

*Safe Handling and Storage of
Isomerized 1-Hexadecene
and
Isomerized 1-Octadecene*

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

PRODUCT STEWARDSHIP	1
INTRODUCTION	2
PART 1 SPECIFICATIONS, PROPERTIES AND TEST METHODS	
Isomerized Alpha Olefin 16 Specifications	3
Isomerized Alpha Olefin 18 Specifications	3
Properties.....	4
Recommended Test Methods.....	6
PART 2 SAMPLING AND HANDLING	
Training	7
Recommended Practice for Sampling	7
Static Electricity and Grounding.....	8
Product Loading/Unloading Requirements	8
Safety References	10
PART 3 STORAGE DESIGN RECOMMENDATIONS	
Storage Tanks.....	11
API and ANSI Design References	11
Particulate Matter	12
Filters	12
Hoses	12
Pumps	12
Valves	13
PART 4 HEALTH, ENVIRONMENT, FIRE AND ACCIDENTAL RELEASE INFORMATION	
Health Hazards and First Aid.....	14
Ecotoxicity/Environmental Fate	14
Fire Information.....	15
Personal Protective Equipment & Occupational Exposure Limits	15
Accidental Release Measures	16
Disposal	16
PART 5 TRANSPORTATION INFORMATION AND REGULATORY PROFILE	
Transportation Information	17
Hazard Classifications.....	18
Regulatory Profiles	19
PART 6 APPENDIX	
Glossary of Terms, Abbreviations and Organizations	21

THIS PAGE INTENTIONALLY LEFT BLANK

PRODUCT STEWARDSHIP

Chevron Phillips Chemical Company LP (“Chevron Phillips Chemical Company”) is committed to being a good Product Steward of the products we produce. We want anyone who comes in contact with one of our products to have access to information that will help them to understand its potential risk and how to use it safely. The thrust of our Product Stewardship program is the implementation of an Operation Excellence Management System (OEMS) initiative, which makes health, safety and environmental protection an integral part of our products. Successful implementation of this system must include a shared responsibility of all those who come in contact with a product throughout its life cycle. Chevron Phillips Chemical Company will continue to work with customers and others to help ensure that all who use and handle our products follow safe and environmentally sound practices.

The information contained in this technical bulletin is not intended to, nor does it, amend or replace the Chevron Phillips Chemical Company Material Safety Data Sheet (MSDS) for Isomerized Alpha Olefin 16 (#7890) and Isomerized Alpha Olefin 18 (#7891). The most current MSDS can be obtained from Chevron Phillips Chemical Company by calling (800) 852-5530 and should be carefully examined prior to working with these products.

Copyright © 2005 by:
Customer Technical Service Group
Chevron Phillips Chemical Company LP
Phone Number: 800-852-5531
All Rights Reserved

INTRODUCTION

CPChem Isomerized Alpha Olefin 16 (IAO 16) and Isomerized Alpha Olefin 18 (IAO 18) have a variety of end uses, but their two primary uses are as drilling mud base fluids and as feedstock for paper sizing agents. When used as a drilling mud base, these products make up about 50% of the drilling mud by volume and perform three basic functions in drilling muds. First, IAO 16 and IAO 18 act as a lubricant for the drilling shaft and bit. Second, these products act as a sealant for the drilling string. Finally, the materials act as a vehicle for removing debris and cuttings from the drilling hole.

When used to make paper sizings, IAO 16 and IAO 18 react with maleic anhydride to produce the desired liquid alkenyl succinic anhydride (ASA).

CPChem IAO 16 and IAO 18 are made via a patented two part process. First, the 1-hexadecene and 1-octadecene alpha olefin feedstocks are manufactured by Chevron Phillips Chemical Company at its Cedar Bayou, Texas petrochemical complex. The feedstocks are then passed through a fixed bed catalyst reactor to produce the isomerized product. This isomerization process randomizes the double bond along the carbon chain and results in a small amount of branching in the final product. Manufacturing is conducted in closed systems. Typical IAO 16 : IAO 18 ratios in blends include 50:50 and 65:35. These blends may be supplemented by other carbon number olefins to enhance performance and supply.

NOTE:

THIS BROCHURE DOES NOT AMEND OR REPLACE OFFICIAL PUBLICATIONS, SAFETY REGULATIONS NOW IN USE, MATERIAL SAFETY DATA SHEETS OR COMMERCIAL TERMS OF SALE. CHEVRON PHILLIPS CHEMICAL COMPANY MAKES NO GUARANTEE OF THE ACCURACY OF THE CONTENTS OF THIS BROCHURE OR ANY WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THE USE OF THIS INFORMATION OR ITS APPLICABILITY. THE USER ASSUMES ALL RISK AND LIABILITY ASSOCIATED WITH THE INFORMATION IN THIS BROCHURE.

PART 1

SPECIFICATIONS, PROPERTIES AND TEST METHODS

SPECIFICATIONS

CHARACTERISTIC	METHOD	IAO 16 SPECIFICATION	IAO 18 SPECIFICATION
Carbon Number, wt. % C16, min.	GLC	96.0	--
Carbon Number, wt. % C18, min.	GLC	--	96.0
Viscosity, Kinematic, cSt, 40°C, max.	ASTM D 445	2.9	3.75
n-Alpha Olefin, wt. %, max.	FTIR	6.0	6.0
Dimer, wt. %, max.	GLC	4.0	4.0
Water, ppm by wt., max.	ASTM D 1744	100	100
Color, Saybolt, min.	ASTM D 6045	+20	+20
Appearance	ASTM D 4176	Clear & Bright	Clear & Bright

Date Approved: March 27, 2003

TYPICALS

ADDITIONAL CHARACTERISTICS	METHOD	TYPICAL VALUE	TYPICAL VALUE
Carbon Number, wt. % C16	GLC	99.0	--
Carbon Number, wt. % C18	GLC	--	99.0
Viscosity, Kinematic, cSt, 0°C	ASTM D 445	6.8	11.4
Viscosity, Kinematic, cSt, 40°C	ASTM D 445	2.6	3.6
Viscosity, Kinematic, cSt, 100°C	ASTM D 445	1.1	1.4
Density, lb./gal., 15.6°C (60°F)	ASTM D 4052	6.5	6.6
Color, Saybolt	ASTM D 6045	25-30	25-30
Flash Point, °C (°F)	ASTM D 93	130 (266)	150 (302)

PROPERTIES

PROPERTY	METHOD	Isomerized Alpha Olefin 16	Isomerized Alpha Olefin 18
Autoignition, °C (°F)	1	215 (419)	240 (464)
Average Molecular Weight		224	252
Boiling Point, °C			
<u>Vapor Pressure, torr</u>			
760		280	310
500		260	290
100		205	230
50		185	210
20		160	185
Color		Colorless to pale yellow	Colorless to pale yellow
Density of the Liquid, gm/cm ³			
<u>Temperature, °C</u>			
15.6	ASTM D 1298	0.78	0.79
40		0.77	0.77
Freezing Point, °C (°F)	ASTM D 1015	<-10°C (14°F)	0°C (<32°F)
Molecular Formula		C ₁₆ H ₃₂	C ₁₈ H ₃₆
Odor		Olefinic	Olefinic
Refractive Index (N _D), 25 °C	ASTM D 1218	1.4	1.4
Relative Density (Specific Gravity) ²			
<u>Temperature, °C</u>			
15.6		0.78	0.79
25		0.78	0.79
Viscosity			
<u>Temperature, °C</u>	ASTM D 445	Absolute Viscosity, <u>centiPoise</u>	Absolute Viscosity, <u>centiPoise</u>
40		2.0	2.8

PROPERTY	METHOD	Isomerized Alpha Olefin 16	Isomerized Alpha Olefin 18
<u>Temperature, °C</u>	ASTM D 445	Kinematic Viscosity, <u>centiStokes</u>	Kinematic Viscosity, <u>centiStokes</u>
40		2.9	3.75
100		1.1	1.4

REFERENCES AND NOTES:

¹Values are calculated based on the known values of CPChem's regular NAO product line.

²Values are calculated from the density of the liquid (obtained experimentally) and the density of pure water at 15.6 °C (0.999012 g/cm³).

RECOMMENDED TEST METHODS

The following ASTM methods⁽¹⁾ are recommended for the analysis of IAO 16 and IAO 18:

1. D 92 Test Method for Flash and Fire Points by Cleveland Open Cup, Vol. 05.01
2. D 97 Test Method for Pour Point of Petroleum Products, Vol. 05.01
3. D156 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method), Vol. 05.01
4. D 287 Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method), Vol. 05.01
5. D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity), Vol. 05.01
6. D 611 Test Methods for Aniline Point and Mixed Anile Point of Petroleum Products and Hydrocarbon Solvents, Vol. 05.01
7. D 1015 Test Method for Freezing Points of High-Purity Hydrocarbons, Vol. 05.01
8. D 1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids, Vol. 05.01
9. D 1298 Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method, Vol. 05.01
10. D 4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures), Vol. 05.02

Notes:

⁽¹⁾1996 Annual Book of ASTM Standards

PART 2

SAMPLING AND HANDLING

TRAINING

In any workplace, training should be conducted before sampling and handling operations of IAO 16 and IAO 18 are undertaken. Several commercial websites provide access to Code of Federal Regulations, NIOSH, and OSHA databases which may help in answering questions and setting up safety programs. The training program may include the following:

1. Properties and health hazards of IAO 16 and/or IAO 18.
2. Safe work and good housekeeping practices.
3. The importance of protection from IAO 16 and/or IAO 18 contact; the proper clothing and cleaning requirements to ensure worker protection.
4. Signs and symptoms of IAO 16 and/or IAO 18 exposure and action to be taken.
5. The care that must be taken whenever and wherever IAO 16 and/or IAO 18 are used, handled, stored, and transported.
6. Emergency procedures for leaks, spills, and fires, including protective clothing to be worn in such instances. Check the product's MSDSs for further information.
7. First aid measures to be used after exposure.
8. The availability of written IAO 16 and/or IAO 18 usage, health hazard, and training program procedures.

It is recommended that this generalized sampling and handling training program should be part of a worker's initial instruction. Refresher training should be scheduled at least annually thereafter. A summary of accidental release, fire, and health information is presented in Section 4 of this brochure.

RECOMMENDED PRACTICE FOR SAMPLING

This information is provided for use in establishing sampling and handling procedures. This information should only be utilized in conjunction with an existing health and safety program and cannot be used as a substitute for expert safety and medical advice.

SAMPLING:

Samples may be taken through the sampling port (tank) or the manway opening (vessel) by means of a clean, dry 1-qt. (1-L) bottle held in a clean, dry sheath of nickel or stainless steel attached to a long rod or lightweight chain of the same material. Fit the bottle with a glass stopper to which is attached a light metal chain. Lower the bottle to near the bottom of the tank and pull out the stopper with a sharp jerk of the chain. Raise it at such a rate that it is about three fourths full when it emerges from the liquid. Stopper the bottle before attempting to rinse the material from the outside. Label the sample bottle according to OSHA Regulations (refer to 29 CFR 1910.1200).

Note – No special respiratory protection is normally required. Other personal protective gear may be required depending on exposure limits set in the individual workplace.

Emphasis should be placed on cleanliness and dryness. Both the sample bottle and its holder must be CLEAN AND DRY. Transfer the sample to another bottle for storage. A suitable bottle for storing the sample is one known as a "Boston Round." The closure should be a screw cap with Teflon® or aluminum foil liner.

If new bottles are used, first rinse them thoroughly with acetone or methanol and then dry in a hot-air oven. Hold the bottles in a



desiccator while cooling to ambient temperature.

Protect them from dirt or moisture by enclosure in a polyethylene bag. Rinse used bottles thoroughly with water, detergents, and solvents. Treat the rinsed containers as new bottles.

The sampling device should be bonded to the tank manway (e.g., by resting the chain on the lip of the manway) prior to sampling.

REFERENCED DOCUMENTS RELATED TO SAMPLING:

ASTM E 300 Practice for Sampling Industrial Chemicals

API RP-500A Classification of Locations for Electrical Installations in Petroleum Refineries

OSHA Regulations, 29 CFR paragraphs 1910.1000 and 1910.2000

U.S. DOT Regulations, 49 CFR Transportation, Subchapters B and C, Parts 171-179

STATIC ELECTRICITY AND GROUNDING

Chevron Phillips IAO 16 and IAO 18 are characterized by high electrical resistivity (low conductivity) which can result in the buildup of excess static charge during transfer operations. These materials are classified as low vapor pressure products under the API RP 2003 Guidelines (i.e., a product with a flash point above 100 °F). If these products are handled at temperatures well below their flash point, flammable vapors will not develop. However, a condition for ignition may exist, if IAO 16 and/or IAO 18 are handled at a temperature above their flash point or are contaminated with intermediate or high vapor pressure products. Likewise, in transporting these products, a condition for ignition can exist when the previous load contained a flammable vapor which was not flushed from the storage tank. This type of loading is commonly called "switch loading".

Key operations which have the potential of generating a flammable atmosphere and/or static charge include tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing/agitation, and vacuum truck operations. To minimize the hazard of static electricity during these operations, bonding and grounding may be necessary but may not, by themselves, be sufficient. For more information, refer to OSHA Standard 29 CFR 1910.106, "Flammable and Combustible Liquids", National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity" and/or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents."

PRODUCT LOADING/UNLOADING REQUIREMENTS

Loading operations must be performed only by qualified persons. These individuals must be properly instructed in the loading of IAO 16 and IAO 18. Workers should refer to their site's fire and safety guidelines for personal protective equipment. Though considered noncombustible by most agencies, use caution to avoid creating any sparks which could ignite these products. As the products are being loaded/unloaded, static build up can occur. Therefore, a ground cable must be placed on the container to prevent the build up of static electricity. Use only clean, oil- and dirt-free, spark resistant tools and implements.

The importance of a thorough pre-trip/post-trip inspection can not be over emphasized. The physical inspection process of the container is one of the best methods of minimizing human error, the principle cause of transportation incidents.

Take extreme care to prevent spills. In case material is spilled, wash contaminated areas thoroughly with large quantities of water and collect the liquid in the plant chemical waste system. Drums and trucks can be used for temporary storage until product can be recycled or disposed of properly. See Section 5 for further information.

WHEN LOADING OR UNLOADING A VESSEL OR BARGE:

The United States Coast Guard classifies IAO 16 and IAO 18 as regulated commodities (combustible Grade E cargo under 46 CFR 30.10-15). Vessel/barge owners must comply with 46 CFR Part 30 (Table 30.25-1; cargo name Olefins (C13+, all isomers)).

Plan and control the loading and unloading of IAO 16 and/or IAO 18 to limit personnel exposure and environmental releases. OSHA and the U.S. Coast Guard have published regulations applicable to people involved in the handling of chemical materials. Some of the key elements are:

1. Employee Training
2. Personal Protective Equipment
3. Warning Signs

Clean stainless steel, rust-free mild steel tanks or suitably washed steel tanks are acceptable for transport of this material. Chevron Phillips carefully selects barges to ensure that product quality is not negatively affected during transport. Qualified contractors should be used to inspect, clean, and repair barges in which IAO 16 and IAO 18 are shipped. The contractor should have facilities to dispose of residual product in an acceptable manner.

WHEN LOADING OR UNLOADING TANK CARS:

General purpose tank cars in the Chevron Phillips Chemical fleet are DOT 111A100W1 and are stenciled accordingly. They are insulated with exterior heating coils and equipped with both top and bottom loading/unloading valves.

Loading

Set the brakes, chock wheels, turn on warning lights, erect track warning signs, and connect ground cable. Inspect tank car exterior for any damage or flags and verify that all appliances and test dates are in compliance. Loosen dome cover bolts slightly and leave two (2) bolts hand tight. Check tank car for pressure. Open dome carefully and inspect car interior for cleanliness and liquid heel. If a liquid heel

exists, removal and cleaning may be required depending upon the previous load. Check dome cover bolts, gaskets, and seating surfaces for a secure condition. Flush load filter and spout, if necessary. Remove bottom cap, open outlet valve, and drain, if necessary. Any material from a previous load should be recycled or disposed of in accordance with federal, state, and local regulations. Close bottom outlet valve and leave bottom cap off. If car is equipped with internal steam coils, remove caps. Open product line to tank car and start pump. Frequently check bottom unload valve for any signs of leakage during loading. If leakage occurs, cease loading. Check steam coils for leakage. Load tank car to proper outage or weight desired.

After loading is completed, shut down pump, close block valves for product, and purge line with nitrogen to clear spout. Remove spout, close and tighten dome (with a wrench), and seal all top appliances/covers. Check to ensure that all plugs and fittings are tight. Secure loading ramp and spout, and remove ground cable. Replace bottom cap and tighten with a wrench. Seal bottom unload valve. Secure heater caps if internally coiled car. Remove ground cable, wheel chocks, and warning signs. Turn off track warning light.

Unloading

Set the brakes, chock wheels, turn on warning lights, erect track warning signs, and connect ground cable. Relieve tank pressure gradually by opening vent valve and loosening dome (manhole cover) at short intervals. Leave dome cover open so air can enter tank while unloading. Operate bottom valve rod handle to see that outlet valve in bottom of tank is seated before removing bottom cap. Loosen bottom cap and allow sufficient time to permit liquid in outlet chamber to escape. Check for leakage from bottom cap. If leakage is absent, remove bottom cap and connect unloading hose (check gasket in hose). Open bottom valve and start unloading pump (it may be necessary to bleed vapors off pump).

After the tank car is unloaded completely, close all unloading valves tightly and remove unloading hose. Tighten all closures except heater coil inlet and outlet pipes which must be left open for drainage. Close dome cover (check gasket), plug or cap all openings and



tighten with wrench. Check gasket, replace bottom cap, and tighten with a wrench. Remove chocks, ground cable, and caution signs. Turn off track warning lights.

WHEN LOADING OR UNLOADING TANK TRUCKS:

Open dome tank trucks are normally of the MC/DOT 307 or 407 type and are used to transport hazardous materials.

Loading

Check wheel chocks in front and back of truck's rear wheels allowing $\frac{3}{4}$ " clearance for ease of removal. Connect ground cable. Close bottom valve leaving the cap off to monitor for leakage while loading. Open dome cover and inspect interior for cleanliness. Flush loading spout and filter, if necessary. Visually inspect trailer exterior for damage and inspection dates.

Open product line and start pump. Check bottom unload valve for leakage. Shut down pump, close product block valves, and nitrogen purge line to clear spout. Remove spout, secure dome lid, and seal dome cover. Check all top openings or valves for tightness. Raise loading ramp and secure spout. Replace bottom unload cap and ensure internal/external valves are in closed position. Seal bottom cap. Remove chocks and ground cables.

Unloading

Check wheel chocks in front and back of truck's rear wheels allowing $\frac{3}{4}$ " clearance. Connect ground cable. Relieve all tank pressure by opening a vent valve or slowly loosening dome cover bolts. Remove dome cover or outlet cap so air can enter the tank during unloading. Check internal and external valves ensuring they are closed and remove unloading valve cap slowly to relieve any pressure. Check gasket in loading hose and connect to unloading valve. Open internal and external valves, and start unloading pump.

After product transfer is completed, shut off unloading pump, close internal and external valves, and remove unloading hose checking for possible product in the line. Close, tighten and cap all fittings. Remove chocks and ground cables.

SAFETY REFERENCES

The following publications are excellent references for product handling, safety and fire control:

NFPA No. 10-
Portable Fire Extinguisher

NFPA NO. 11-
Foam Extinguishing Systems

NFPA NO. 70 -
National Electrical Code as adopted by National Fire Protection Association.

NFPA NO. 77 -
Recommended Practice of Static Electricity as adopted by National Fire Protection Association.

PART 3

STORAGE DESIGN RECOMMENDATIONS

STORAGE TANKS

Storage tanks should be of welded steel construction. Underground storage tanks are not recommended because of the difficulty of locating leaks. However, some states require underground storage tanks. Diking, drainage, and tank supports should be designed to conform with local regulations. A rule of thumb commonly used for determining the size of storage facilities suggests that storage facilities be 1½ times the size of shipments received. The secondary containment requirements as well as tank layout and spacing requirements should be in accordance with NFPA 30. Rotating equipment such as pumps should be kept outside of the secondary containment area. Some facilities may require larger inventories, and thus storage facilities, because of seasonal transportation problems.

The storage tank inlet should be located at the bottom of the tank. Should a top inlet be desired, the fill pipe should be extended to a depth no greater than the diameter of the fill pipe from the bottom of the tank in order to minimize static charge accumulating during filling. The fill pipe should be connected electrically to both the tank flange and the transfer pipeline. The purpose of this electrical connection is to dissipate any static charge which may build up during filling.

Chevron Phillips IAO 16 has a pour point of <14°F and IAO 18 has a pour point of <32°F. Whether or not heating is required depends on the ambient temperature, the duration of that low temperature, and the size of the tank. If the ambient temperature is likely to drop below the product's pour point and the nature of the process allows this product to sit in the lines for a period of time, the tank and lines should be insulated and steam-traced. Uninsulated storage tanks for IAO 16 and IAO 18 may be coated with black paint to keep the product warmer in the winter months.

All of the lines and valves, as well as the tank, can be carbon steel. However, carbon steel

lines will accumulate rust if allowed to remain empty for long periods. In this situation the first few gallons of product moved down the line may have a yellow to orange color and particulates depending on the amount of rust that has accumulated.

Unlined carbon steel tanks may also accumulate rust above the liquid level. This rust, along with the condensate, will settle to the bottom of the tank and may not show up until the tank is stripped. Rust can be avoided by having storage tanks lined with a zinc, epoxy, or other coating that is compatible with these products.

Exercise care in selecting the gasket and seal materials to be used. This product can cause rubber to swell and subsequently deteriorate. Additionally, plastic materials will become brittle and crack or break. Viton® has proven to be compatible with this product.

Specific bulk storage designs must conform to insurance underwriter's codes and local fire and building regulations. Critical design, placement, installation, and maintenance requirements are usually addressed in these codes and regulations and must be followed.

Inspect tanks periodically for leaks and service in accordance with API Standard 653.

Workers should never be permitted to enter an empty tank which has been used for IAO 16 and IAO 18 until the requirements of the OSHA confined space standard (29 CFR 1910.146) and the safe entry recommendation of API Standard 2015 have been met, including, but not limited to, required concentrations for oxygen.

API AND ANSI DESIGN REFERENCES

American Petroleum Institute
1220 L Street, N. W.
Washington, DC 20005



Part I – Design:

API RP-520: *Sizing, Selection, and Installation of Pressure Relieving Devices in Refineries*

Part II – Installation:

API 601: *Metallic Gaskets for Raised-Face Pipe Flanges and Flanged Connections (Double-Jacketed Corrugated and Spiral-Wound)*

API 620: *Recommended Rules for the Design and Construction of Large Welded, Low-Pressure Storage Tanks*

API 650: *Welded Steel Tanks for Oil Storage*

API Standard 653: *Tank Inspection, Repair, Alteration, and Reconstruction*

API RP-2000: *Venting Atmospheric and Low-Pressure Storage Tanks*

API RP-2003: *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*

API Standard 2015: *Safe Entry and Cleaning of Petroleum Storage Tanks*

API RP-2028: *Flame Arresters in Piping System*

API RP-2210: *Flame Arresters for Vents of Tanks Storing Petroleum Products*

API RP-2350: *Overfill Protection for Petroleum Storage Tanks*

American National Standards Institute
11 West 42nd Street
New York, New York 10036

ANSI B16.21: *Nonmetallic Flat Gasket for Pipe Flanges*

ANSI B31: *American National Code of Pressure Piping*

PARTICULATE MATTER

Chevron Phillips IAO 16 and IAO 18 should be free of particulate matter when shipped.

However, some particulate matter may originate from outside contamination via the receiving-transfer system.

Particulate matter may be avoided by:

1. Paying careful attention to cleanliness.
2. Filtering product to remove particulate matter before use.

FILTERS

Since small amounts of foreign matter may enter storage tanks and transport vessels from various sources, a filter in the transfer piping between the storage tank and processing equipment is recommended. This can be accomplished by inserting a corrugated cellulose filter paper (5 µm) inside a woven polyester fiber (10 µm mesh) cartridge-type filter. Other types of product compatible filters might also be used. Flow rates and pressures should be used to determine the proper filter for specific situations. Contact Chevron Phillips Chemical's Technical Service Group at (800) 852-5531 for specific recommendations.

HOSES

Hard piping is preferred to the use of hoses where possible and practical. If hoses are needed for loading or unloading operations, they should be inspected and pressure tested at the intervals required by the various regulations. A satisfactory type hose is SW-309 PETRO-VAC 150 Tank Truck Hose (seamless nitrile tube with multiple plies of polyester with helix wire and a one piece nitrile blend cover) or a SP-483 modified X-link chemical hose (seamless X-link polyethylene tube with multiple plies of polyester which is supported by a PVC rod helix and a 1 piece blue synthetic cover). Viton® and Teflon® are also recommended. U.S. Coast Guard regulation 33 CFR Part 154.500 applies to hoses used for bulk transfers to and from tank vessels.

PUMPS

Liquid product can be transferred by pump or vacuum. For most product handling, centrifugal

pumps with mechanical seals perform satisfactorily. The pump manufacturer can recommend the proper type of pump if the following parameters are known: 1) flow in gallons per minute, 2) the size and length of suction and discharge lines, 3) the suction and discharge pressures, and 4) the range of product temperatures during transfer. A drain valve should be installed at the lowest point in the system so that the pump and all piping can be completely drained and washed before any maintenance work is done. Totally enclosed fan cooled (TEFC) motors are recommended. However, local fire and insurance codes should be consulted to determine if an explosion-proof motor must be used. Pump seals must be capable of meeting EPA emission standards - this requires tandem or double seals. Tandem seals enhance safety when pumping these products (at elevated temperatures). Demisting systems should be used to keep pump bearings lubed.

The following practices are recommended to minimize the possibility of pump leakage:

1. Mechanical seals in conformance with API 682, 1st edition.
2. Pumps in conformance with API 610, 8th edition are recommended.
3. The pump should be designed so that pump bearings will be able to carry thrust at no flow. Consider selecting non-metallic (PEEK) wear rings to minimize damage if the pump runs dry.
4. The pump shaft should be highly polished.
5. Pumps should not be subjected to forces beyond specified pump tolerances.
6. Vibration monitoring with automatic pump shutdown may be applicable in certain situations.

VALVES

Full-bore ball valves are preferred for pigged pipelines. Gate valves, butterfly valves, or ball valves may be used for pipelines that are not pigged. These valves should be made of cast

iron, case steel, or other recommended materials. Valves should be packed with the following graphite materials:

- Garlock® EVSP Simplified (#9000/98)⁽¹⁾
- Garlock® 70# / 98 (-400 to 1200 °F; 10,000 psi)⁽²⁾
- Garlock® 1303 (good for steam)⁽²⁾
- Slade® 3300G (-400 to 1200 °F; 10,000 psi)⁽²⁾

⁽¹⁾Most efficient packing is the flexible die-form rings with flexible braided end-rings.

⁽²⁾Used for field repacking.

PIPELINES

The following are recommended practices in engineering pipelines for IAO 16 and IAO 18:

1. A minimum of flanged connections should be used to avoid potential leaks.
2. Lines should not be buried because of the difficulty of checking for leakage.
3. All lines should be sloped with drain valves at appropriate locations so that they can be completely drained for maintenance.
4. All newly installed pipelines should be pressure-tested by an approved method before use.
5. Bellow valves for 2 inch and smaller lines are recommended to eliminate emissions from packing glands.

PART 4

HEALTH, ENVIRONMENT, FIRE, AND ACCIDENTAL RELEASE INFORMATION

Chevron Phillips IAO 16 and IAO 18 have a low order of toxicity and if handled properly should not present a health hazard. This material will burn but is not considered a flammability or combustibility hazard.

The MSDS's for IAO 16 and IAO 18 are available from Chevron Phillips to help customers satisfy their own safe handling and disposal needs, and OSHA Hazard Communication Standard requirements. Such information should be requested and studied prior to working with this product. Please call Chevron Phillips at (800) 852-5530 to request the MSDS.

**NOTE: THIS BOOKLET DOES NOT
SUBSTITUTE FOR THE MSDS.**

HEALTH HAZARDS AND FIRST AID

INHALATION: With respect to short-term inhalation exposures, based on results of animal testing with similar materials, neither IAO 16 nor IAO 18 is expected to be harmful if inhaled. **First Aid:** No specific first aid measures are required because this material is not expected to be harmful if inhaled. If a person is exposed to excessive levels of material in the air, move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

EYES: These products are not expected to cause prolonged or significant eye irritation. **First Aid:** No first aid procedures are required. However, as a precaution, remove contact lenses, if worn, and flush eyes with water.

SKIN: Contact of either IAO 16 or IAO 18 with skin is not expected to cause prolonged or significant irritation, or allergic skin responses. Prolonged or frequently repeated contact may cause the skin to become

cracked or dry from the defatting action of this material. If absorbed through the skin, this material is considered practically non-toxic to internal organs. The acute dermal LD50 in rabbits for IAO 16 and IAO 18 is >2 g/kg.

First Aid: Remove contaminated clothing and shoes. Wash skin with soap and water. Wash or clean contaminated clothing and shoes before reuse.

INGESTION: If swallowed, these substances are considered practically non-toxic to internal organs. The acute oral LD50 in rats for IAO 16 and IAO 18 is >5 g/kg. Because of the low viscosity of these substances, they can directly enter the lungs if swallowed (this is called aspiration). This can occur during the act of swallowing or when vomiting the substance. Once in the lungs, the substances are very difficult to remove and can cause severe injury to the lungs and death. **First Aid:** If swallowed, do not induce vomiting. Give the person a glass of water or milk to drink and get immediate medical attention. Never give anything by mouth to an unconscious person.

This information is not intended to, nor does it, amend or replace the MSDS's for IAO 16 and IAO 18. The most current MSDS should be carefully examined prior to working with this product.

ECOTOXICITY/ENVIRONMENTAL FATE

ECOTOXICITY: Based on results of laboratory tests with several species of aquatic organisms, IAO 16 and IAO 18 are not expected to be harmful to aquatic organisms.

ENVIRONMENTAL FATE: Based on the results of 28-day ready biodegradability tests with similar material, IAO 16 and IAO 18 are expected to be ultimately, but not readily, biodegradable (31 - 46% at 28 days).

FIRE INFORMATION

FLAMMABILITY PROPERTIES:

<u>Critical Properties</u>	<u>IAO 16</u>	<u>IAO 18</u>
Flash Point, (COC)°C (°F)	127 (261)	150 (302)
Autoignition Temperature, °C (°F)	215 (419)	240 (464)
NFPA Fire: Hazard Rating	1	1

Do not use or store IAO 16 or IAO 18 near heat, sparks, or open flames. Use or store only in a well-ventilated area. Keep container closed when material is not in use. Do not use pressure to empty drum or drum may rupture with explosive force; the drum is not designed to contain pressure. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed. Static hazards should be eliminated to prevent ignition. Refer to Static Electricity subsection in Part 2 for further information.

FIRE HAZARDS:

This material can burn but is not considered a flammability or combustibility hazard.

FIRE FIGHTING INSTRUCTIONS AND COMBUSTION PRODUCTS:

For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide. Extinguish with foam, dry chemical, or carbon dioxide. Use water in flooding quantities as

fog; solid streams of water may be ineffective. Cool exposed containers near the fire with water. Drainage and runoff should be controlled and collected in a remote location for recovery or disposal. Minimize spread to reduce clean up cost.

PERSONAL PROTECTIVE EQUIPMENT & OCCUPATIONAL EXPOSURE LIMITS

PERSONAL PROTECTIVE EQUIPMENT:

Use in a well-ventilated area. No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice. Wear impervious protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection and will depend on operations conducted. Users should determine acceptable performance characteristics of protective clothing. Consider physical requirements and other substances present when selecting protective clothing. Suggested materials for protective gloves include Viton[®], nitrile, and polyurethane. No special respiratory protection is normally required.

ANSI REFERENCES:

ANSI	Z41.1	Safety for Footwear
ANSI	Z87.1	Practice for Occupational and Educational Eye and Face Protection
ANSI	Z88.2	Practices for Respiratory Protection
ANSI	Z89.1	Protective Headwear for Industrial Workers
ANSI	Z38.1	Emergency Eye Wash and Showers Equipment

OCCUPATIONAL EXPOSURE LIMITS:

	<u>IAO 16 and IAO 18</u>
OSHA Permissible Exposure Limit:	
8-Hour Time Weighted Average (TWA):	None Established
ACGIH Threshold Limit Value:	
8-Hour Time Weighted Average (TWA):	None Established



ACCIDENTAL RELEASE MEASURES

If a transportation incident involving IAO 16 and/or IAO 18 does occur, contact the Chemical Transportation Emergency Center (CHEMTREC) for immediate assistance. CHEMTREC is a public service organization established by the Chemical Manufacturers Association to provide assistance in chemical material incidents. **FOR A CHEMICAL EMERGENCY, CALL CHEMTREC AT (800) 424-9300 Toll Free in the United States, Canada, Puerto Rico, and the Virgin Islands. For emergency calls outside the United States call (703) 527-3887. For non-emergency chemical information and assistance at CHEMTREC call (800) 262-8200 Monday - Friday, 9:00 AM - 6:00 PM (EST).**

CHEMTREC will provide the caller preliminary emergency assistance in the form of Material Safety Data Sheet (MSDS) information. In all cases once CHEMTREC determines the incident involves a Chevron Phillips Chemical material, CHEMTREC will immediately contact the on-call Chevron Phillips Chemical Company Crisis Management Team (CMT) member at 1-866-4HAZMAT (442-9628). The contacted Chevron Phillips Chemical CMT member will then be responsible for coordinating an appropriate response to the transportation incident. In addition, if the CMT member determines that the incident involves exposure or potential health effects, the on-call Chevron Phillips Chemical toxicologist will also be contacted.

If an accidental release of IAO 16 and/or IAO 18 has occurred, eliminate all sources of ignition in vicinity of spill. Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in the Personal Protective Equipment section. All spill cleanup activities must meet the requirements of any state and local regulations. Contain liquid to prevent further contamination of soil, surface water, or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Effective absorbents include sand or Claymax®, a loose "vermiculite like" material. Claymax® may be purchased from:

Road Fabric, Inc.
Environmental Division
P.O. Box 1
McCook, IL 60535
Phone: (708) 447-0088

Where feasible and appropriate, remove contaminated soil. Follow prescribed procedure for reporting and responding to larger releases. Contact local environmental or health authorities for guidance on how to dispose of the used absorbing agent, contaminated liquid product or soil. If the spill is on a hard surface, the area should be scrubbed with soap and water after the bulk of the IAO 16 and/or IAO 18 has been removed. There is no Reportable Quantity (RQ) for either IAO 16 or IAO 18 under CERCLA section 302.4.

Release of these products should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The reportable quantity is an amount that causes a sheen on nearby surface water. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

DISPOSAL

All disposal procedures are to be carried out in strict conformance to state and local regulations.

Recovered IAO 16 or IAO 18 liquid from a spill or contaminated product may be reprocessed. However, if the product can not be reprocessed, it must be disposed of in a legally acceptable manner. Recovered material may be incinerated in a properly designed furnace. Please contact Chevron Phillips Chemical's Technical Service Group at (800) 852-5531 if additional assistance is required.

PART 5

TRANSPORTATION INFORMATION AND REGULATORY PROFILES

TRANSPORTATION INFORMATION

BILL OF LADING DESCRIPTION:

	<u>IAO 16</u>	<u>IAO 18</u>
Bulk Truck Bill of Lading Description:	Not Regulated by DOT	Not Regulated by DOT
Bulk Rail Bill of Lading Description:	Not Regulated by DOT	Not Regulated by DOT
Package Bill of Lading Description:	Not Regulated by DOT	Not Regulated by DOT

Note: The preceding descriptions are subject to frequent changes. Consult current DOT regulations and other appropriate sources to verify proper bill of lading descriptions.

CHEMICAL DESIGNATIONS:

CG Compatibility Class:	Olefinic Hydrocarbon	Olefinic Hydrocarbon
Formula:	$C_{16}H_{32}$	$C_{18}H_{36}$
CAS Registry No.:	26952-14-7	27070-58-2

INTERNATIONAL MARITIME ORGANIZATION (IMO):

Pollution Category	III	III
--------------------	-----	-----

SHIPPING INFORMATION:

Grades of Purity	>96%	>96%
Storage Temperature	Ambient or above $-6^{\circ}C$, if liquid state storage desired	Ambient or above $-6^{\circ}C$, if liquid state storage desired
Inert Atmosphere	No requirement	No requirement
Venting	Open (Flame arrester)	Open (Flame arrester)



HAZARD CLASSIFICATIONS

IAO 16

IAO 18

OSHA (29 CFR 1910.1200):	Not Classified as Flammable/Combustible	Not Classified as Flammable/Combustible
American National Standards Institute Precautionary Labeling Standard (1994):	Noncombustible	Noncombustible
U. S. Dept. of Transportation (49 CFR 173.120):	Not Regulated as a Hazardous Material	Not Regulated as a Hazardous Material
EU Dangerous Substances Directive (93/21/EEC):	Not Classified as Flammable or Combustible	Not Classified as Flammable or Combustible
National Fire Protection Association (NFPA 30):	Class IIIB Combustible Liquid	Class IIIB Combustible Liquid

NFPA HAZARD CLASSIFICATION:

Category

Health Hazard (Blue)	0	0
Flammability (Red)	1	1
Reactivity (Yellow)	0	0

Various restrictions apply to the preceding classifications. Please refer to the specific regulation for details concerning classification requirements. 46 CFR Part 30 should also be referenced for information about Coast Guard regulations governing the transport of IAO 16 and IAO 18.

REGULATORY PROFILE: IAO 16

(1) **ODCs:** Class 1 or Class 2 Ozone Depleting Chemicals (ODCs) **NO**

(2) **TSCA:** Is this product or its components subject to any of the following TSCA requirements of 40CFR, Part:

707	Export Notification (12b)	NO
712	Chemical Information Reporting (8a)	NO
716	Health & Safety Data Reporting (8d)	NO
721	Significant New Use (5e)	NO
723.50	Low Volume Exemption	NO
720.36	R&D Exemption	NO
720.38	Test Marketing Exemption	NO
723.25	Polymer Exemption	NO
790	Health and/or Environmental Effects Testing (4e)	NO

Is this material distribution under limitations of a 5(e) or 5(f) Consent Order? **NO**

Have there been any Section 8(e) submissions for this material? **NO**

(3) **INTERNATIONAL REGISTRATION:** Are all components of this material listed on the following international inventories?:

TSCA	(United States)	YES	TSCA reg. nos. 26952-14-7 and 182636-01-7) (but n-Hexadecene is on NDSL)
DSL	(Canada)	NO	
EINECS	(Europe)	NO	
METI	(Japan)	YES	
AICS	(Australia)	NO	
ECL	(Korea)	NO	(n-Hexadecene KMOE reg. no. KE-18474)
Philippines		NO	
China		NO	

(4) **FDA:** Do FDA regulations permit use of this material as a direct or indirect food additive?

DIRECT: **NO**
INDIRECT: **NO**

(5) **HAZARDOUS METALS:** Does the sum of the concentration levels of lead, cadmium, mercury, and hexavalent chromium present in this material exceed 100 ppm by weight? **NO**

(6) **ADDITIONAL REGULATORY INFORMATION:** See CPChem MSDS 7890, Section 15 for additional regulatory information.

REGULATORY PROFILE: IAO 18

(3) **ODCs:** Class 1 or Class 2 Ozone Depleting Chemicals (ODCs) **NO**

(4) **TSCA:** Is this product or its components subject to any of the following TSCA requirements of 40CFR, Part:

707	Export Notification (12b)	NO
712	Chemical Information Reporting (8a)	NO
716	Health & Safety Data Reporting (8d)	NO
721	Significant New Use (5e)	NO
723.50	Low Volume Exemption	NO
720.36	R&D Exemption	NO
720.38	Test Marketing Exemption	NO
723.25	Polymer Exemption	NO
790	Health and/or Environmental Effects Testing (4e)	NO

Is this material distribution under limitations of a 5(e) or 5(f) Consent Order? **NO**

Have there been any Section 8(e) submissions for this material? **NO**

(4) **INTERNATIONAL REGISTRATION:** Are all components of this material listed on the following international inventories?:

TSCA	(United States)	YES	TSCA reg. nos. 182636-02-8 and 27070-58-2 (but is on NDSL)
DSL	(Canada)	NO	
EINECS	(Europe)	NO	
METI	(Japan)	YES	
AICS	(Australia)	NO	
ECL	(Korea)	YES	(n- Octdecene KMOE reg. no.KE-26435)
Philippines		NO	
China		YES	

(5) **FDA:** Do FDA regulations permit use of this material as a direct or indirect food additive?

DIRECT: **NO**
INDIRECT: **NO**

(7) **HAZARDOUS METALS:** Does the sum of the concentration levels of lead, cadmium, mercury, and hexavalent chromium present in this material exceed 100 ppm by weight? **NO**

(8) **ADDITIONAL REGULATORY INFORMATION:** See CPChem MSDS 7891, Section 15 for additional regulatory information.

PART 6

APPENDIX

GLOSSARY OF TERMS, ABBREVIATIONS AND ORGANIZATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AIAG	Automotive Industry Action Group
AIHA	American Industrial Hygienists Association
AALA	American Association for Laboratory Accreditation
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
BABT	British Approvals Board of Communication
BACT	Best Available Control Technology
Bonding	The connection of two or more conductive objects by means of a conductor (most commonly a wire or metal plate).
BSI	British Standards Institute
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAD	Computer-Aided Design
CANUTEC	Canadian Transport Emergency Centre
Carbonyls	Compounds containing the C=O functional group. They can occur as impurities in many organic compounds forming from peroxide contaminants.
CE mark	Conformity European Union Mark
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CG	Coast Guard
CHEMTREC	Chemical Transportation Emergency Center

CMA	Chemical Manufacturers Association
Confined Space	An area that by design has limited openings for entry and exit. A confined space has unfavorable natural ventilation and is not intended for continuous worker occupancy.
CPC	Chemical Protective Clothing
DOT	Department of Transportation
EPA	Environmental Protection Agency
ESD	Electro static discharge
EU	European Union
FDA	Food & Drug Administration
Flashpoint	The minimum temperature at which a liquid gives off vapor in sufficient concentrations to form an ignitable mixture with air near the surface of a liquid.
FMEA	Failure Mode Effect Analysis
GLP	Good Laboratory Practices
Grounding	The connection of one or more conductive objects to the ground: a specific form of bonding. Grounding is also referred to as earthing.
HAP	Hazardous Air Pollutant
HazWOpER	Hazardous Waste Operations and Emergency Response
HON	Hazardous Organic NESHAP
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IDLH	Immediately Dangerous to Life and Health: the airborne concentration of a toxic material from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects.
IEEE	Institute of Electrical and Electronics Engineers
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
IQA	Institute of Quality Assurance
ISGOTT	International Safety Guide for Oil Tanker and Terminals
ISO	International Organization of Standardization

LFL	Lower Flammability Limit
MACT	Maximum Achievable Control Technology
MIL	Military
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NACCB	National Accreditation Council for Certification Board
NDE	Nondestructive Evaluation
NDT	Nondestructive Testing
NEC	National Electrical Code
NESHAP	National Emission Standard for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
OEM	Original Equipment Manufacture
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit. An occupational exposure limit established under OSHA's regulatory authority. It may be a time-weighted average (TWA) concentration or a maximum concentration never to be exceeded either instantaneously (CEILING) or during any 15-minute period (STEL).
Peroxides	Compounds containing the -O-O- linkage. They occur as impurities in many organic compounds, where they have been slowly formed by the action of oxygen.
PM	Preventative Maintenance
PPE	Personal Protective Equipment
ppm	parts per million
QA	Quality Assurance
QC	Quality Control
QMI	Quality Management Institute
RAB	Registrar Accreditation Board
RCRA	Resource Conservation and Recovery Act

RQ	Reportable Quantity
SARA	Superfund Amendment and Reauthorization Act
SCC	Standards Council of Canada
SPC	Statistical Process Control
SQC	Statistical Quality Control
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value; the TLV is a copyrighted exposure standard developed by the ACGIH, that refers to the airborne concentration of a substance under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. TLVs are expressed in four ways: (1) TLV-C; (2) TLV-STEL; (3) TLV-Skin; (4) TLV-TWA.
TLV-C	Threshold Limit Value - Ceiling Exposure Limit; the concentration that should not be exceeded during any part of the working exposure.
TLV-Skin	The "skin" notation after the TLV indicates that there is a potential for the cutaneous route (mucous membranes, eyes, skin) to significantly contribute to the overall exposure. Vehicles present in solutions or mixtures can also significantly enhance potential skin absorption. The skin designation is an alert that air sampling alone is insufficient to accurately quantitate exposure and that measures to prevent significant cutaneous absorption may be required.
TLV-STEL	Threshold Limit Value - Short Term Exposure Limit; the concentration to which it is believed that workers can be exposed continuously for a short period of time without suffering from 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded. A STEL is a 15-minute TWA exposure which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA. Exposures above the TLV-TWA up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range.
TLV-TWA	Threshold Limit Value - Time Weighted Average; the time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.
TOC	Total Organic Carbon
TPQ	Threshold planning quantity - under the Superfund Amendments Reauthorization Act (SARA Title III) Section 302, 304, 4311/312, a chemical specific quantity, in pounds, that triggers certain reporting requirements.
TQC	Total Quality Control
TQM	Total Quality Management

TWA	Time-Weighted Average
UL	Underwriters Laboratory
Ullage	Amount by which a packaging falls short of being liquid full
UN	United Nations
USCG	United States Coast Guard
Vapor Pressure	The pressure exerted by a volatile liquid while under defined equilibrium conditions. Vapor pressure is usually measured in millimeters of mercury (mm Hg).
VOC	Volatile Organic Compound