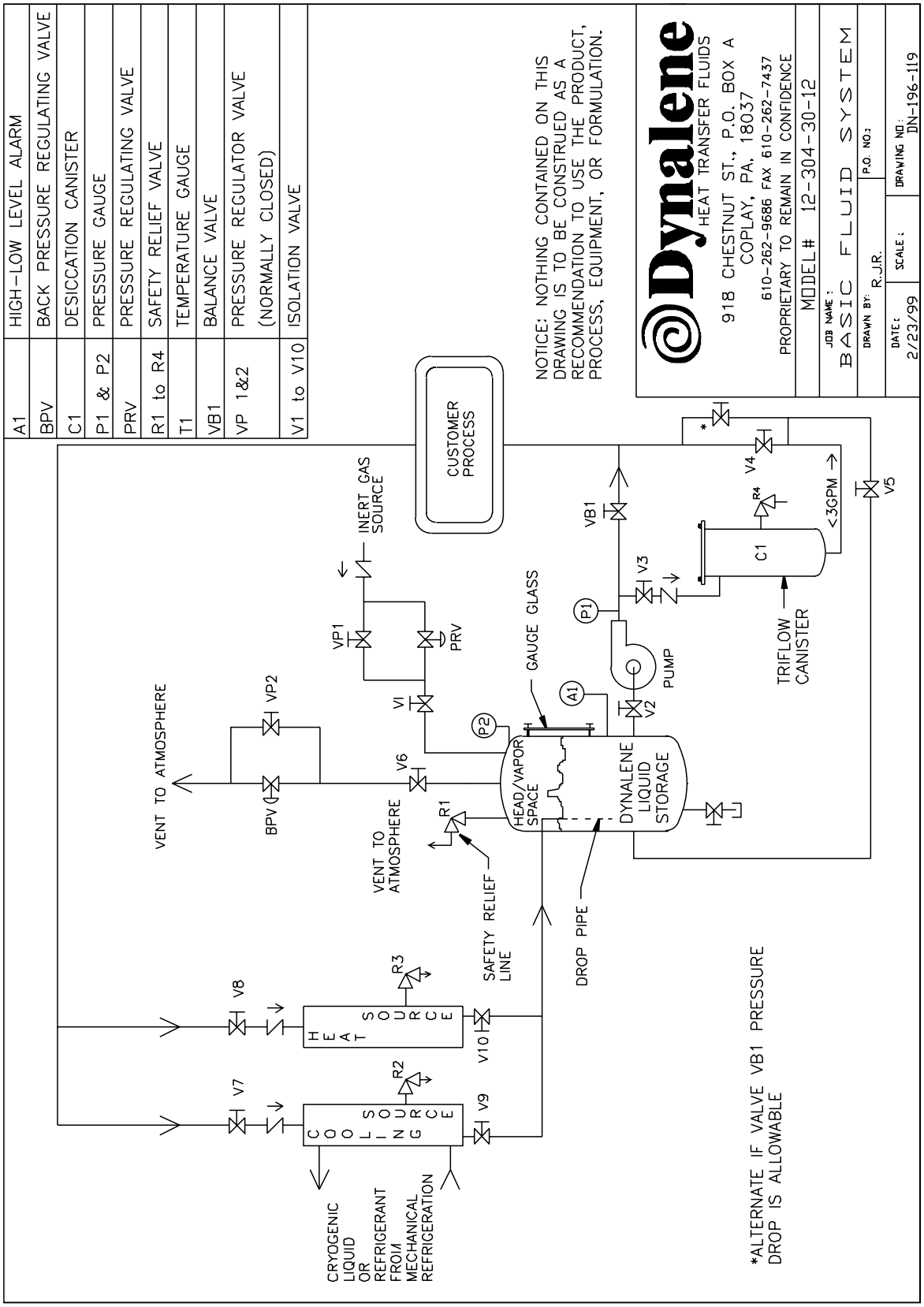
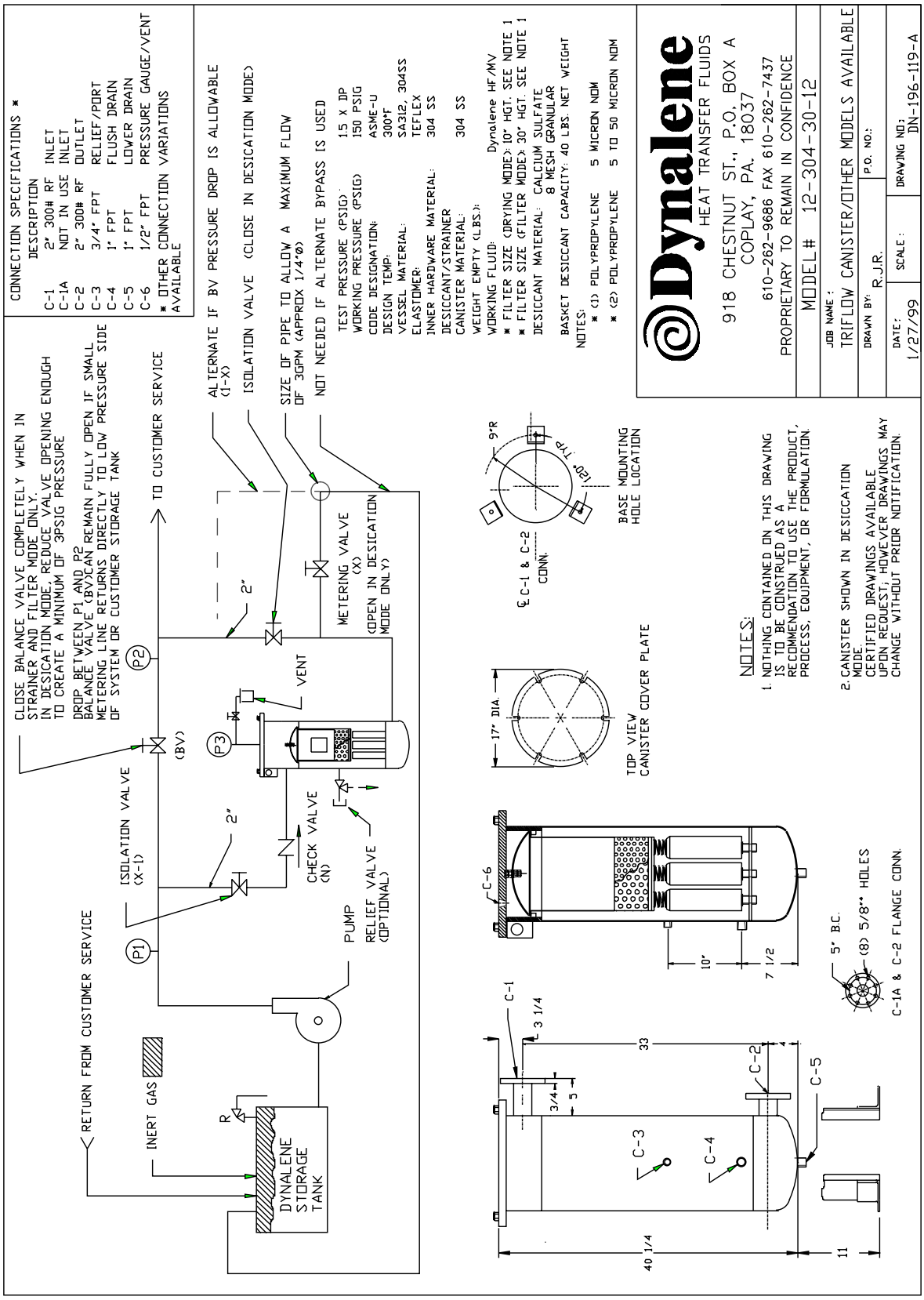
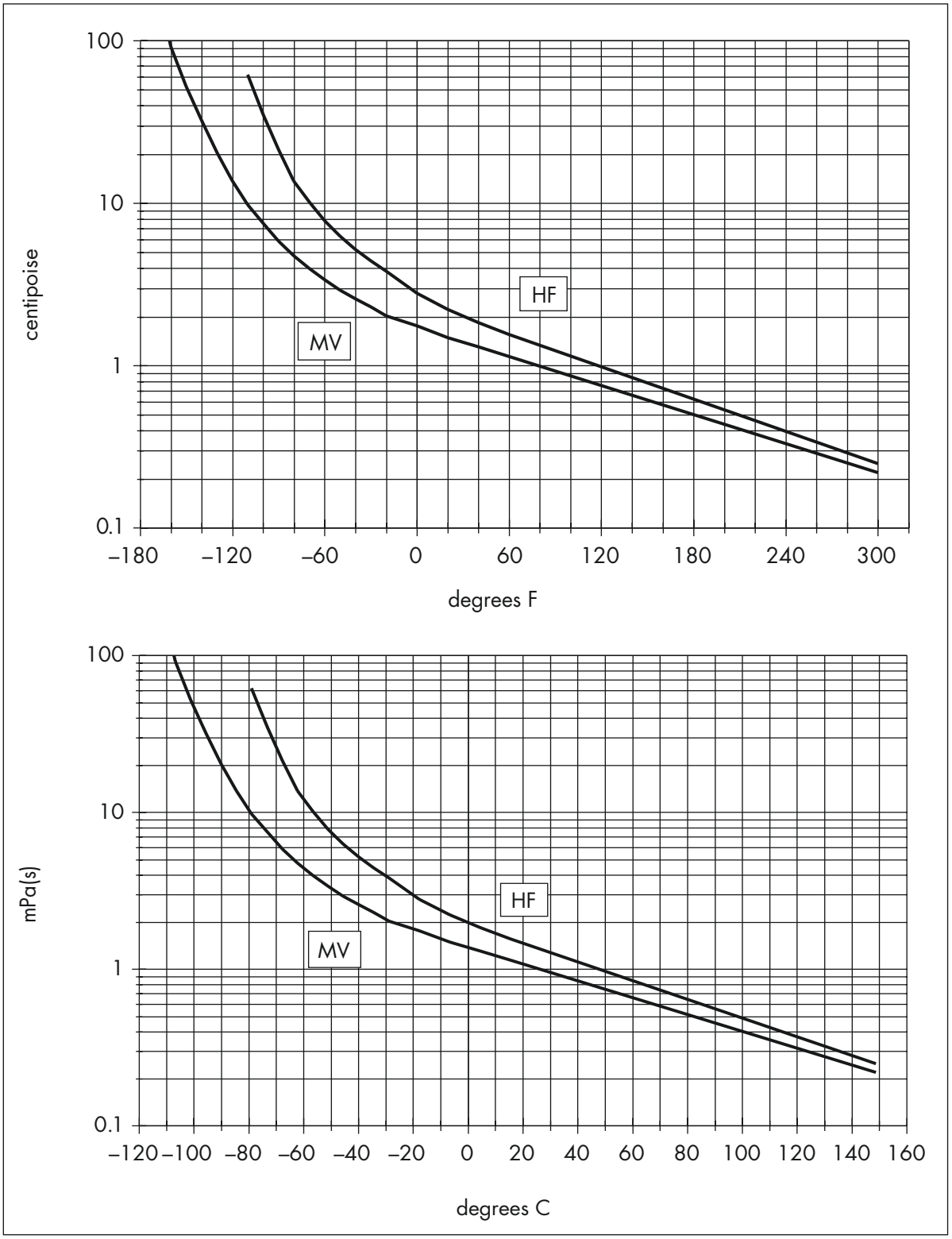


Figure 2 TriFlow Desiccation System

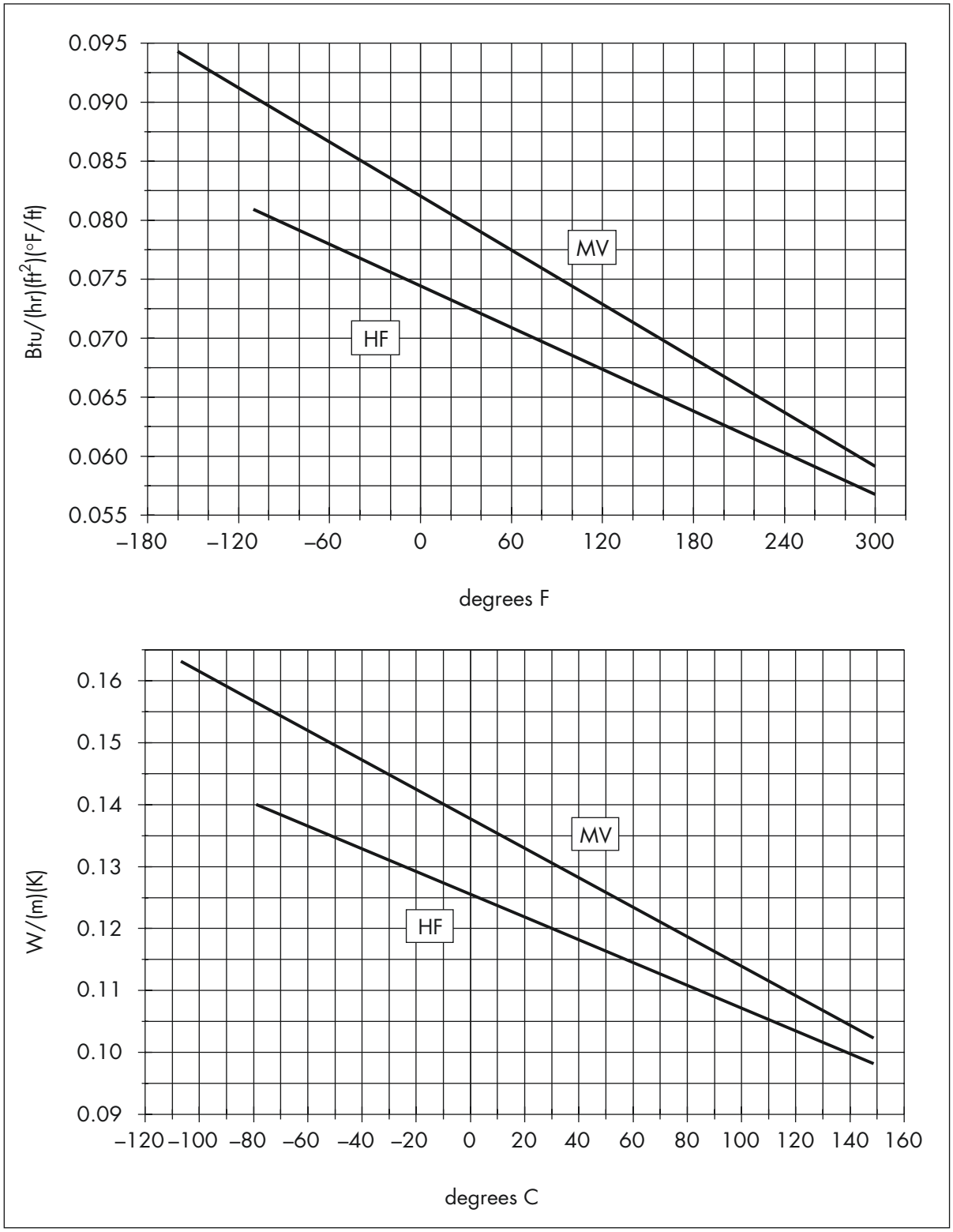


THERMOPHYSICAL PROPERTY GRAPHS OF DYNALENE HF/MV IN ENGLISH AND SI UNITS

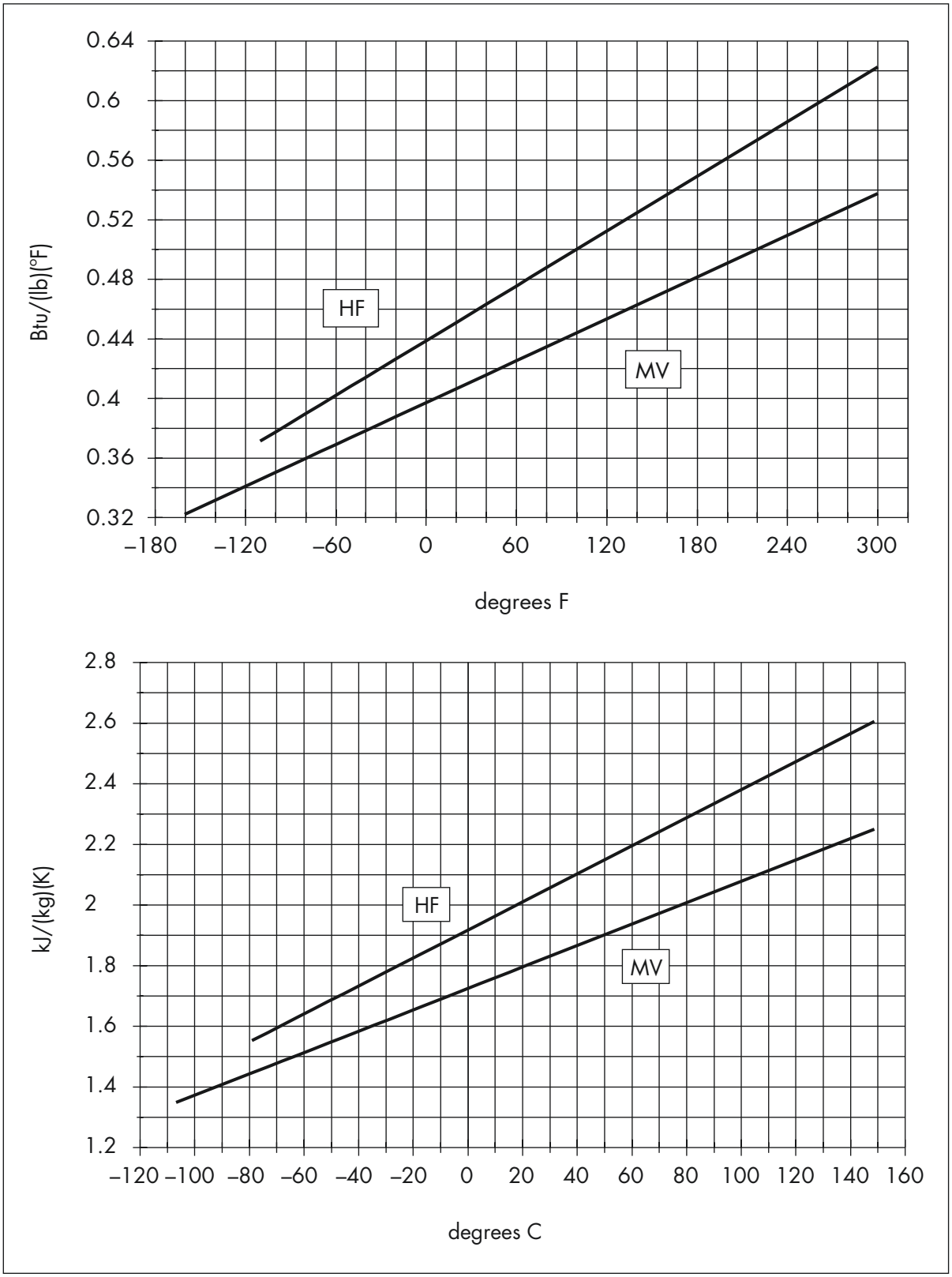
Viscosity



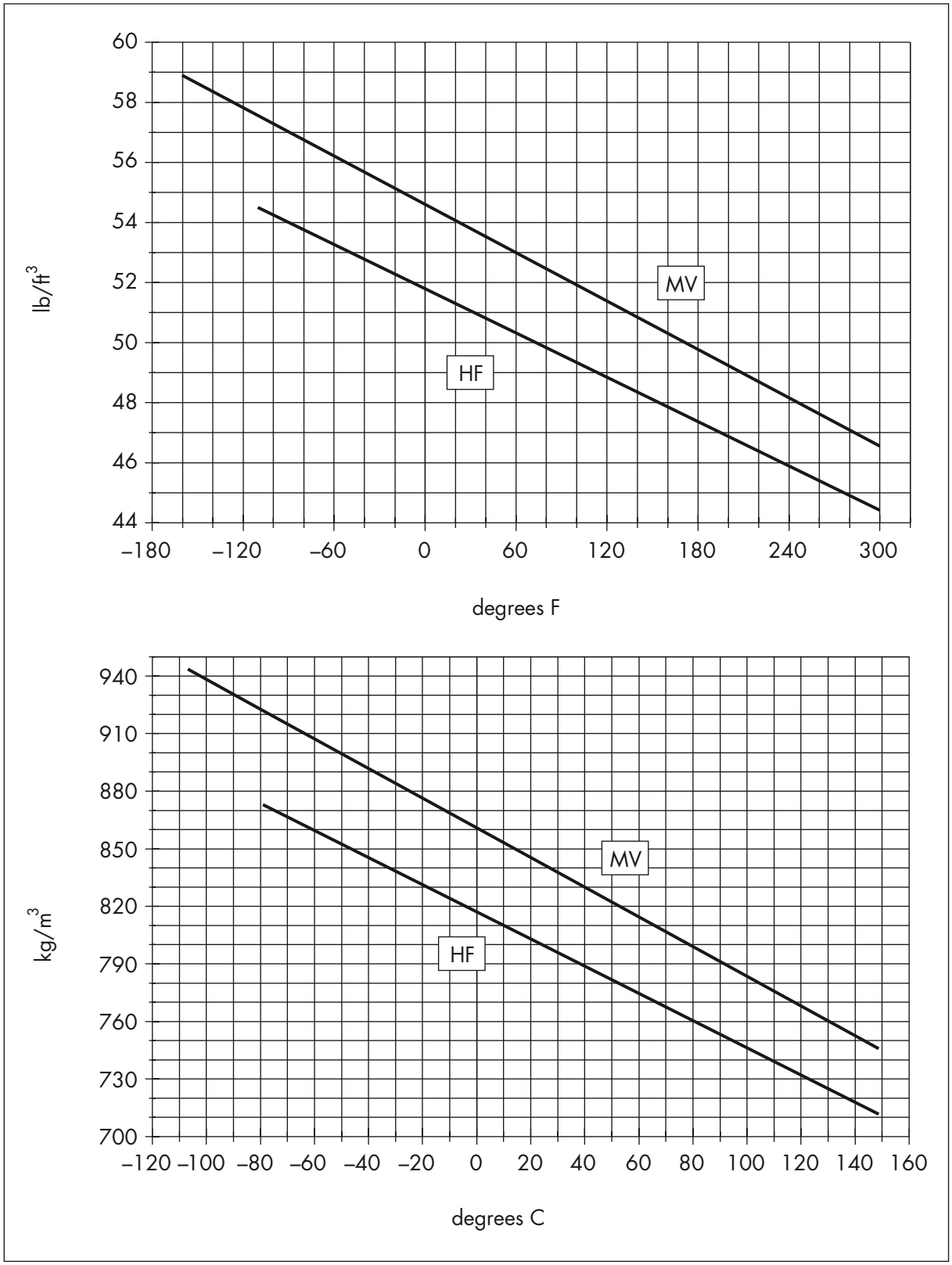
Thermal Conductivity



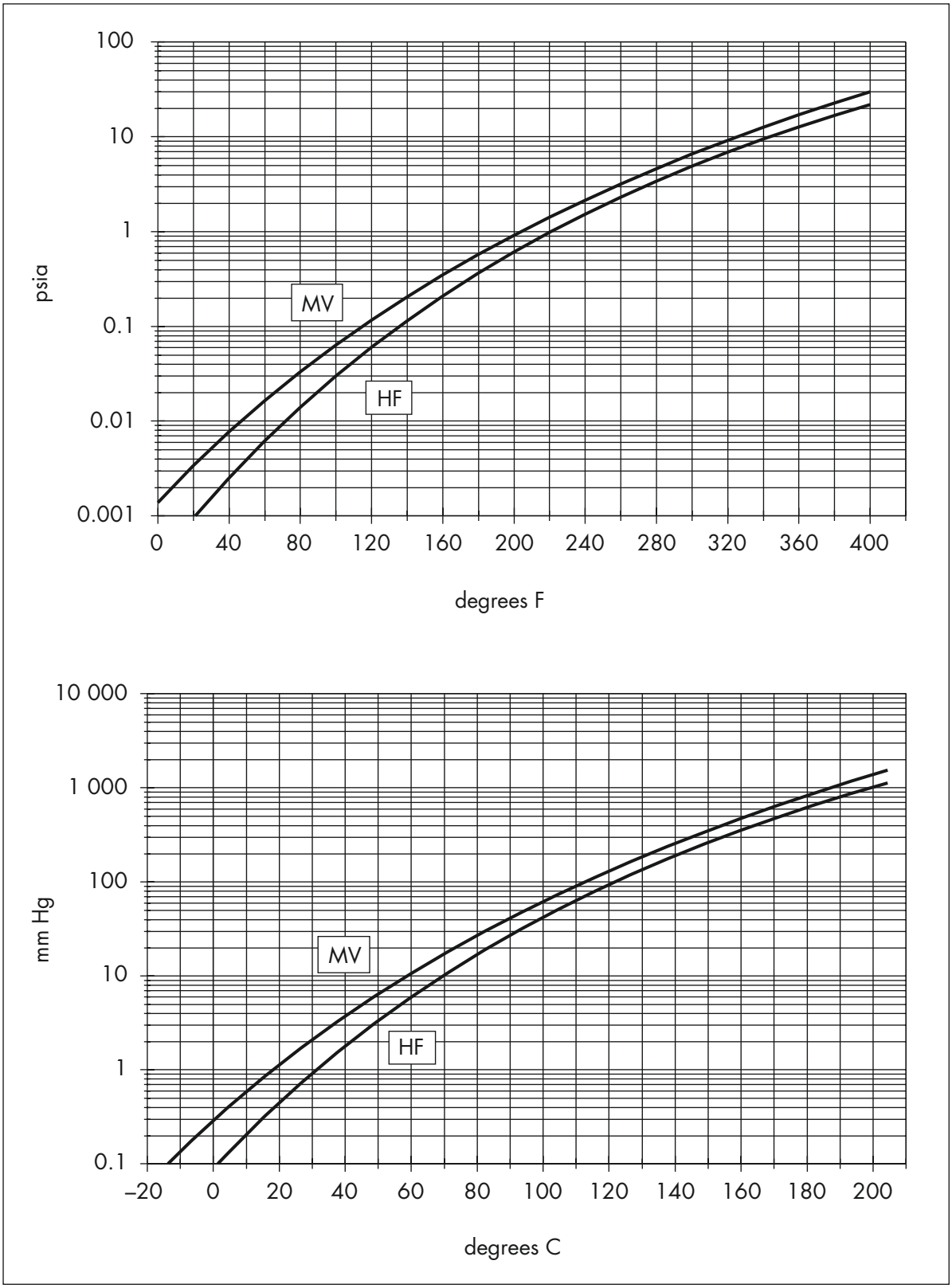
Heat Capacity



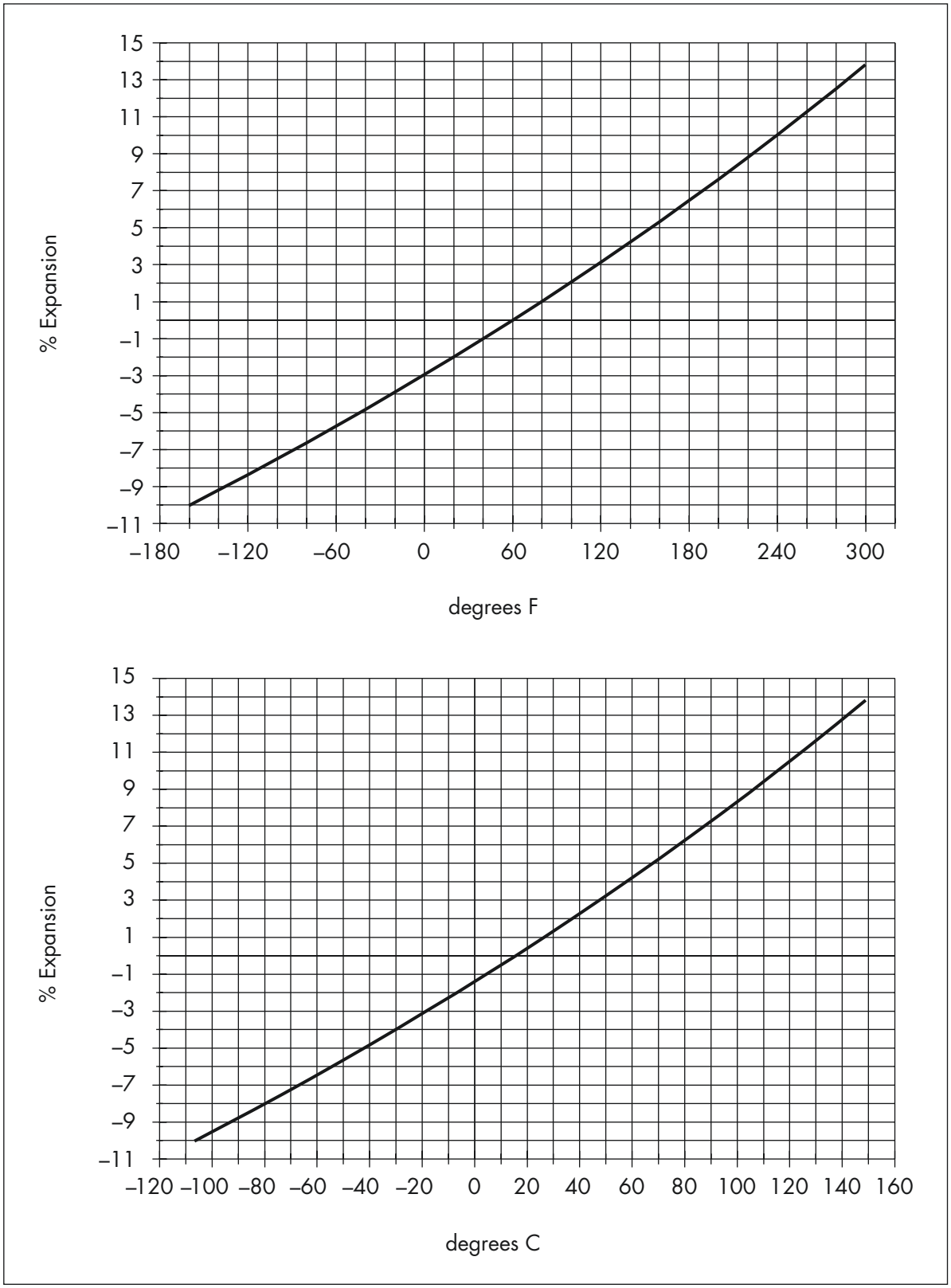
Density


lb/ft3
60
58
56
54
52
50
48
46
44
MV
HF
–180
–120
–60
0
60
120
180
240
300
degrees F
kg/m3
940
910
880
850
820
790
760
730
700
MV
HF
–120
–100
–80
–60
–40
–20
0
20
40
60
80
100
120
140
160
degrees C

Vapor Pressure



Volumetric Expansion



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DYNALENE HEAT TRANSFER FLUIDS
P.O. BOX A
Coplay, PA 18037

g:msds\loikits\reglet1.107

To Whom It May Concern:

November 10, 1997

Chemical Safety Associates (CSA) has reviewed information pertaining to the ingredients of your product, Dynalene HF, to determine the material's potential hazards and to ascertain the applicability of regulations from a variety of Federal and State Agencies. The ingredient information used for this analysis is from several sources; these sources will be listed later in this document. A change of any ingredient in Dynalene HF will void the regulatory Statements and other data contained within this document.

HAZARD EVALUATION

Health Hazard Analysis

Dynalene HF is a transparent, clear to slightly yellow liquid, which is odorless or which has a slight, hydrocarbon odor. Based on the toxicity data available for the components of Dynalene HF, the estimated toxicity is as follows: LD_{50} (oral, rat) > 5000 mg/kg[1]. Based on standard industrial hygiene criteria, as well as the toxicity classification scheme of the Chemical Hazards Response Information System, the product may be classified as practically non-toxic (based on oral exposure). Additionally, this product is not classified as a primary skin irritant by standard industrial hygiene criteria.

The estimated toxicity value and low potential for skin irritancy is comparable to that of U.S.P. White Oil, which is widely recognized as a material that presents limited health hazards and is suitable for a wide range of indirect and direct food applications (per the specifications of the Food and Drug Administration).

Flammability Hazard Analysis

This material is not flammable, per the definitions of the Federal Occupational Safety and Health Administration, the Department of Transportation, and the Consumer Product Safety Commission. However, with a flash point of 62°C (142°F), this material must be classified as combustible based on the criteria of the Agencies mentioned above.

[1] LD_{50} (oral, rat) = the dose administered orally to a population of rats which is lethal to 50 percent of the test animals. This value is used in industrial hygiene literature and Federal regulations to gauge the toxicity of compounds.

HAZARDOUS MATERIAL MANAGEMENT
HAZARDOUS WASTE DISPOSAL

INDUSTRIAL HYGIENE & MONITORING
REGULATORY, HEALTH & SAFETY CONSULTING

The autoignition temperature of Dynalene HF is relatively high [> 399°C (> 750°F)]. This autoignition temperature permits this product to be used at higher temperatures than is possible with materials having similar boiling points and lower autoignition temperatures.

Reactivity Hazard Analysis

This product is stable under normal conditions of use and handling. Oxidative breakdown is relatively slow under ambient environmental conditions. This product is compatible with most chemicals in the typical, industrial workplace; however, care should be taken to avoid contact with strong oxidizers (e.g., concentrated hydrogen peroxide, potassium permanganate).

FOOD AND DRUG ADMINISTRATION REGULATIONS

Dynalene HF is used for heat transfer operations. If used according to the manufacturer's guidelines and good manufacturing practices, Dynalene HF is not reasonably anticipated to come into contact with food or articles manufactured for food use. Subsequently, it is not specifically regulated by the Food and Drug Administration when used in the manufacture of food containers or related operations.

It is important to note that the components of this product are recognized as additives which may be directly added to food items intended for human consumption. The following regulatory information is given to provide additional background data on Dynalene HF.

FOOD ADDITIVES PERMITTED FOR DIRECT ADDITION TO FOOD FOR HUMAN CONSUMPTION - 21 CFR PART 172

The components of Dynalene HF are recognized by the Food and Drug Administration as food additives permitted for direct addition to food for human consumption. The specific sections of 21 CFR Part 172 applicable to this product are 21 CFR 172.515 (Synthetic Flavoring Substances and Adjuvants) and 21 Part 172.882 (Synthetic Isoparaffinic Petroleum Hydrocarbons).

INDIRECT FOOD ADDITIVES, ISOPARAFFINIC PETROLEUM HYDROCARBONS, SYNTHETIC - 21 CFR SECTION 178.3530

A main component of Dynalene HF has a boiling point [186°C (367°F)] within the range designated by the 21 CFR 178.3530 [93-260°C (200-500°F)]. This component also meets the above cited section's Ultraviolet Absorbance Spectrometry limits (used to gauge the purity of the material), as well as other specifications in the above cited Section, and may be used in the production of nonfood articles intended for use in producing, manufacturing, packaging, transporting, or holding food.

INDIRECT FOOD ADDITIVES, ODORLESS LIGHT PETROLEUM HYDROCARBONS - 21 CFR SECTION 178.3650

A main component of this product has a boiling point range within that designated by 21 CFR 178.3650 [300-650°C [572-1202°F]). This component also meets the above cited Section's required Ultraviolet Absorbance Spectrometry limits (used to gauge the purity of the material), as well as other specifications in the above cited Section, and may be used in the production of nonfood articles intended for use in contact with food.

ENVIRONMENTAL PROTECTION AGENCY REGULATIONS

REPORTING REQUIREMENTS of the SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT - 40 CFR PARTS 302, 355, and 372

The components of this product are not identified on the following lists: 40 CFR Table 302.4 (List of Hazardous Substances and Reportable Quantities); 40 CFR Part 355, Appendix A (The List of Extremely Hazardous Substances and Their Threshold Planning Quantities); 40 CFR 372.65 (Chemicals and Chemical Categories to which Toxic Release Reporting Requirements Apply). Subsequently, this product is not subject to the Toxic Release Inventory reporting requirements, emergency planning provisions, or other community right-to-know reporting specifications of Sections 302, 304, or 313 of the Superfund Amendments and Reauthorization Act.

RESOURCE CONSERVATION AND RECOVERY ACT - 40 CFR PARTS 260 and 261

This material is not classified as a hazardous waste under the requirements of the Resource Conservation and Recovery Act.

CLEAN AIR ACT - 40 CFR PARTS 68 and 82

Dynalene HF contains no chemical listed under Title III, Section 112(r) of the Clean Air Act [per 40 CFR 68.130 (Chemical Accident Prevention/List of Substances)]. This product also contains no components which are identified by the Environmental Protection Agency to be ozone-depleting chemicals [per 40 CFR 82, Appendices A and B (Protection of Stratospheric Ozone/Class I and Class II Controlled Substances)].

TOXIC SUBSTANCES CONTROL ACT - 40 CFR SUBCHAPTER R

The components of Dynalene HF are listed on the Toxic Substances Control Act Inventory.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS

Dynalene HF will be used by employees for a variety of indirect food processing applications. Subsequently, the following Standard is applicable.

HAZARD COMMUNICATION STANDARD - 29 CFR SECTION 1910.1200

The labels and Material Safety Data Sheets for Dynalene HF have been prepared to be fully compliant with the requirements of the Federal Hazard Communication Standard and State equivalent regulations. Furthermore, the Material Safety Data Sheet is in complete compliance with the more stringent American National Standards Institute requirements for such documents (Z400.1, 1994) and the Canadian Workplace Hazardous Materials Identification System Standards.

Hazard Communication Standard - Appendix A

Based on the toxicity data currently available for the components of this product, Dynalene HF is not corrosive, toxic, or highly toxic under the health hazards definitions of the Federal Hazard Communication Standard. Dynalene HF is not a skin irritant. Dynalene HF does not contain sensitizers (materials capable of inducing an allergy-like reaction) or carcinogens. Dynalene HF does meet the definition of a combustible liquid.

CONSUMER PRODUCT SAFETY COMMISSION REGULATIONS

Though Dynalene HF is not intended for consumer use, the regulations of the Consumer Product Safety Commission provide important criteria for gauging the potential health hazards of product.

FEDERAL HAZARDOUS SUBSTANCES ACT REGULATIONS - 16 CFR PART 1500

Based on the available toxicology information for this product and its components, this product is not classified as highly toxic, corrosive, or toxic under the regulations of the Federal Hazardous Substances Act. Dynalene HF is not a skin irritant. This product does not contain sensitizers, carcinogens, neurotoxicological toxicants (material which cause nerve damage), or developmental/reproductive toxins, as defined in the above cited Part. Dynalene HF does meet the definition of a combustible liquid.

DEPARTMENT OF TRANSPORTATION REGULATIONS

This product does not meet the Department of Transportation regulation definition of a "Flammable Liquid". However, with a flash point of 62°C (142°F), this product is classified as a "Combustible Liquid". Because of its relatively high flash point, this product may not be regulated when shipped in non-bulk packaging. The following information is applicable:

HAZARDOUS MATERIALS TRANSPORTATION ACT - 49 CFR PARTS 171-173

PROPER SHIPPING NAME: Combustible liquid, n.o.s. (Synthetic Aliphatic Hydrocarbon, Hydrotreated; Terpene-Based Hydrocarbon Compound)

HAZARD CLASS:	Combustible liquid
UN IDENTIFICATION NUMBER:	NA 1993
PACKING GROUP:	III
DOT LABEL(S) REQUIRED:	Not applicable.

NORTH AMERICAN EMERGENCY RESPONSE GUIDE NUMBER: 128

MARINE POLLUTANT: This product contains no chemicals which have been designated by the Department of Transportation to be Marine Pollutants in 49 CFR 172.101, Appendix B.

EXCEPTION FOR NON-BULK PACKAGING: Unless a shipment is being offered for transport by vessel or aircraft, there is an exception applicable to this product when shipped in non-bulk packaging [under 450L (119 gallons)]. Refer to 49 CFR 173.150 for additional information.

STATE REGULATIONS

Components of this product are not identified under the following state regulations.

GENERAL STATE STANDARDS

Alaska - Designated Toxic and Hazardous Substances
California - Permissible Exposure Limits for Chemical Contaminants
Florida - Substance List
Illinois - Toxic Substance List
Kansas - Section 302/313 List
Massachusetts - Substance List
Michigan - Critical Materials Register
Minnesota - List of Hazardous Substances
Missouri - Employer Information/Toxic Substance List
North Dakota - List of Hazardous Chemicals, Reportable Quantities
Pennsylvania - Hazardous Substance List
Rhode Island - Hazardous Substance List
Texas - Hazardous Substance List
West Virginia - Hazardous Substance List
Wisconsin - Toxic and Hazardous Substances

Dynalene HEAT TRANSFER FLUIDS

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	**DYNALENE HF®**
CHEMICAL NAME/CLASS:	Heat Transfer Fluid
SYNONYMS:	Mixture; None applicable.
DISTRIBUTOR'S NAME:	**Loikits Technologies, Inc.**
ADDRESS:	5250 West Coplay Road Whitehall, PA 18052
EMERGENCY PHONE:	800/424-9300 (CHEMTREC)
BUSINESS PHONE:	(610) 262-3681
DATE OF PREPARATION:	March 16, 1999 (Rev. 2)

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% v/v	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV mg/m³	STEL mg/m³	PEL mg/m³	STEL mg/m³	IDLH mg/m³	OTHER mg/m³
Aliphatic Hydrocarbons	Proprietary	< 50%	NE	NE	NE	NE	NE	Manufacturer recommends 300 ppm based on composition.
Diluent	Proprietary	< 50%	NE	NE	NE	NE	NE	NE
Inhibitor Solution		Balance	None of the other ingredients has established exposure limits or contributes any significant, additional hazard to this product. All pertinent hazard information has been provided in this Material Safety Data Sheet, per the requirements of the Federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Level See Section 16 for Definitions of Terms Used.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format. Compounds in this product are listed as proprietary; however, all pertinent hazard information has been provided in this Material Safety Data Sheet, per the requirements of the Federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear, colorless, to slightly yellow, combustible liquid, with a mild, hydrocarbon odor. Vapors and mists from this product may be irritating, if inhaled. The product can be irritating to contaminated skin or eyes. The product will ignite and burn at elevated temperatures in the presence of an ignition source. If involved in a fire, this liquid will release toxic gases (i.e. carbon monoxide and carbon dioxide). This product is not reactive under typical emergency response conditions. Emergency responders must wear proper personal protective equipment and have adequate fire protection for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of exposure to this product are by inhalation of mists or vapors generated by the product and contact with the skin and eyes.

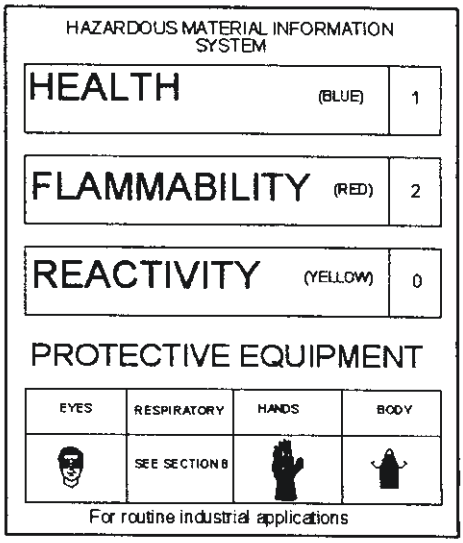
INHALATION: Inhalation of the mists or vapors of this product can be irritating to the nose, throat, mucous membranes, and other tissues of the respiratory system. Additionally, inhalation of large quantities of this product's vapors, mists or sprays (such as may occur in an enclosed or poorly ventilated area) may cause central nervous system depression. Symptoms of such over-exposure can include headache, nausea, dizziness, drowsiness confusion. Severe inhalation over-exposure can result in unconsciousness and possibly death.

CONTACT WITH SKIN or EYES: This liquid may cause local redness or irritation of the skin following prolonged exposure. Repeated or prolonged exposure may lead to dermatitis (red, inflamed skin). Contact with the eyes will cause irritation and possibly burning, which is generally alleviated when the product is rinsed from the eyes.

SKIN ABSORPTION: Skin absorption is not known to be a potential route of over-exposure for the components of this product.

INGESTION: Ingestion of this product, while not likely to occur in an industrial setting, may cause irritation of the mouth and throat, gastric upset, nausea and vomiting. Additionally, aspiration of this product can result in severe, life-threatening lung damage.

INJECTION: Though not an expected route of occupational exposure for this product, injection (via punctures or lacerations in the skin) may cause local reddening, tissue swelling and discomfort.



HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Symptoms associated with over-exposure to this product are as follows:

ACUTE: The chief health hazards associated with this product would be the potential for irritation of contaminated skin and eyes, and central nervous system effects after inhalation exposures. Severe inhalation over-exposures can be fatal. Ingestion may cause gastric distress and lung damage as a result of aspiration.

CHRONIC: Prolonged or repeated skin exposures can lead to dermatitis (dry, chapped skin). Refer to Section 11 (Toxicological Information) for additional information.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water; use soap if available. Remove exposed or contaminated clothing, taking care not to contaminate eyes. The minimum recommended flushing time is 15 minutes. Contaminated individual should seek medical attention, especially if irritation or redness develops.

EYE EXPOSURE: If the product enters the eyes, open victim's eyes while under gentle running water. Use sufficient force

4. FIRST-AID MEASURES (Continued)

to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Contaminated individual should seek immediate medical attention, especially if symptoms persist.

INHALATION: If vapors or mists of the product are inhaled, remove victim to fresh air. If necessary, use artificial respiration if breathing stops. If breathing is difficult, seek medical attention.

INGESTION: If the product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

5. FIRE-FIGHTING MEASURES

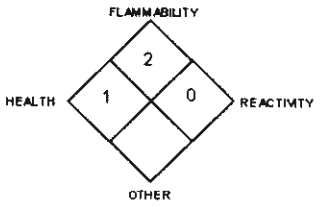
FLASH POINT, °C (method): >60°C (140°F) (Closed Cup)

AUTOIGNITION TEMPERATURE, °C: Not available.

FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not available.
Upper (UEL): Not available.

FIRE EXTINGUISHING MATERIALS:
Water Spray: YES (cooling only) Carbon Dioxide: YES Foam: YES
Dry Chemical: YES Halon: YES Other: Any "B" Class

NFPA RATING



UNUSUAL FIRE AND EXPLOSION HAZARDS: This is a Class II combustible liquid. The vapors of this product may travel a considerable distance to a source of ignition and flash back to a leak or open container. This product can float on water and may travel to distant locations and/or spread fire. When involved in a fire, this material may decompose and produce irritating vapors, toxic gases (e.g., oxides of carbon), soot, and smoke. This product's vapors can accumulate in confined spaces, resulting in a toxicity and flammability hazard.

Explosion Sensitivity to Mechanical Impact: Not sensitive
Explosion Sensitivity to Static Discharge: This product may be ignited by static discharge, especially if heated.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Stop leak before attempting to put out fire. If the leak cannot be stopped, and there is no risk to surrounding area, let the fire burn itself out. If the flames are extinguished without stopping the leak, vapors could re-ignite. Evacuate area and fight fire from a safe distance or a protected location. Move fire exposed containers if it can be done without risk to fire-fighters. Isolate materials not yet involved in fire and protect personnel. If a leak or spill has not ignited, use water spray in large quantities to disperse the vapors and to protect personnel attempting to stop a leak. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally areas. Decontaminate fire-response equipment with soap and water solution if necessary.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Eliminate sources of ignition. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

In the event of a non-incidental release, use non-sparking tools and have adequate fire protection. The minimum Personal Protective Equipment should be: **chemical resistant gloves, (such as nitrile, polyvinyl alcohol or Viton™), rubber apron or other chemically resistant suit, and boots, hard-hat, and if vapors are high, use a NIOSH approved organic vapor respirator.** Absorb spilled liquid with polypads or other suitable absorbent materials. Decontaminate the area thoroughly. If necessary, decontaminate spill response equipment with soap and water solution. Place all spill residue in a suitable container and seal. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations)

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Use in a well-ventilated location. Do not eat or drink while handling this material. Use ventilation and other engineering controls to minimize potential exposure to the aerosol, sprays and vapors of this product.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Use non-sparking tools. Liquid will accumulate static charge. Electrically ground and bond all containers during transfer of this product. Do not expose empty drums or other empty containers of this product to any source of ignition. Open containers slowly, on a stable surface. Drums and other containers of this product should be properly labeled. Empty containers may contain residual amounts of this product, therefore, empty containers should be handled with care. Do not cut, weld or solder any empty container which has contained this product.

Store containers in a cool, dry, well ventilated location, away from direct sunlight, or sources of intense heat. Keep containers away from incompatible chemicals (See Section 10, Stability and Reactivity). Keep drums and other containers of this product tightly closed when not in use. Dispose of oil-soaked combustible materials (i.e. paper, rags) in containers approved for flammable wastes. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients). Use a non-sparking , grounded ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside, taking necessary environmental precautions. Prudent practice is to ensure eyewash/safety shower stations are available near areas where this product is used. In confined spaces, mechanical ventilation and proper monitoring should be done.

RESPIRATORY PROTECTION: None needed for normal circumstances of use. Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.

EYE PROTECTION: Splash goggles or safety glasses.

HAND PROTECTION: Wear nitrile, polyvinyl alcohol or Viton™ gloves for routine industrial use and spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

BODY PROTECTION: Use body protection appropriate for task.

PERSONAL PROTECTIVE EQUIPMENT LEVEL: C

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not available.
EVAPORATION RATE (n-BuAc=1): Not available.
SPECIFIC GRAVITY (water = 1): < 1
FREEZING/MELTING POINT or RANGE: <-112.2°C <(-170°F)
SOLUBILITY IN WATER: <1%, Practically insoluble.
BOILING POINT: 186°C (367°F)
VAPOR PRESSURE, mm Hg @ 20 °C: < 2
pH: Not applicable.
ODOR THRESHOLD: Not available.
COEFFICIENT WATER/OIL DISTRIBUTION: Not available.

APPEARANCE AND COLOR: This product is a clear, colorless, to slightly yellow liquid, with a mild, hydrocarbon odor.
HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance and odor may act as distinguishing characteristics of this product.

10. STABILITY and REACTIVITY

STABILITY: Stable

DECOMPOSITION PRODUCTS: Ignition of this product can produce carbon dioxide, carbon monoxide, and other organic decomposition products.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with strong oxidizers, exposure to excessive heat, or to sparks, flame, or other ignition sources.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Additional toxicology information for components greater than 1 percent in concentration is provided below.

ALIPHATIC HYDROCARBON: No toxicology data are currently available for this component of the product.

DILUENT:
Oral-Rat LD_{50}: 4390 mg/kg

SUSPECTED CANCER AGENT: The ingredients of this product are not listed on the following lists: FEDERAL OSHA Z LIST, NTP, IARC or CAL/OSHA, and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Repeated or prolonged exposure to this product may cause irritation to contaminated tissues.

SENSITIZATION TO THE PRODUCT: No components of this product are reported to be sensitizers

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans.
Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.
Teratogenicity: This product is not reported to cause teratogenic effects in humans.
Reproductive Toxicity: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis and other skin disorders may be aggravated by skin contact with this product. Inhalation over-exposures may aggravated respiratory and central nervous system conditions.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce exposures.

BIOLOGICAL EXPOSURE INDICES: Currently, there are no Biological Indices (BEIs) associated with the components of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product will be degraded over time into other organic compounds.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful to contaminated plant and animal life (especially if large quantities are released). Refer to Section 11 (Toxicological Information) for specific information regarding effects of this product's components on test animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may be harmful to aquatic life if large quantities are released into bodies of water. This product will float on water and will cut-off oxygenation of bodies of water, contributing to aquatictoxicity.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: D001, applicable to wastes consisting only of this product.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Combustible liquid, n.o.s .
HAZARD CLASS NUMBER and DESCRIPTION:	(Combustible)
UN IDENTIFICATION NUMBER:	NA 1993
PACKING GROUP:	III
DOT LABEL(S) REQUIRED:	None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER(1996): 128

NOTE: Refer to 49 CFR 173.150(f) for exceptions applicable to combustible liquids shipped in non-bulk packaging [under 450L (119 gallons)].

MARINE POLLUTANT: No component of this product is classified as a Marine Pollutant, as per Appendix B to 49 CFR 172.101.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows.

COMPOUND	SECTION 302	SECTION 304	SECTION 313
Aliphatic Hydrocarbon	NO	NO	NO
Diluent	NO	NO	NO

SARA THRESHOLD PLANNING QUANTITY: Not applicable.

TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER FEDERAL REGULATIONS: Not applicable.

STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: No.
Florida - Substance List: No.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: No.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Diluent.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: No.
Rhode Island - Hazardous Substance List: No.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA PROPOSITION 65: No component of this solution is on the California Proposition 65 lists.

15. REGULATORY INFORMATION (Continued)

LABELING (Precautionary Statements): **CAUTION!** COMBUSTIBLE LIQUID AND VAPORS. FLASH POINT = 62°C (142°F). MAY CAUSE SKIN AND EYE IRRITATION. HARMFUL IF INHALED. CAN CAUSE CENTRAL NERVOUS SYSTEM EFFECTS. HARMFUL IF SWALLOWED-ASPIRATION HAZARD. Avoid breathing vapors, mists or sprays. Avoid prolonged contact with skin. Do not get on skin or in eyes. Keep away from heat, sparks and flame. Use non-sparking tools. Keep container closed. Use only with adequate ventilation. Wash throughly after handling. Wear gloves, safety goggles, and appropriate body protection when using this product. Use gloves and safety goggles and appropriate body protection. FIRST-AID: In case of contact, immediately flush skin or eyes for at least 15 minutes. If inhaled, move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, do not induce vomiting. Get medical attention. IN CASE OF FIRE: Use water fog, foam, dry chemical of CO_2. IN CASE OF SPILL: Absorb with inert material and place in suitable container. Flush area with water. Refer to MSDS for additional information.

TARGET ORGANS: Skin, eyes, respiratory system, central nervous system.

WHMIS SYMBOLS: **B3**: Flammable and combustible materials/ Combustible liquid

16. OTHER INFORMATION

Date of Printing: March 16, 1999

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Loikits assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Loikits assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - this exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL", is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

FLAMMABILITY LIMITS IN AIR

Much of the information related to fire and explosion is derived from the **N**ational **F**ire **P**rotection **A**ssociation (**NFPA**). LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL -the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

REGULATORY INFORMATION

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and Transport Canada, respectively. The following laws are pertinent to the information presented in the MSDS: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund).** This section also includes information on the precautionary warnings which appear on the material's package label.

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): **DYNALENE MV®**

CHEMICAL NAME/CLASS: Heat Transfer Fluid
SYNONYMS: Mixture; None applicable.

DISTRIBUTOR'S NAME: **Loikits Technologies, Inc.**
ADDRESS: 5250 West Coplay Road
Whitehall, PA 18052
EMERGENCY PHONE: 800/424-9300 (CHEMTREC)
BUSINESS PHONE: (610) 262-3681

DATE OF PREPARATION: March 23, 1999

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% v/v	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Aromatic Hydrocarbon	Proprietary		NE	NE	NE	NE	NE	NE
Diluent	Proprietary		NE	NE	NE	NE	NE	NE
Non-Hazardous Ingredients, per 29 CFR 1910.1200. These ingredients are each less than one percent in concentration and do not contribute significantly to the hazards associated with this product.		< 1%	NE	NE	NE	NE	NE	NE

NE = Not Established C = Ceiling Level See Section 16 for Definitions of Terms Used.
NOTE (1): All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

Note (2): All hazard information pertinent to the proprietary compounds has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear, colorless, combustible liquid, with a strong aromatic hydrocarbon odor. The product will ignite and burn at elevated temperature in the presence of an ignition source. Vapors and mists from this product may be irritating, if inhaled. In the event of an emergency involving this product, it must be treated as a combustible liquid. Emergency responders must wear proper personal protective equipment and have adequate fire protection since toxic fumes are released in a fire situation.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: This product is slightly to moderately toxic by ingestion and mildly toxic by inhalation and skin contact. The strong aromatic and citric odor may be objectionable, but is not considered toxic. Symptoms of over-exposure may include dizziness, drowsiness, gastric upset, and nausea.

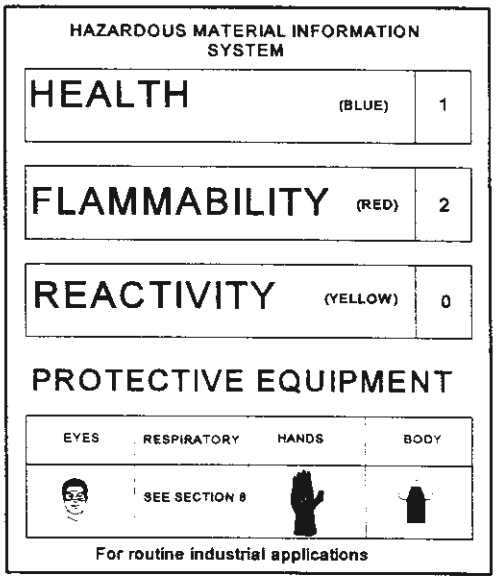
INHALATION: Mild respiratory irritation may occur after inhalation of the mists or vapors of this product, with coughing and possible breathing difficulty. Most complaints of over-exposure are derived from the strong odor, rather than from systemic or local toxicity. High dose over-exposure may cause central nervous system depression symptoms, such as drowsiness, dizziness, nausea, vomiting, excitability, narcosis, and at very high concentration, unconsciousness or death.

CONTACT WITH SKIN or EYES: This liquid may cause local redness or irritation of the skin following prolonged exposure. Contact with the eyes will cause irritation and burning, which will be resolved when the product is rinsed from the eyes.

SKIN ABSORPTION: The aromatic hydrocarbon compound is reported to enter the body via absorption through the skin. Symptoms such as those listed above for "Inhalation Over-exposure", as well as gastric upset and nausea may occur.

INGESTION: Ingestion of this product, while not likely in an industrial setting, may cause irritation of the mouth and throat, gastric upset and nausea. Vomiting may occur. Aspiration may cause chemical pneumonia and lung damage.

INJECTION: Accidental injection of this product may cause local irritation and redness.



HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. This product is generally low risk for possible health hazards.

ACUTE: Very high over-exposure by inhalation of vapors or mists may cause respiratory irritation, drowsiness, and dizziness. Ingestion may cause an upset stomach and vomiting. Contact with the skin may be mildly irritating. If the liquid, vapors, or mist contacts the eyes, irritation may occur.
CHRONIC: Prolonged over-exposure may cause liver or kidney damage. This product is not known to cause any specific chronic illnesses.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product is spilled on the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. The minimum recommended flushing time is 15 minutes; use soap if available.. Victims should seek medical attention, especially if irritation or redness develops.

4. FIRST-AID MEASURES (Continued)

EYE EXPOSURE: **Immediately flush victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. If irritation develops, seek medical attention.**

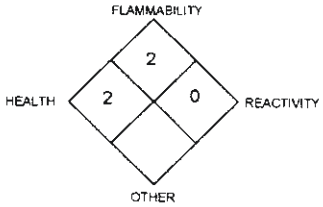
INHALATION: If mist or vapors of the product are inhaled, remove victim to fresh air. If not breathing, begin artificial respiration.

INGESTION: If chemical is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

Victims of chemical exposure should be taken for medical attention. Take copy of label and MSDS to physician or health professional with victim.

5. FIRE-FIGHTING MEASURES

NFPA RATING



FLASH POINT, °C (method): 53 °C (127 °F) (Tag Closed Cup); >61 °C (>142 °F)(Tag Open Cup)

AUTOIGNITION TEMPERATURE, °C: 388 °C (730 °F) (ASTM E659)

FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): 0.9
Upper (UEL): 6.5

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES (cooling only) Carbon Dioxide: YES Foam: YES
Dry Chemical: YES Halon: YES Other: Any "B" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This is a combustible liquid. When involved in a fire, this material may decompose and produce irritating fumes and toxic gases including oxides of carbon and heavy, black soot and smoke.

Explosion Sensitivity to Mechanical Impact: Not sensitive
Explosion Sensitivity to Static Discharge: This product may be ignited by static discharge, especially if heated.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear positive pressure Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: In case of a spill, clear the affected area, protect people, and respond with trained personnel. Clean-up small spills (5 gallons or less) promptly. Wear safety glasses, Viton™, Silver Shield™, or Nitrile Rubber gloves, apron or other equivalent body protection, and full work shoes. Use an air purifying respirator, consistent with the recommendations in Section 8 (Exposure Controls - Personal Protection).
For large spills (greater than 5 gallons), the minimum Personal Protective Equipment should be: **Chemical resistant gloves (Nitrile Rubber over Viton™ or othter suitable resistant gloves), chemically resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus.** Absorb spilled liquid with polypads or other suitable absorbent materials. Decontaminate the area thoroughly. Place all spill residue in a double plastic bag and seal. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).
Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used.

PROTECT THE ENVIRONMENT: This product may float on water. Measures should be taken to limit runoff onto soil, waterways, or sewer.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash hands after handling this product. Do not eat or drink while handling this product.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by this product. Use only with adequate local ventilation to ensure vapor concentrations are below the applicable guidelines listed in Section 2 (Commotion and Information on Ingredients) and that flammable concentrations of vapors do not accumulate. Open containers slowly, on a stable surface. Wash thoroughly after using this material.

Inspect containers to ensure proper labeling and good condition before storage or use. Store containers in a cool, dry location, away from direct sunlight, or sources of intense heat. Keep containers away from incompatible chemicals. Keep container tightly closed when not in use. Vapors from this product are heavier than air and may travel long distances to an ignition source and flashback. Empty containers may contain ignitable vapors, and may explode, if subject to a cutting torch. Containers in storage and in use must be properly grounded and bonded. Check grounding and bonding periodically for continuity.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside. Provide sufficient ventilation to prevent employee discomfort from the strong aromatic odor of this product.
RESPIRATORY PROTECTION: None needed for normal circumstances of use. Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.
EYE PROTECTION: Splash goggles or safety glasses.
HAND PROTECTION: Wear Viton™, Silver Shield™, or Nitrile Rubber gloves for routine industrial use. Use Nitrile Rubber over Viton™ or other suitable resistant gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.
BODY PROTECTION: Use body protection appropriate for task.
PERSONAL PROTECTIVE EQUIPMENT LEVEL: C

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): 4.5
SPECIFIC GRAVITY (water = 1): 0.85
SOLUBILITY IN WATER: Negligible.
VAPOR PRESSURE, mm Hg @ 25 °C: 1.9
ODOR THRESHOLD: Not determined.
EVAPORATION RATE (n-BuAc=1): < 1
FREEZING/MELTING POINT or RANGE: < - 118°C (< -180 °F)
BOILING POINT: 176 - 179°C (348-354°F)
pH: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not available.
APPEARANCE AND COLOR: Clear, colorless, liquid. Appearance and color may be altered, if a dye is added to satisfy vendor or customer requirements.
HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance and the strong hydrocarbon odor are characteristic of this product.

10. STABILITY and REACTIVITY

STABILITY: Stable

DECOMPOSITION PRODUCTS: Carbon dioxide, carbon monoxide. Containers should be handled appropriately because of the possibility of explosion or fire. For additional information, call the Dynalene Engineering Department, at (610) 262-9686.

10. STABILITY AND REACTIVITY (Continued)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: **Strong oxidizers.**

HAZARDOUS POLYMERIZATION: **Will not occur.**

CONDITIONS TO AVOID: Contact with strong oxidizers, exposure to excessive heat, or to sparks, flame, static charges, or other ignition sources.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Additional toxicology information for components greater than 1 percent in concentration is provided below.

Aromatic Hydrocarbon:
Skin Irritancy (rabbit) 100% Moderate reaction.
Eye Irritancy (rabbit) 88 mg. Mild reaction.
LD_{50} (oral-rabbit) = 3 gm/kg
LD_{50} (oral-mammal) = 6200 mg/kg
LD_{50} (rat) = 2520-5000 mg/kg

Diluent:
TDLo (oral-rat) 20083 mg/kg. Reproductive effects.
TDLo (oral-rat) 20083 mg/kg. Teratogenic effects.
TDLo (oral-mouse) 67000 mg/kg. Experimental teratogenic effects.
LD_{50} (oral-rat) = 4400 mg/kg
LD_{50} (intraperitoneal-rat) = 3600 mg/kg
LD_{50} (intravenous-rat) =110 mg/kg
LD_{50} (oral-mouse) = 5600 mg/kg
LD_{50} (intraperitoneal-mouse) = 600 mg/kg
LD_{50} (intraduodanol-mouse) = 1000 mg/kg

SUSPECTED CANCER AGENT: This product's ingredients are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore is not considered to be, nor suspected to cancer causing agents by these agencies.
IRRITANCY OF PRODUCT: This product is a mild skin and eye irritant.
SENSITIZATION TO THE PRODUCT: This product is not known to cause sensitization.
BIOLOGICAL EXPOSURE INDICES: Not applicable.
REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: The components of this product are not known to cause mutagenic effects.
Embryotoxicity: This product is not reported to produce embryotoxic effects in humans, see the following paragraph for additional information.
Teratogenicity: The diluent component of this product has been shown to cause teratogenic effects in laboratory animals at very high doses.
Reproductive Toxicity: The diluent component of this product has been shown to cause reproductive toxicity in laboratory animals at very high doses.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, kidney, liver, and respiratory disorders may be aggravated by over-exposure to this product.
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce exposures. No Biological Indices currently exist for the components of this product.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: If the aromatic hydrocarbon compound or diluent are released into the soil, they will be volatilized near the surface or will leach to the groundwater. The aromatic hydrocarbon compound or diluent will be biodegraded in aerobic environments. The half-life of the components of this product in water is estimated to be relatively short. This product is not expected to adsorb to sediment

12. ECOLOGICAL INFORMATION (CONTINUED)

nor bioconcentrate in aquatic organisms.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: While no specific data exist related to the effect of this product on plants or animals, it is expected to cause effects similar to those described for humans. Vegetation may be severely stressed, due to the oily nature of this product.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product will float on water and will cut-off oxygenation of bodies of water, contributing to aquatic toxicity.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This chemical, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION WHEN SHIPPED BY AIR, VESSEL, OR IN BULK HIGHWAY or RAIL CONTAINERS (> 110 gallons).

PROPER SHIPPING NAME:	Dynalene MV™ (Diethylbenzene solution)
HAZARD CLASS NUMBER and DESCRIPTION:	3 (Flammable Liquid)
UN IDENTIFICATION NUMBER:	UN 2049
PACKING GROUP:	III
DOT LABEL(S) REQUIRED:	Flammable Liquid

NOTE: The bulk packaging requirements of 49 CFR 173.241 are applicable.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER(1996): 130
MARINE POLLUTANT: Diethylbenzene is classified as a Marine Pollutant, as listed in Appendix B to 49 CFR 172.101.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS.

PROPER SHIPPING NAME:	Dynalene MV™ (Diethylbenzene solution)
HAZARD CLASS NUMBER and DESCRIPTION:	3(Flammable liquid)
UN IDENTIFICATION NUMBER:	UN 2049
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DOT LABEL(S) REQUIRED:	Flammable liquid

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER(1996): 130

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows.

COMPOUND	SECTION 302	SECTION 304	SECTION 313
Aromatic Hydrocarbon	NO	NO	NO
Diluent	NO	NO	NO

SARA Threshold Planning Quantity: Not applicable.
TSCA INVENTORY STATUS: The chemicals in this product are not listed on the TSCA Inventory.
CERCLA REPORTABLE QUANTITY (RQ): Not applicable
OTHER FEDERAL REGULATIONS: No special regulations are applicable.
STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: NO
California - Permissible Exposure Limits for Chemical Contaminants: NO
Florida - Substance List: NO
Illinois - Toxic Substance List: NO
Kansas - Section 302/313 List: NO
Massachusetts - Substance List: NO
Minnesota - List of Hazardous Substances: NO
Missouri - Employer Information/Toxic Substance List: NO
New Jersey - Right to Know Hazardous Substance List: NO
North Dakota - List of Hazardous Chemicals, Reportable Quantities: NO
Pennsylvania - Hazardous Substance List: NO
Rhode Island - Hazardous Substance List: NO
Texas - Hazardous Substance List: NO
West Virginia - Hazardous Substance List: NO
Wisconsin - Toxic and Hazardous Substances: NO

CALIFORNIA PROPOSITION 65: No component of this solution is on the California Proposition 65 lists.

LABELING (Precautionary Statements): WARNING! Combustible liquid. Vapors are heavier than air and may travel a long distance to an ignition source and flashback, causing a fire or explosion. Harmful by irritation if in contact with skin, or eyes. Harmful if swallowed. Irritating to eyes, skin, and respiratory system. Keep away from heat, sparks, and sources of ignition, including flames. Do not smoke when working with this product. Empty containers may contain ignitable or explosive concentrations of vapors. Do not cut containers with a torch or other spark-producing tool. Avoid breathing vapors or mists. Use with sufficient mechanical ventilation to prevent excessive exposure. In case of contact with skin or eyes, rinse affected area thoroughly. Remove contaminated clothing and do not re-use. Seek medical attention. Clean-up spills promptly. Keep containers closed when not in use. Store containers in a cool, dry location. Containers should be properly grounded when in storage and when in use. Grounding and bonding should be checked for continuity. Wear protective equipment appropriate for the task. Refer to MSDS for additional information. Keep out of the reach of children.

TARGET ORGANS: Skin, eyes, respiratory system, central nervous system.
WHMIS SYMBOLS:

16. OTHER INFORMATION

PREPARED BY: DYNALENE HEAT TRANSFER FLUIDS
5250 West Coplay Road, Whitehall, PA 18052

610/262/3681

Date of Printing: March 23, 1999

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Loikits assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Loikits assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average (TWA)**, the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling Level**. Skin adsorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - this exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL", is placed next to the PEL which was vacated by Court Order.

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Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL -the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

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Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause death. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

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This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and Transport Canada, respectively. The following laws are pertinent to the information presented in the MSDS: **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund).** This section also includes information on the precautionary warnings which appear on the material's package label.

Product Disclaimer

The information contained in this entire publication is presented in good faith at "no charge" and is believed to be correct as of the date indicated. No representations or warranties are made as to its completeness or accuracy. The information listed is supplied upon the condition that the persons receiving it will make their own determination as to its suitability for their purposes prior to use. In no event will the seller be responsible for damages of any nature whatsoever resulting from the use of, or reliance upon, this information or the product to which this information refers. Nothing contained on this page is to be construed as a recommendation to use the product, process, equipment or formulation in conflict with any patent. No representation or warranty, expressed or implied, is made that the use of this product will not infringe any patent.

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