

Safe Handling and Storage of

1-Decene

and

1-Dodecene

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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 1-Decene (#PE0018) or 1-Dodecene (#PE0019). 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.

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INTRODUCTION

Gulf Oil Chemicals Company first commercialized the production of normal alpha olefins, Gulftene[®] alpha olefins, in 1965. Today, alpha olefin products are produced and marketed by Chevron Phillips Chemical Company (CPChem). This brochure covers the safe handling and storage of 1-decene (Alpha Olefin 10) and 1-dodecene (Alpha Olefin 12) alpha olefins. A brief description of typical applications of these products follows.

Oligomerization of 1-decene or 1-dodecene produces synthetic base fluids for high-performance lubricants and functional fluids. These oligomers or polyalphaolefin (PAO) fluids such as CPChem's Synfluid[®] PAO have excellent low temperature properties, high viscosity index and low volatility. These properties provide superior automotive, industrial and aerospace lubricants with greater efficiencies, longer service life and improved economics relative to mineral oil.

CPChem 1-decene and 1-dodecene are feedstocks for the production of surfactants (detergent alcohols and alkyl aromatics). Another use is in the production of linear alkyl benzene sulfonates, which are employed in dishwashing liquids, laundry detergents, all-purpose cleaners and lube-oil additives. Higher olefins, like 1-dodecene, are used to manufacture alkyl dimethyl amines (ADMAs), which are precursors to amine oxides, quaternary ammonium halides and betaines. The amine oxides are used as foam boosters in shampoos, bubble baths and dishwashing detergents. Quaternary ammonium halides are used as biocides, fungicides and antistatic agents, while betaines are mild amphoteric surfactants.

Other uses of 1-decene and 1-dodecene include the manufacture of C₁₁ plasticizer alcohols and C₁₃ synthetic detergent alcohols, respectively. Reaction with maleic anhydride produces alkenyl succinic anhydrides, which are used as dispersants in lube oils and automatic transmission fluids, and as pour-point depressants in lube and crude oils. Both 1-decene and 1-dodecene can be used in the manufacture of specialty chemicals such as epoxides and halogenated olefins. Also, 1-dodecene can be used to produce mercaptans and metal alkyls.

NOTE:

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PART 1

SPECIFICATIONS, PROPERTIES AND TEST METHODS

1-DECENE (C₁₀H₂₀) SALES SPECIFICATION

CHARACTERISTIC	METHOD	SPECIFICATION
Carbon Number, wt. % C ₁₀ , min.	GLC	98.5
n-Alpha Olefin, wt. %, min.	GLC	95.8
Vinylidene, wt. %, max.	GLC	3.6
cis- & trans-2-Decene, wt. %, max.	GLC	0.3
Paraffin, wt. %, max.	GLC	0.3
Color, Saybolt	ASTM D 6045	+30
Water, ppm by wt., max.	ASTM E 1064	100
Appearance	ASTM D 4176	Clear & Bright

Date Approved: February 6, 2002

The following technical data is for informational purposes only and is not a part of the sales specification for 1-Decene:

ADDITIONAL INFORMATION	METHOD	TYPICAL VALUE
API Gravity, 15.6°C/15.6°C (60°F/60°F)	ASTM D 287	58.5
Specific Gravity, 15.6°C/15.6°C (60°F/60°F)	ASTM D 287	0.745
Density, lb/gal, 15.6°C (60°F)	--	6.21
Flash Point, TCC, °C (°F)	ASTM D 56	48.9 (120)
Autoignition Temperature, °C (°F)	ASTM E 659	210 (410)

1-DODECENE (C₁₂H₂₄) SALES SPECIFICATION

CHARACTERISTIC	METHOD	SPECIFICATION
Carbon Number, wt. % C ₁₂ , min.	GLC	98.0
n-Alpha Olefin, wt. %, min.	GLC	94.6
Vinylidene, wt. %, max.	GLC	4.2
cis and trans 2-Dodecene, wt. %, max.	GLC	0.3
Paraffin, wt. %, max.	GLC	0.3
Color, Saybolt	ASTM D 6045	+30
Water, ppm by wt., max.	ASTM E 1064	100
Appearance	ASTM D 4176	Clear & Bright

Date Approved: February 7, 2002

The following technical data is for informational purposes only and is not a part of the sales specification for 1-Dodecene:

ADDITIONAL INFORMATION	METHOD	TYPICAL VALUE
API Gravity, 15.6°C/15.6°C (60°F/60°F)	ASTM D 287	54.1
Specific Gravity, 15.6°C/15.6°C (60°F/60°F)	ASTM D 287	0.762
Density, lb/gal, 15.6°C (60°F)	--	6.36
Pour Point, °C (°F)	ASTM D 97	-36.1 (-33)
Freezing Point, °C (°F)	ASTM D 1015	-35.0 (-31)
Flash Point, TCC, °C (°F)	ASTM D 56	77.2 (171)
Autoignition Temperature, °C (°F)	ASTM E 659	226 (439)

PROPERTIES

	<u>1-Decene</u>	<u>1-Dodecene</u>
Aniline Point ¹ , °C (°F)	44.1 (111.4)	--
API Gravity ¹ , 15.6°C (60°F)	58.51	53.96
Appearance	Clear & Bright	Clear & Bright
Autoignition Temperature ² , °C (°F)	210 (410)	226 (439)
Boiling Point ³ , °C		
<u>Vapor Pressure, mm of Hg</u>		
760	170.597	213.401
700	167.398	209.979
600	161.550	203.721
500	154.871	196.572
400	147.030	188.174
300	137.424	177.882
200	124.764	164.309
100	105.215	143.332
80	99.419	137.109
50	87.913	124.748
20	67.88	103.21
Coefficient of expansion at 60 °F per °F, Calculated ⁴	0.00060	--
Color		
Saybolt	+30	+30
Critical Density ³		
gm/cm ³	0.240	0.240
lb/ft ³	14.98	14.98
Critical Pressure ³		
atmosphere	21.021	18.653
lb/in ²	308.93	274.12
bar	21.300	18.900
Critical Temperature ³		
°K	616.9	666.0
°C	343.7	384.2
°R	1,110.4	1,198.8
°F	650.7	723.1

	<u>1-Decene</u>	<u>1-Dodecene</u>
Critical Volume ³		
cm ³ /gm-mole	584.5	700.5
ft ³ /lb-mole	9.363	11.22
ft ³ /lb	0.0667	0.0690
Critical PV/RT ^(ref 3)	0.243	0.232
Density of the Liquid ³ , gm/cm ³		
<u>Temperature, °C</u>		
10	0.7486	0.7730
20	0.7408	0.7584
25	0.7369	0.7547
<u>(Linear Least Squares Constants)⁵</u>		
(for units of gm/cm ³)		
m	-0.777272	-0.733454
b	0.756360	0.773040
Entropy of Vaporization ³ at Boiling Point, cal K-1 mol-1	20.82	21.22
Flammability Limits ² , vol%	0.7 lower to 5.9 upper	0.6 lower to 5.4 upper (Estimated)
Flash Point ² , (TCC), °C (°F)	48.9 (120)	77.2 (171)
Free Energy of Formation ³ at 25 °C, kcal/mole		
Gas, Ideal, State	28.64	32.76
Freezing Point ¹ , °C (°F)	-66.31 (-87.35)	-35.23 (-31.41)
Heat Capacity ³ at 25 °C, cal/gm-°C		
Gas	0.3775	0.3789
Liquid	0.5117	0.5121
Heat of Combustion of the Liquid ³ at 25 °C and Constant Pressure, Gross, kcal/mole		
H2O(l) +CO2(g)	1581.8	1894.3
H2O(g) +CO2(g)	1476.6	1768.1
Heat of Formation of the Gas ³ at 25 °C, kcal/mole	-29.80	-39.54
Heat of Vaporization at Boiling Point ³ , kcal/mole	9.24	10.27

	<u>1-Decene</u>	<u>1-Dodecene</u>
Ideal Gas Thermodynamic Properties ³	Heat Capacity, <u>cal/gm-mole-°C</u>	Heat Capacity, <u>cal/gm-mole-°C</u>
<u>Temperature, °C</u>		
0	49.82	59.99
25	53.50	64.43
100	64.15	77.28
500	106.30	128.02
1000	133.26	160.24
	Enthalpy, <u>cal/gm-mole</u>	Enthalpy, <u>cal/gm-mole</u>
<u>Temperature, °C</u>		
0	8,928	10,655
25	10,200	12,186
100	14,602	17,488
500	49,543	59,585
1000	110,280	132,703
Molecular Formula	C ₁₀ H ₂₀	C ₁₂ H ₂₄
Molecular Weight	140.27	168.32
Odor	Olefinic	Olefinic
Odor Threshold in Air ⁶ , (ppm)	7	--
Refractive index ³ ,		
<u>Temperature, °C</u>	<u>(N_D)</u>	<u>(N_D)</u>
20	1.42146	1.43002
25	1.41913	1.42782
Relative Density (Specific Gravity) ⁷ ,		
10 °C/15.6 °C	0.7493	0.7665
20 °C/15.6 °C	0.7415	0.7592
25 °C/15.6 °C	0.7376	0.7554
Relative Vapor Density (Air = 1) ⁷	4.8	5.8
Solubility of Product in Water ⁸ (ppmw), 20 °C (68 °F)	8.6	--
Surface tension ³ , dynes/cm		
<u>Temperature, °C</u>		
0	25.84	27.38
25	23.54	25.15
50	21.24	22.92
70	19.41	21.14
100	16.65	18.47

	<u>1-Decene</u>	<u>1-Dodecene</u>
Vapor Pressure at 300 °F ³ , mm Hg	422.1	121.9
<u>Antoine Coefficients⁹</u>		
A	6.93477	6.97607
B	1,484.98	1,621.11
C	195.707	182.449
Viscosity ³		
<u>Temperature, °C</u>	<u>Absolute Viscosity,</u> <u>centipoises</u>	<u>Absolute Viscosity,</u> <u>centipoises</u>
0	1.127	1.95
25	0.754	1.203
50	0.549	0.829
75	0.424	0.610
100	0.341	0.475
<u>Temperature, °C</u>	<u>Kinematic Viscosity,</u> <u>centiStokes</u>	<u>Kinematic Viscosity,</u> <u>centiStokes</u>
0	1.49	2.53
25	1.022	1.60
50	0.766	1.125
75	0.607	0.850
100	0.501	0.676

REFERENCES AND NOTES:

1. "Physical Constants of Hydrocarbon and Non-Hydrocarbon Compounds", 2nd edition, ASTM Data Series DS 4B, Philadelphia, PA, 1988.
2. Chevron Phillips Chemical Company Test Results
3. TRC Thermodynamic Tables-Hydrocarbon; The Texas A&M University System, College Station, TX 77843-3124.
4. "Physical Constants of Hydrocarbons C₁ to C₁₀", ASTM Data Series DS 4A, Philadelphia, PA, 1971
5. Density (gm/cm³) = [(m/1000) * (temperature (°C))] + b. For 1-decene and 1-dodecene, 0 °C ≤ Temperature ≤ 120 °C. Values are good to 4 decimal places up to 100 °C.
6. Stahl, W. H., Ed. Compilation of Odor and Taste Threshold Values Data. American Society for Testing and Materials, Philadelphia, PA, 1973.
7. Values are calculated
8. Natarajan, G.S.; Venkatachalam, K.A., J. Chem. Eng. Data, 1972, 17, 328.
9. Log₁₀P = A - B/ (C+t) (10 mm Hg ≤ P ≤ 1500 mm Hg, t in °C)

RECOMMENDED TEST METHODS

The following ASTM methods are recommended for the analysis of 1-decene and 1-dodecene:

1. ASTM D 56 Standard Test Method for Flash Point by Tag Closed Cup Tester
2. ASTM D 97 Standard Test Method for Pour Point of Petroleum Products
3. ASTM D 287 Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)
4. ASTM D 1015 Standard Test Method for Freezing Points of High-Purity Hydrocarbons
5. ASTM D 4176 Standard Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)
6. ASTM D 6045 Standard Test Method for Color of Petroleum Products by the Automatic Tristimulus Method
7. ASTM E 659 Standard Test Method for Autoignition Temperature of Liquid Chemicals
8. ASTM E 1064 Standard Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration

PART 2

SAMPLING AND HANDLING

TRAINING

In any workplace, training should be conducted before sampling and handling operations of 1-decene and 1-dodecene are undertaken. Several commercial websites provide access to the 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 1-decene or 1-dodecene.
2. Safe work and good housekeeping practices.
3. The importance of protection from 1-decene or 1-dodecene contact; the proper clothing and cleaning requirements to ensure worker protection.
4. Signs and symptoms of 1-decene or 1-dodecene exposure and action to be taken.
5. The care that must be taken whenever and wherever 1-decene or 1-dodecene is 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 MSDS for further information.
7. First aid measures to be used after exposure.
8. The availability of written 1-decene or 1-dodecene 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 PART 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:

If testing for water, peroxide or carbonyl contaminants, samples must be obtained using a gas cylinder. As a best practice, Chevron Phillips Chemical Company uses cylinders specified by 49 CFR, Subpart C, Section 178.36 (3A or 3AX seamless steel cylinders). The charging of these cylinders must conform to Section 173.302. Purge the cylinder with product before collecting the final sample. Ensure the appropriate outage be left for the liquid. For all other testing procedures and before sampling 1-decene or 1-dodecene, the nitrogen atmosphere within the storage container or transport vessel should be depressurized safely. 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). Also as required by DOT, an emptied 1-decene or 1-dodecene cylinder or bottle must retain the same

markings and labels used during its initial transport until the container has been sufficiently purged.

NOTE: Fresh air and 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 a 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 very 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.

REFERENCE DOCUMENTS:

ASTM E 300 –
Standard Practice for Sampling Industrial Chemicals

ANSI Z 288.1 –
Flammable and Combustible Liquids Code

API RP 500 –
Classification of Locations for Electrical Installation at Petroleum Facilities Classified as Class I, Division 1, and Division 2

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

Alpha olefins are characterized by high electrical resistivity (low conductivity), which can result in the buildup of excess static charge during transfer operations. Both 1-decene and 1-dodecene are classified as low vapor pressure products under the API RP 2003 Guidelines. At 37.8°C (100°F), 1-decene and 1-dodecene have vapor pressures of 3.76 and 0.41 mm Hg, respectively. However, a condition for ignition may exist if these products are handled at temperatures above their flash points 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 that was not flushed from the container. 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 personnel. These individuals must be properly instructed in the loading of hazardous materials and made responsible for careful compliance with 49 CFR, Parts 172 and 173. Workers should refer to their site's fire and safety guidelines for required personal protective equipment. Due to the combustible nature of 1-decene and 1-dodecene, use caution to avoid creating any sparks that could

ignite the product. As the product is being loaded/unloaded, static buildup can occur. Therefore, a ground cable must be placed on the container to prevent the buildup of static electricity. Use only clean, oil- and dirt-free, spark-resistant tools and implements.

The importance of thorough pre-trip and post-trip safety inspections cannot be overemphasized. The process of physical inspection 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 PART 5 of this brochure for further information.

WHEN LOADING OR UNLOADING A VESSEL OR BARGE:

Requirements for shipments of combustible liquids over water are defined in 46 CFR. Additionally, barge shipments are regulated by the U.S. Coast Guard and the regulations are published in 46 CFR, Part 151. Refer to current International Safety Guide for Oil Tankers and Terminals (ISGOTT) and United States Coast Guard (USCG) rules (46 CFR, Part 153) for regulations governing transportation by sea-going vessels. Chevron Phillips Chemical Company and independent inspectors ensure that 1-decene and 1-dodecene are loaded in uncontaminated tanks.

Plan and control the loading and unloading of 1-decene or 1-dodecene to limit personnel exposure and environmental releases. OSHA and the U.S. Coast Guard have published regulations applicable to personnel involved in the handling of these products. Some of the key elements are:

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

To reduce exposure of personnel to 1-decene or 1-dodecene, gauging on the barge should consist of a closed device for use during transfer of product and a restricted device to determine product quantity during transfer. At ambient temperatures, vapor return lines are not usually required.

Clean stainless steel tanks, rust-free mild steel tanks or suitably washed steel tanks are acceptable for transport of 1-decene or 1-dodecene. ChevronTexaco Shipping 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 1-decene and 1-dodecene are shipped. The contractor should have facilities to dispose of residual product in an acceptable manner.

WHEN LOADING OR UNLOADING TANK CARS:

General Purpose (GP) tank cars in the Chevron Phillips Chemical Company fleet are DOT 111A100W1 rated and are stenciled accordingly. They are insulated, have exterior heating coils and are equipped with both top and bottom loading/unloading valves.

Loading

Erect track warning signs, set hand brakes, place wheel chocks, turn on track warning lights (if available) and connect ground cable. Inspect tank car exterior for any damage or flags and verify that all appliances and test dates are in compliance. Check tank car for pressure. Loosen dome cover bolts slightly leaving two (2) bolts hand tight. 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 cargo. 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, stop loading immediately. 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 the car is internally coiled. Placard car accordingly on all four placard holders (see PART 5). Remove wheel chocks and warning signs. Turn off track warning lights.

Unloading

Erect track warning signs, set hand brakes, place wheel chocks, turn on track warning lights (if available) and connect ground cable. Relieve tank pressure gradually by slowly opening vent valve and loosening dome (manhole cover). 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 there is no leakage, 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 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. Leave appropriate placards in place until tank car is cleaned. Remove wheel chocks, ground cable, and caution signs. Turn off track warning lights.

WHEN LOADING OR UNLOADING TANK TRUCKS

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

Loading

Place 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. Purge trailers with nitrogen. Visually inspect trailer exterior for damage and inspection dates.

Open product line and start pump. Check bottom unload valve for leakage. When loading is complete, 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 wheel chocks and ground cable. Apply proper placards to trailer for 1-decene and 1-dodecene shipments.

Unloading

Place 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 making sure 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 complete, 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 wheel chocks

and ground cable. 1-Decene and 1-dodecene trailers retain placards until trailer is cleaned.

SAFETY REFERENCES

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

NFPA 10 –
Standard for Portable Fire Extinguishers

NFPA 11 –
Standard for Low-, Medium-, and High-Expansion Foam Systems

NFPA 30 –
Flammable and Combustible Liquids Code

NFPA 70 –
National Electrical Code®

NFPA 77 –
Recommended Practice on Static Electricity

**Manual Sheet TC-4,
Chemical Manufacturer's Association**
Recommended Practice for Unloading
Flammable Liquids from Tank Cars.

PART 3

STORAGE DESIGN RECOMMENDATIONS

STORAGE TANKS

Storage tanks for 1-decene or 1-dodecene 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 to local regulations. A rule of thumb commonly used for determining the size of customer 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 that may build up during filling.

A nitrogen blanketing system is necessary for applications where the product is going to be stored for long periods of time and peroxides and/or carbonyls would present a problem in the process. A nitrogen system that maintains positive pressure and adds nitrogen as the product is withdrawn, and as the tank breathes, prevents the introduction of air that can cause peroxide buildup in the product and keeps moisture from condensing in the tank. Free water will settle out in the bottom of the tank and will normally not be seen until the tank is stripped. Dissolved water up to the saturation level may be found in the product. If water is a critical contaminant, an olefin sample should be

tested periodically and withdrawn through the sump. When peroxide and carbonyl development is a concern, use a closed handling system that maintains a nitrogen atmosphere on the product through the loading, unloading and other handling activities to minimize exposure to atmospheric oxygen.

CPChem 1-dodecene has a freezing point of -35°C (-31°F) and therefore does not normally require heating or an insulated tank. Heating or insulation is not necessary for 1-decene, since this product freezes at -66°C (-87°F).

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 of time. 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 be seen until the tank is stripped. Rust can be avoided by having storage tanks lined with zinc, epoxy or another coating that is compatible with these products.

Exercise care in selecting the gasket and seal materials to be used. White Canadian Asbestos, Teflon® and glass impregnated Teflon®, have proven to be compatible with these products.

Coat storage tanks with reflective paint to reduce temperature fluctuations.

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.

Tanks should be periodically inspected for leaks and serviced in accordance with the principle of API Standard 653.

Workers should never be permitted to enter an empty tank which has been used for 1-decene or 1-dodecene 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 and limitations on concentrations of 1-decene or 1-dodecene.

API AND ANSI DESIGN REFERENCES

American Petroleum Institute
1220 L Street, NW
Washington, DC 20005

Part I - Design

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

Part II - Installation

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

API Standard 620: *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*

API Standard 650: *Welded Steel Tanks for Oil Storage*

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

API Standard 2000: *Venting Atmospheric and Low-Pressure Storage Tanks; Nonrefrigerated and Refrigerated*

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

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

API RP 2028: *Flame Arresters in Piping Systems*

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

API RP 2350: *Overfill Protection for Storage Tanks in Petroleum Facilities*

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, New York 10036

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

ANSI B31: *Interpretations of Code for Pressure Piping*

PARTICULATE MATTER

CPCHEM 1-decene and 1-dodecene 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 Company's Customer Technical Service Group at 800-852-5531 for recommendations. Inspect and renew filter cartridges periodically.

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 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 make recommendations regarding the proper type of pump if the following parameters are known: 1) flow rate, 2) size and length of suction and discharge lines, 3) suction and discharge pressures, and 4) 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 flammable or combustible materials and reduce vapor emissions of product at elevated temperatures into the atmosphere. 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 Standard 682.

2. Pumps in conformance with API Standard 610.
3. Pumps 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 flexible die-formed rings with flexible braided end-rings.

⁽²⁾ Used for field repacking.

PIPELINES

The following are recommended practices in engineering pipelines for 1-decene or 1-dodecene:

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. Bellows valves for 2-inch and smaller lines are recommended to eliminate emissions from packing glands.

VAPOR CONTROL SYSTEMS

Evaporative emissions from 1-decene and 1-dodecene are not regulated by the Federal Clean Air Act. However, some states and localities may regulate emissions of these materials. Check local regulations in the facility's state.

PART 4

HEALTH, ENVIRONMENT, FIRE, AND ACCIDENTAL RELEASE INFORMATION

In animal studies, 1-decene and 1-dodecene have shown a low level of toxicity following exposures using the oral, dermal or inhalation routes. However, due to their combustibility, these materials require special handling.

Material Safety Data Sheets (MSDS) for 1-decene and 1-dodecene are available from Chevron Phillips Chemical Company to help customers further satisfy safe handling and disposal needs and OSHA Hazard Communication Standard requirements. Such information should be requested and studied prior to working with these products. Please call Chevron Phillips Chemical Company at 800-852-5530 to request the MSDS for either of these products.

NOTE:

The following information is not intended to, nor does it, amend or replace the MSDS for 1-decene or 1-dodecene. The most current MSDS should be carefully examined prior to working with these products.

HEALTH HAZARDS AND FIRST AID

EYE CONTACT: Neither 1-decene nor 1-dodecene is expected to cause prolonged or significant eye irritation. **First Aid:** No first aid procedures are required. As a precaution remove contact lenses, if worn, and flush eyes with fresh water.

SKIN CONTACT: Contact of 1-decene or 1-dodecene with skin causes skin irritation but is not expected to cause allergic skin responses. Prolonged or frequently repeated contact may cause the skin to become cracked or dry from the defatting action of either material. If absorbed through the skin, these materials are considered practically non-toxic to internal organs. The acute dermal LD50 in rats for both materials is >10g/kg. **First Aid:** Remove contaminated clothing and shoes. Wash skin thoroughly with soap and

water. Wash or clean contaminated clothing and shoes before reuse.

INGESTION: If swallowed, these materials are considered practically non-toxic to internal organs. The acute oral LD50 in rats for both materials is >10 g/kg. Because of the low viscosities of 1-decene and 1-dodecene, either substance can directly enter the lungs if it is swallowed or vomited. Once in the lungs, the substances are very difficult to remove and can cause severe injury to the lungs or 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.

INHALATION: With respect to short-term inhalation exposures, based on results of animal testing, 1-decene and 1-dodecene are practically non-toxic (LC50 for 1-decene >8.7 g/m³ [4 hr, rat]; LC50 for C12-C16 alpha olefin blend >9.9 g/m³ [1 hr, rat]). However, excessive or prolonged breathing of these materials may cause respiratory irritation or central nervous system (CNS) effects which may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion or disorientation. At extreme exposures, CNS effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death. **First Aid:** If symptoms occur, 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.

ECOTOXICITY/ENVIRONMENTAL FATE

ECOTOXICITY: Based on the results of testing with similar materials, 1-decene and 1-dodecene are not expected to be harmful to aquatic organisms.

ENVIRONMENTAL FATE: Based on the results of 28-day ready biodegradability tests for similar materials, 1-decene and 1-dodecene are expected to be readily biodegradable.

FIRE INFORMATION

FLAMMABILITY PROPERTIES:

<u>Critical Properties</u>	<u>1-Decene</u>	<u>1-Dodecene</u>
Flash Point (TCC), °C (°F):	48.9 (120)	77.2 (171)
Autoignition Temperature, °C (°F):	210 (410)	222 (432)
Flammable Limits in Air: Vol %	0.7-5.9	0.6-5.4
Burning Rate ⁽¹⁾ : mm/min.	6.0	5.8
NFPA Fire Hazard Rating:	2	2
Behavior in Fire:	For both products vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.	

⁽¹⁾ The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by Burgess et.al., in Fire Research Abstracts and Reviews, 3, 177 (1961).

Do not use or store 1-decene or 1-dodecene 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 be properly disposed of. Static hazards should be eliminated to prevent ignition. Refer to the Static Electricity subsection in PART 2 for further information.

FIRE HAZARDS:

DOT and OSHA classify 1-decene as flammable and combustible, respectively. Both federal agencies classify 1-dodecene as combustible. These materials are fire hazards. Liquid evaporates and forms vapor (fumes), which can catch fire and burn with explosive force. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater when handling a product at a temperature within 20 degrees below its flash point.

FIRE FIGHTING INSTRUCTIONS AND COMBUSTION PRODUCTS:

For fires involving either material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus (SCBA) to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Normal combustion forms carbon dioxide and water vapor, while incomplete combustion can produce carbon monoxide.

Fires involving 1-decene or 1-dodecene can be safely extinguished 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. Minimize spread to reduce cleanup cost.

PERSONAL PROTECTIVE EQUIPMENT & OCCUPATIONAL EXPOSURE LIMITS

PERSONAL PROTECTIVE EQUIPMENT:

If user operations generate airborne material, use process enclosures, local exhaust ventilation or other engineering controls to

control exposure. As a good safety practice, wear safety glasses with side shields or chemical goggles when working with these materials. 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. If exposure to airborne material may occur, wear a NIOSH/MSHA approved air-supplying respirator when working with these materials.

ANSI REFERENCES:

- ANSI Z41.1 Protective 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 Z358.1 Emergency Eyewash and Shower Equipment

OCCUPATIONAL EXPOSURE LIMITS:

	<u>1-Decene</u>	<u>1-Dodecene</u>
OSHA Permissible Exposure Limit:		
8-Hour Time Weighted Average (TWA):	none	none
	established	established

	<u>1-Decene</u>	<u>1-Dodecene</u>
ACGIH Threshold Limit Value:		
8-Hour Time Weighted Average (TWA):	none	none
	established	established

ACCIDENTAL RELEASE MEASURES

If a transportation incident involving 1-decene or 1-dodecene does occur, the Chemical Transportation Emergency Center (CHEMTREC) should be contacted for

immediate assistance. CHEMTREC is a public service organization established by the American Chemistry Council to provide assistance in hazardous 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.**

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 1-decene or 1-dodecene has occurred, eliminate all sources of ignition in vicinity of spill or released vapor. 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
 27 West 045 St. Charles Road
 Carol Stream, IL 60188
 Phone: (630) 293-3111

Where feasible and appropriate, remove contaminated soil. Follow the 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 1-decene or 1-dodecene has been removed. There is no Reportable Quantity (RQ) for 1-decene or 1-dodecene under CERCLA section 302.4.

Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of either 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 federal, state and local regulations.

Recovered liquid 1-decene or 1-dodecene, from a spill or contaminated product, may be reprocessed. However, if the product cannot 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 Company's Customer Technical Service Group at 800-852-5531 if additional assistance is required.

PART 5

TRANSPORTATION INFORMATION AND REGULATORY PROFILES

TRANSPORTATION INFORMATION

LABELING OF 1-DECENE AND 1-DODECENE SHIPPING CONTAINERS:

Containers should be labeled in accordance with applicable OSHA and DOT requirements.

Identification numbers are required 1) on each side and each end of bulk packaging, if the packaging capacity is 1000 gallons or more or, 2) on two opposing sides if the packaging capacity is greater than 119 gallons but less than 1000 gallons. Markings for non-bulk packaging (119 gallons or less) include the proper shipping name, identification number preceded by UN or NA, the technical name if applicable and the consignee or consignor's name and address.

Labels are required on non-bulk packages and must be located on the same surface and near the marking.

Placards are required on each side and each end of bulk packaging.

Requirements concerning marking, labeling, placarding, and the preparation of shipping papers vary somewhat depending on the transport mode, packaging configuration, and quantity of hazardous material being transported.

DOT marking, labeling, and placarding requirements are explained in detail in 49 CFR, Part 172, Subparts D, E, and F respectively. Subparts E and F show sample labels and placards. Labels and placards applicable to flammable liquids are required for 1-decene (see Figure 1). Bulk containers should remain placarded when emptied unless the special requirements of Subpart F are met. Requirements for OSHA labels are presented in 29 CFR 1910.1200.

Note: The preceding information is subject to frequent change. Consult DOT and OSHA regulations for current requirements.



Figure 1: Example of 1-decene or 1-dodecene DOT placard



BILL OF LADING DESCRIPTION (DOT):

	<u>1-Decene</u>	<u>1-Dodecene</u>
Bulk Truck Bill of Lading Description:	HYDROCARBONS, LIQUID, N.O.S. (1-DECENE), 3, UN3295, III	HYDROCARBONS, LIQUID, N.O.S. (1-DODECENE), COMBUSTIBLE LIQUID, UN3295, III
Bulk Rail Bill of Lading Description:	HYDROCARBONS, LIQUID, N.O.S. (1-DECENE) // 3 // UN3295 // III // HAZMAT STCCI12285	HYDROCARBONS, LIQUID, N.O.S. (1-DODECENE) // COMBUSTIBLE LIQUID // UN3295 // III // HAZMAT STCCI14026
Package Bill of Lading Description:	HYDROCARBONS, LIQUID, N.O.S. (1-DECENE), 3 UN3295, III	Not Regulated by DOT

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

CHEMICAL DESIGNATIONS:

CG Compatibility Class:	Olefin	Olefin
Formula:	C ₁₀ H ₂₀	C ₁₂ H ₂₄
IMO/UN Designation:	UN3295	UN3295
DOT ID No.:	UN3295	UN3295
CAS Registry No.:	872-05-9	112-41-4

INTERNATIONAL MARITIME ORGANIZATION (IMO):

Proper Shipping Name:	HYDROCARBONS, LIQUID, N.O.S. (1-DECENE)	Not regulated by IMO
Class:	3	
UN Number:	UN 3295	
Pollution Category:	B	

SHIPPING INFORMATION:

Grades of Purity (n-Alpha Olefin, wt. %):	96+%(¹)	95+%(¹)
Storage Temperature:	Ambient	Ambient
Inert Atmosphere:	No requirement(²)	No requirement(²)
Venting:	Open (flame arrester) or pressure-vacuum	

(¹) The data are for informational purposes only.

(²) As a best practice, Chevron Phillips Chemical Company recommends purging shipping containers with nitrogen for extended transportation.

HAZARD CLASSIFICATIONS

	<u>1-Decene</u>	<u>1-Dodecene</u>
OSHA (29 CFR 1910.1200):	Combustible Liquid	Combustible Liquid
American National Standards Institute Precautionary Labeling Standard (1994):	Flammable Liquid	Combustible Liquid
U.S. Dept. of Transportation (49 CFR 173.120):	Flammable Liquid	Combustible Liquid
EU Dangerous Substance Directive (93/21/EEC):	Flammable Liquid	Not Classified as Flammable or Combustible
National Fire Protection Association (NFPA 30):	Class II Combustible Liquid	Class IIIA Combustible Liquid

NFPA HAZARD CLASSIFICATION:

<u>Category</u>	<u>Classification</u>	
Health Hazard (Blue)	1 ⁽¹⁾	1 ⁽¹⁾
Flammability (Red)	2	2
Reactivity (Yellow)	0	0

⁽¹⁾ Based on data indicating that 1-decene and 1-dodecene cause skin irritation.

Various restrictions apply to the preceding classifications. Please refer to the specific regulation for details concerning classification requirements. 46 CFR, Parts 150-154 should also be referenced for information about U.S. Coast Guard regulations governing the transport of 1-decene and 1-dodecene.

REGULATORY PROFILES

1-DECENE:

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

TSCA: Is this product or its components subject to any of the following TSCA requirements of 40 CFR?

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**

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

TSCA	(United States)	YES	(CAS Reg. No. 872-05-9)
DSL	(Canada)	YES	
EINECS	(Europe)	YES	(EINECS Reg. No. 212-819-2)
METI	(Japan)	YES	(ENCS Reg. No. 2-27X)
AICS	(Australia)	YES	
ECL	(Korea)	YES	(KMOE Reg. No. KE-09498)
PPICS	(Philippines)	YES	
IECS	(China)	YES	

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

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

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**

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects:	YES
2. Delayed (Chronic) Health Effects:	NO
3. Fire Hazard:	YES
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

ADDITIONAL REGULATORY INFORMATION: See CPChem MSDS PE0018, Section 15 for additional regulatory information.

1-DODECENE:

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

TSCA: Is this product or its components subject to any of the following TSCA requirements of 40 CFR?

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**

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

TSCA	(United States)	YES	(CAS Reg. No. 112-41-4)
DSL	(Canada)	YES	
EINECS	(Europe)	YES	(EINECS Reg. No. 203-968-4)
METI	(Japan)	YES	(ENCS Reg. No. 2-27X)
AICS	(Australia)	YES	
ECL	(Korea)	YES	(KMOE Reg. No. KE-12898)
PPICS	(Philippines)	YES	
IECS	(China)	YES	

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

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

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**

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects: **YES**
2. Delayed (Chronic) Health Effects: **NO**
3. Fire Hazard: **YES**
4. Sudden Release of Pressure Hazard: **NO**
5. Reactivity Hazard: **NO**

ADDITIONAL REGULATORY INFORMATION: See CPChem MSDS PE0019, Section 15 for additional regulatory information.

REVISION HISTORY

This revision replaces the version titled 1-Decene 1-Dodecene 2005 rev 0.DOC. The following sections have been updated and should be reviewed by the user.

June 12, 2006

Part 5 International Maritime Organization (IMO) Class

page 24

Part 5 Regulatory Profiles – International Registrations

page 26 and 27

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 (The CE-mark is the official marking required by the European Community)
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
Flash Point	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 for 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 quantify 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 work week, 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) Sections 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 reported in millimeters of mercury (mm Hg) at specified temperatures.
VOC	Volatile Organic Compound