



**Qatar Chemical Company II Limited
(Q- Chem II)**

Safe Handling and Storage of

Alpha Olefin Waxes

*C20-24, C24-28
and C30+*



OPERATIONAL EXCELLENCE POLICY

We will strive each day to conduct our business in a safe, secure, injury-free, and environmentally responsible manner. We are committed to comply with all laws and regulations applicable to our facilities and business activities and to comply with all voluntary programs to which we elect to subscribe such as Responsible Care® and International Organization for Standardization (ISO) etc. We will strive to make optimal use of the resources we consume and minimize emissions and waste. We will strive to limit the risks of our products throughout their lifecycle. We are committed to reducing risks in our operations to safeguard our employees, contractors, and the communities where we operate and engage in business activities. We are committed to protect information, critical infrastructures and information systems to maintain confidentiality, integrity and availability. We will openly communicate our results and welcome the input of our employees and contractors, regulatory agencies, our communities, our customers, and other interested stakeholders.

We will accomplish this by integrating safety, physical and cyber security, health, environmental, reliability, and quality into our management processes using our Operational Excellence System (OE). OE will be used facility wide to: set goals for continual improvement; provide alignment of activities and resources; assess and manage risks; gain stakeholder input; and, rigorously audit our performance against operational objectives and compliance requirements.

**Chief Executive Officer
Q-Chem**

**OPERATIONAL
EXCELLENCE
SYSTEM**

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PRODUCT STEWARDSHIP

Qatar Chemical Company II Ltd (“Q-Chem II”) 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. Qatar Chemical Company II Ltd (“Q-Chem II”) 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 Qatar Chemical Company II Ltd Safety Data Sheet (SDS) for C20-24, C24-28 and C30+. The most current SDS can be obtained from Qatar Chemical Company II Ltd at www.qchem.com.qa or by calling (974) 4 484 -7110 and should be carefully examined prior to working with this products.

INTRODUCTION

Gulf Oil Chemicals Company first commercialized the production of normal alpha olefins, Gulftene® alpha olefins, in 1965. Alpha olefin products are being manufactured by Qatar Chemical Company II Ltd (Q-Chem II) under licensed from Chevron Phillips Chemical Company (CPChem) and sold/distributed by Muntajat. This brochure covers the safe handling and storage of alpha olefins C20-24, C24-28 and C30+. A brief description of typical applications of these products follows.

Qatar Chemical Company II Ltd (Q-Chem II) alpha olefins C20-24, C24-28 and C30+ are utilized in the production of copolymers. These products when reacted with phenol or benzene (and after further processing to sulfonate salts) produce lubricating oil additives.

Specialty chemicals, such as epoxides, are produced using alpha olefins C20-24 and C24-28. Epoxides are used to produce epoxy resins and polyether ingredients in polyurethanes. Halogenated olefins can be manufactured from all five olefin cuts via reaction with halogen gases. Chlorinated alpha olefins C20-24 are incorporated as a secondary plasticizer in PVC formulations. Other end product uses of chlorinated and brominated alpha olefins include fire retardant agents in films and stable, high pressure additives in metal working fluids. Derivatives of alpha olefins above C20 find uses in lube oils, transmission fluids and as pour-point depressants in lube and crude oil. These wax fractions can also be chemically modified to make polishes or using their physical properties in candles. These waxes can be emulsified for coating applications such as particleboard coating. Furthermore, the physical properties of alpha olefin C30+ allow them to be used as lubricants in polyvinylchloride (PVC) extrusion.

THIS BROCHURE DOES NOT AMEND OR REPLACE OFFICIAL PUBLICATIONS, SAFETY REGULATIONS NOW IN USE, SAFETY DATA SHEETS OR COMMERCIAL TERMS OF SALE. QATAR CHEMICAL COMPANY II Ltd (Q-Chem II) 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, TYPICALS AND TEST METHODS

ALPHA OLEFIN C20-24, ALPHA OLEFIN C24-28, AND ALPHA OLEFIN C30+ SALES SPECIFICATION

Please reference the Qatar Chemical Company II Ltd website for sales specifications at www.qchem.com.qa

PROPERTIES

Property	Method	C20-24	C24-28	C30+
Carbon Number, wt. % <C ₁₈	GLC	0.00	---	---
Carbon Number, wt. % C ₁₈	GLC	1.47	---	---
Carbon Number, wt. % C ₂₀	GLC	40.93	---	---
Carbon Number, wt. % <C ₂₂	GLC	---	---	0.00
Carbon Number, wt. % C ₂₂	GLC	34.90	0.32	0.00
Carbon Number, wt. % C ₂₄	GLC	21.73	---	---
Carbon Number, wt. % C ₂₆	GLC	0.95	---	---
Carbon Number, wt. % >C ₂₆	GLC	0.01	---	---
Carbon Number, wt. % C ₂₄₋₂₈	GLC	---	80.62	12.17
Carbon Number, wt. % C ₃₀₊	GLC	---	19.05	87.82
n-Alpha Olefin, wt. %	NMR	89.3	72.2	69.70
Vinylidene, wt. %	NMR	8.0	---	---
cis and trans 2-Olefin, wt. %	NMR	0.3	---	---
Linear Internal Olefins, wt. %	NMR	---	2.8	2.90
Branched Olefins, wt. %	NMR	---	24.2	26.70
Paraffin, wt. %	Calculated	0.3	---	---
API Gravity at 60 °F/60 °F (15.6 °C/15.6 °C)	ASTM D 287	42.5	40.0	38.17
Specific Gravity (Solid), 60°F/60°F (15.6°C/15.6°C)	ASTM D 287	0.81	0.82	0.83
Density, lb/gal, 60°F (15.6°C)	---	6.41	6.50	6.58
Water, ppm by wt.	ASTM E 1064	23.28	---	---
Melting Point, °F (°C)	ASTM D 87	96 (35.6)	143 (61.7)	---



Congealing Point, °F (°C)	ASTM D 938	---	126 (52.2)	162 (72.2)
Drop Melt Point, °F (°C)	ASTM D 127	---	151 (66.1)	---
Autoignition Temperature, °F (°C)	ASTM E 659	462 (239) ⁽⁴⁾	653 (345)	694 (368) ⁽⁴⁾
Flash Point, PM, °F (°C)	ASTM D 93	362 (183)	425 (218)	485 (252)

Property	Method	C20-24	C24-28	C30+
Viscosity, 210 °F (99 °C)				
- Kinematic, cSt	ASTM D 445	2.1	2.5	6.69
- Saybolt, SUS	ASTM D 2161	33	35	52
Penetration, 0.10 mm				
@ 77 °F (25 °C)	ASTM D 1321	150	59	13
@ 100 °F (37.8 °C)			99	24
@ 110 °F (43.3 °C)			162	34
Color, Saybolt	ASTM D 156	30	26	---
Appearance	ASTM D 4176	(2)	(2)	---
Boiling Point, oC (@ 760 mmHg)	(3)	342 - 390	390 - 430	---
Distillation, °F (°C)				
IBP	ASTM D 1160 (5mm)	---	190 (87.8)	204 (95.6)
5%			436 (224.4)	461 (238.3)
95%			582 (305.6)	643 (339.4)
EP			608 (320.0)	693 (367.2)

- (1) The nominal properties herein are typical of the product but do not reflect normal production and testing variances and therefore should not be used for specification purposes. Values are rounded.
- (2) Clear and Bright
- (3) Values correspond to the range of initial boiling points and were obtained from TRC Thermodynamic tables-Hydrocarbon; The Texas A&M University System, College Station, TX 77843-3124
- (4) Experimental results

RECOMMENDED TEST METHODS

The following ASTM methods¹ are recommended for the analysis of alpha olefins C20-24, C24-28 and C30+:

1. D 70 Test Method for Specific Gravity and Density of Semi-Solid Bituminous Materials, Vol. 04.03 (This method has been modified.)
2. D 87 Test Method for Melting Point of Petroleum Wax (Cooling Curve), Vol. 05.01
3. D 93 Test Method for Flash Point by Pensky-Martens Closed Cup Tester, Vol. 05.01
4. D 127 Test Method for Drop Melting Point of Petroleum Wax, Including Petrolatum, Vol. 05.01
5. D156 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method), Vol. 05.01
6. D 287 Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method), Vol. 05.01
7. D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity), Vol. 05.01
8. D 938 Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum, Vol. 05.01
9. D 1160 Test Method for Distillation of Petroleum Products at Reduced Pressure, Vol. 05.01 (Conducted at 5 mm Hg of Pressure)
10. D 1321 Test Method for Needle Penetration of Petroleum Waxes, Vol. 05.01
11. D 2161 Practice for Conversion of Kinematic Viscosity to Saybolt Universal Viscosity or to Saybolt Furol Viscosity, Vol. 05.01
12. D 4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures), Vol. 05.02
13. E 659 Test Method for Autoignition Temperature of Liquid Chemicals, Vol. 14.02
14. E 1064 Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration, Vol. 15.05

Notes:

¹1996 Annual Book of ASTM Standards

PART 2

SAMPLING AND HANDLING

TRAINING

In any workplace, training should be conducted before sampling and handling operations of alpha olefins C20-24, C24-28 and C30+ 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 alpha olefins C20-24, C24-28 and C30+.
2. Safe work and good housekeeping practices.
3. The importance of protection from alpha olefins C20-24, C24-28 and C30+ contact; the proper clothing and cleaning requirements to ensure worker protection.
4. Signs and symptoms of alpha olefins C20-24, C24-28 and C30+ exposure and action to be taken.
5. The care that must be taken whenever and wherever alpha olefins C20-24, C24-28 and C30+ 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 MSDS for further information.
7. First aid measures to be used after exposure.
8. The availability of written alpha olefins C20-24, C24-28 and C30+ 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:

Alpha olefins C20-24, C24-28 and C30+ samples are collected in screw top metal containers in lieu of glass bottles. Label the metal containers according to OSHA Regulations (refer to 20 CFR 1910.1200).

Note – Appropriate eye protection and thermally insulated and chemically resistant gloves should be used when sampling heated material. When vapor or fumes from the heated material are not adequately controlled, wear a NIOSH/MSHA approved respirator. See Section 4 for further details.

Emphasis should be placed on cleanliness and dryness. The metal container and its holder must be CLEAN AND DRY. After the sample has been heated, transfer the liquefied sample to another metal container for storage. A pint size, screw cap, metal container is used to store the waxes.

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:

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

ASTM D 4057	Petroleum Refineries Standard Practice for Manual Sampling of Petroleum and Petroleum Products
ASTM D 4177	Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
ASTM E 300	Practice for Sampling Industrial Chemicals

STATIC ELECTRICITY AND GROUNDING

These materials 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 points, flammable vapors will not develop. However, a condition for ignition may exist, if the products are handled at temperatures near 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 which was not flushed from the storage tank. This type of loading is commonly called "switch loading". Finally, the effects of the elevated temperatures, to maintain liquefied product, upon the vapor pressure of any contaminants or previous cargo, must be considered.

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 Alpha olefins C20-24, C24-28 and C30+.

Workers should refer to their site's fire and safety guidelines for personal protective equipment. Though considered noncombustible, use caution to avoid creating any sparks which could ignite the product. As the product is being loaded, 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 safety inspection cannot 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. Product at elevated temperatures may be allowed to cool and solidify. Solidified material can be scooped up. Drums and trucks can be used for temporary storage until product can be recycled or disposed of properly. See Section 4 for further information.

WHEN LOADING OR UNLOADING A VESSEL OR BARGE:

The United States Coast Guard classifies these materials 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 Alpha olefins C20-24, C24-28 and C30+ to limit personnel exposure and environmental releases. OSHA and the U.S. Coast Guard (CFR 46) have published regulations applicable to people involved in the handling of bulk chemical materials. Some of the key elements are:



Employee Training
Personal Protective Equipment
Warning Signs

These products are heated prior to loading/unloading. During transport by ship, the product is heated. Average product temperatures are as follows:

Product	Melting Point, °C (°F)	Shipping Temperature, °C (°F)
C20-24 NAO	35 (95)	52-82 (131-180)
C24-28 NAO	63 (145)	71-90(160-194) ⁽¹⁾
C30+ NAO	--	82-90 (180-194) ⁽¹⁾

⁽¹⁾Many tank linings used by vessels have an upper temperature rating of 185 °F.

Barges are not normally heated during transit and may require steaming prior to unloading. Transfer lines should be insulated and steam-traced. Clean stainless steel, rust-free mild steel tank or suitably washed steel tanks are acceptable for transport of these products. Barges should be carefully selected to ensure that product quality is not negatively affected during transport. Qualified contractors should be used to inspect, clean and repair barges in which alpha olefins C20-24, C24-28 and C30+ 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 should be DOT 111A100W1 and are stenciled accordingly. They are insulated with exterior heating coils and equipped with both top and bottom loading/unloading valves.

The melting point of these products is such that they require a coiled rail car for storage and transportation. Average product temperatures are as follows:

Product	Melting Point, °C (°F)	Shipping Temperature, °C (°F)
C20-24 NAO	35 (95)	52-82 (131-180)
C24-28 NAO	63 (145)	71-90(160-194)
C30+ NAO	--	82-90 (180-194)

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 bolts hand tight. Check tank car for pressure. Open dome carefully and inspect car interior for cleanliness and liquid or wax heel. If a liquid or wax 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.

The dome may be opened for sampling, gauging, and/or to assure emptiness of the vehicle. Inbound product should be visually inspected. Tank cars should be cleaned and prepared for shipment in accordance with DOT regulations prior to releasing. Shipment of these products requires a coiled and insulated compartment maintained within an appropriate temperature range (see Table on page 11). Liquefaction of a 20 M-gallon tank of alpha olefins C20-24, C24-28 and C30+ from ambient temperature requires approximately 1-2 days of heating (see storage tank temperatures listed in Part 3). Rate of liquefaction will vary by heat and application location.

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.

The melting point of these products is such that they require a coiled and insulated vessel for storage and transportation. Care should be exercised depending on the weather conditions and number of days in transit. Use the average product shipping temperatures listed in the "When Loading or Unloading Tank Cars" section.

Arranging for "In Transit Heat" is often appropriate via tank truck. This system utilizes the tractor's radiator heat system as an aid in minimizing temperature loss during transportation.

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. 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. 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. Apply proper placards to trailer for alpha olefins C20-24, C24-28 and C30+ HA shipments if the material is kept heated.

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. Trailers transporting alpha olefins C24-28 and C30+ retain placards and "HOT" markings until cleaned (See Part 5). 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.



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 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.

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.

All products require a coiled and insulated tank. Storage tanks must be clean and dry before receiving this product. The product should be maintained within a specified temperature range and circulated once a week while steam is being applied and the tank is static.

The pour points of alpha olefins C20-24 and C24-28 and the congealing points of alpha olefins C30+ require these products to be stored in coiled and insulated tanks. Product lines should be insulated and steam-traced.

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 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. These products 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 these products.

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 alpha olefins C20-24, C24-28 and C30+ 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, NY 10036

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

ANSI B31: *American National Code of Pressure Piping*

PARTICULATE MATTER

Qatar Chemical Company II Ltd alpha olefins C20-24, C24-28 and C30+ are free of foreign matter when produced. However, some foreign matter may contaminate the product in the course of being transferred, stored or transported.

Foreign matter may be avoided by:

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

Note: C30+ fraction are heavy cuts and may contain varying amounts of particulates which are solid at operating temperatures.

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. The cellulose paper filter has a rating of 375 °F before scorching is expected, and paper breakdown begins at 425 °F. Other types of product compatible filters might be used also. Insulate and steam trace the filter housing. Flow rates and pressures should be used to determine the proper filter for

specific situations. 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 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). Teflon® is 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 products 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 alpha olefins C20-24, C24-28 and C30+:

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.

HEAT TRACING AND INSULATION

Heat-traced lines, valves, and pumps are necessary to prevent alpha olefins C20-24, C24-28 and C30+ from freezing during handling. It is recommended that the temperature of these products be kept within the specified range during transfer operations. These temperature ranges are listed near the beginning of this section.

Lines can be traced either by steam or electrical tracing. Steam tracing frequently involves tracing lines with tubing covered by insulation adequate for worst-case weather conditions. Three-eighths inch copper tubing has been found to be effective. Electrical tracing of lines with appropriate insulation may also be used; however, lines heat up more rapidly when traced with steam. The extent of pipe damage due to corrosion caused by steam heating should be monitored on a periodic basis. Remove the insulation to facilitate ease of inspection.

Horizontal pipes are traced by running the tracing along the bottom of the pipe. Vertical lines are traced by running the tracing line with the pipe. If steam tracing is being used, a minimum of one steam trap should be used for each tracer and every 150 feet of tracing. Adjust steam pressures used in tracing to take into account the melting point of the specific alpha olefins fraction. Traced pipes should be effectively insulated.

Proper thermal pressure relief must be provided. Care should be taken in design to avoid the possibility of overheating and boiling isolated sections of piping. Thermal reliefs should be sized for fire conditions. Steam traces the safety valve discharge and suction to prevent cold points in the piping which would result in plugging of the valve.



PART 4

HEALTH, ENVIRONMENT, FIRE AND ACCIDENTAL RELEASE INFORMATION

Safety Data Sheets (SDS) for NAO products are available from Qatar Chemical Company II Ltd to help customers 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. The most current SDS's can be obtained from Qatar Chemical Company II Ltd at www.qchem.com.qa or by calling (974) 44847110. Specific questions about SDS's can be sent to marketing@qchem.com.qa.

PART 5

TRANSPORTATION INFORMATION AND REGULATORY PROFILE

Safety Data Sheets (SDS) for NAO products are available from Qatar Chemical Company II Ltd to help customers 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. The most current SDS's can be obtained from Qatar Chemical Company II Ltd at www.qchem.com.qa or by calling (974) 44847110. Specific questions about SDS's can be sent to marketing@qchem.com.qa.

PART 6

APPENDIX

GLOSSARY OF TERMS, ABBREVIATIONS AND ORGANIZATIONS

ANSI	American National Standards Institute
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
Bonding	The connection of two or more conductive objects by means of a conductor (most commonly a wire or metal plate).
CEIC	Chevron Emergency Information Center
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
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.
DOT	Department of Transportation
EPA	Environmental Protection Agency
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.
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
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.
SDS	Material Safety Data Sheet
Vapor Pressure	The pressure exerted by a volatile liquid while under defined equilibrium conditions. A common way to measure vapor pressure is in millimeters of mercury (mm Hg).