U. S. Oil & Refining Co.

3001 Marshall Avenue, Tacoma, Washington, 98421 (253) 383-1651

Product Specification
Vacuum Gas Oil

Characteristic		ASTM Method		Typical Ranges
Gravity, ºAPI		D 4052		19.0 - 23.0
Distillation - ºC (º F)		D 1160		
Initial Boiling Point				255 - 300 (490 - 570)
10% recovered				343 - 393 (650 - 740)
50% recovered				438 - 465 (820 - 870)
90% recovered				500 - 560 (940 - 1040)
End Point				527 - 582 (980 - 1080)
Flash Point, ºC (º F)		D 93B		150-190 (300 - 374)
Pour Point, ºC (º F)		D 5950		12 - 33 (54 - 91)
Viscosity @50ºC, mm^2/s		D 7042		30 – 60
Sulfur, mass %		D 4294		1.0 - 1.5
Carbon, mass %		D 4530		0.1 - 0.4
BS&W, volume %		D 96		ND[2] - 0.1
Aniline Point, ºC (º F)		D 611		74 - 81 (165 – 178)
Asphaltenes, mass %		D 6560		ND[2] - 0.2
Total Nitrogen, ppm		D 4629		1200 – 1700
Vanadium, ppm		IP 501		ND[2] - 0.5
Nickel		IP 501		ND[2] - 0.5
Copper		IP 501		ND[2] - 0.2
Lead		IP 501		ND[2] - 0.2
Sodium		IP 501		ND[2] - 2.0
Iron		IP 501		0.5 - 1.0
Calcium		IP 501		ND[2] - 0.5
Hydrogen Sulfide, ppm		D 5705		ND[2] - 100

1) reserved
2) Not Detectable

SAFETY DATA SHEET

Vacuum Gas Oil

Date of Preparation: November 7, 2019

Section 1: IDENTIFICATION

Product Identifier:	Vacuum Gas Oil
Other Means of Identification:	FCC Feedstock; Light Vacuum Gas Oil; Heavy Vacuum Gas Oil; Raw Vacuum Gas Oil.
SDS Number:	644400
Product Code:	Not available.
Product Use:	Refinery Feedstock.
Restrictions on Use:	Not available.
Manufacturer/Supplier:	U.S. OIL & REFINING CO. 3001 Marshall Ave. Tacoma, WA 98421
Emergency Phone:	U.S. OIL & REFINING CO.: (253) 383-1651 CHEMTREC: 800-424-9300 NATIONAL POISON CENTER: 1-800-222-1222
Date of Preparation of SDS:	November 7, 2019

Section 2: HAZARD(S) IDENTIFICATION

CLASSIFICATION: Carcinogenicity, Category 1B

LABEL ELEMENTS

Hazard Symbol(s):

Signal Word: Danger

Hazard Statements: H350: May cause cancer.

PRECAUTIONARY STATEMENTS

Prevention: P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P280: Wear protective gloves, protective clothing, eye protection and face protection.

Response: P308 + P313: IF exposed or concerned: Get medical advice/attention.

Storage: P405: Store locked up.

Disposal: P501: Dispose of contents and container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: No applicable information was found.

Ingredients with Unknown Acute Toxicity: 100% of this product mixture consists of ingredient(s) of unknown acute toxicity.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

This material is considered hazardous by the Hazardous Products Regulations.

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Distillates (petroleum), light vacuum	Not available.	70592-77-7	100
Polycyclic Aromatic Hydrocarbons	Not available.	130498-29-2	Variable
Hydrogen Sulfide (H_2S)	Not available.	7783-06-4	Trace

Section 4: FIRST-AID MEASURES

Inhalation:

If inhaled: Remove person to fresh air and keep comfortable for breathing. If symptoms persist, get medical attention/advice.

Acute and delayed symptoms and effects: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product contains trace amounts of Hydrogen Sulfide which may accumulate in confined spaces. Inhalation of Hydrogen Sulfide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within minutes of continuous exposure. Above 500 ppm Hydrogen Sulfide may cause instantaneous loss of consciousness and immediate death.

Skin Contact:

If on skin (or hair): Rinse skin with water/shower. Get immediate medical advice/attention. Remove non-adhering contaminated clothing. Cool adherent materials and burned areas with ice and/or cold water. Do not remove adherent material or clothing.

Acute and delayed symptoms and effects: May cause skin irritation. Signs/symptoms may include localized redness, swelling, and itching. Hot liquid product may cause serious thermal burns on direct contact.

Eye Contact:

If in eyes: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

Acute and delayed symptoms and effects: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hot liquid product may cause serious thermal burns on direct contact.

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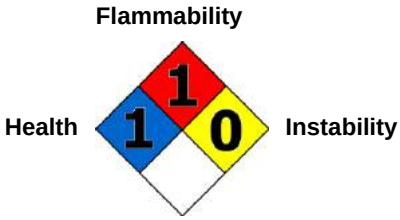
Ingestion: If swallowed: Rinse mouth. Immediately call a poison center or doctor. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

Acute and delayed symptoms and effects: Hot product may cause thermal burns. Causes burns to nose, mouth, throat, and digestive tract. Signs/symptoms may include severe mouth, throat and abdominal pain, nausea, vomiting, and diarrhea, blood in the feces and/or vomitus may also be seen.

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulfide, consider Oxygen.

Section 5: FIRE-FIGHTING MEASURES

NFPA 704



SUITABLE/UNSUITABLE EXTINGUISHING MEDIA

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if it can be done safely.

Unsuitable Extinguishing Media: Do not spray water onto burning product as this may cause spattering and spreading of the flame.

SPECIFIC HAZARDS

Not flammable or combustible by OSHA/WHMIS criteria. When heated, this material may evolve toxic and flammable Hydrogen Sulfide.

Products of Combustion: Oxides of Carbon. Oxides of Sulfur.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: Take precautionary measures against static discharge. This material is sensitive to static discharge at temperatures at or above the flash point.

SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause pollution. Hydrogen Sulfide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions:	Do not touch or walk through spilled material. Use personal protection recommended in Section 8. Don full-face, positive pressure, self-contained breathing apparatus.
Protective Equipment:	Emergency eyewash capability should be available. Wear respiratory protection as conditions warrant.
Emergency Procedures:	Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP

Methods for Containment:	Stop leak if it can be done without risk. Contain hot liquid by dyking and allow to cool and solidify. Do not flush to sewer or allow to enter waterways.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

Section 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING:
Do not swallow. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Grounding of containers/pouring equipment is necessary when transferring hot liquid product. See Section 8 for information on Personal Protective Equipment.

CONDITIONS FOR SAFE STORAGE:
Store locked up. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Head spaces in storage containers may contain toxic Hydrogen Sulfide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

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Vacuum Gas Oil

SAFETY DATA SHEET

Date of Preparation: November 7, 2019

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS

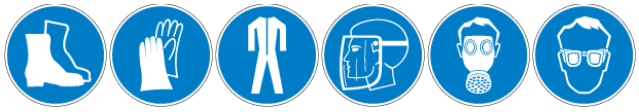
Component	ACGIH	OSHA
Distillates (petroleum), light vacuum [CAS No. 70592-77-7]	No TLV established.	No PEL established.
Polycyclic Aromatic Hydrocarbons [CAS No. 130498-29-2]	A2; BEI; Exposure by all routes should be carefully controlled to levels as low as possible (1990); For Benz[a]anthracene	0.2 mg/m³ (TWA); For benzene-soluble fraction.
Hydrogen Sulfide [CAS No. 7783-06-4]	1 ppm (TWA); 5 ppm (STEL); (2009)	20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.) 10 ppm (TWA); 15 ppm (STEL) [Vacated]

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

ENGINEERING CONTROLS

Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, gas, etc.) below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT (PPE)



Eye/Face Protection:

Wear chemical safety goggles. If product is hot, wear full face-shield. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection:

Wear protective gloves. If product is hot, thermally protective gloves are recommended. Consult manufacturer specifications for further information.

Skin and Body Protection:

Wear protective clothing. Clothing with full length sleeves and pants should be worn.

Respiratory Protection:

If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH approved air-purifying respirator, with organic vapor cartridge or self-contained breathing

	apparatus must be used. Supplied air breathing apparatus must be used when Oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices. Consult a competent industrial hygienist to determine hazard potential and/or the PPE manufacturers to ensure adequate protection. Emergency eyewash should be available near operations presenting a potential splash exposure. Avoid skin exposure. Promptly remove contaminated clothing, gloves, and shoes.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Dark green to black colored viscous liquid.
Color:	Dark green to black.
Odor:	Slightly cracked or burnt to asphaltic odor.
Odor Threshold:	Not available.
Physical State:	Liquid.
pH:	Not available.
Melting Point / Freezing Point:	29 °C (85 °F) (Pour Point)
Initial Boiling Point:	Not available.
Boiling Range:	Not available.
Flash Point:	> 135 °C (275 °F) (PMCC)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not applicable.
Lower Flammability Limit:	Approximately 0.6 %
Upper Flammability Limit:	Approximately 7.5 %
Vapor Pressure:	0.1 psia at 38 °C (100 °F) (Reid Vapor Pressure)
Vapor Density:	Not available.
Relative Density:	0.91 to 0.93 (Water = 1) at 4 °C (39 °F)
Solubilities:	Insoluble in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	399 °C (750 °F) (estimated)
Decomposition Temperature:	Not available.

Viscosity:	30 to 50 cSt at 50 °C (122 °F)
Percent Volatile, wt. %:	Not available.
VOC Content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Reactivity:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Chemical Stability:	Stable under normal storage conditions.
Possibility of Hazardous Reactions:	None known.
Conditions to Avoid:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Incompatible Materials:	Strong acids. Bases. Strong oxidizers.
Hazardous Decomposition Products:	Oxides of Carbon. Oxides of Sulfur.

Section 11: TOXICOLOGICAL INFORMATION

LIKELY ROUTES OF EXPOSURE: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

ACUTE EXPOSURE

PRODUCT TOXICITY

Oral:	Not available.
Dermal:	Not available.
Inhalation:	Not available.

COMPONENT TOXICITY

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Distillates (petroleum), light vacuum	70592-77-7	Not available.	Not available.	Not available.
Polycyclic Aromatic Hydrocarbons	130498-29-2	Not available.	Not available.	Not available.
Hydrogen Sulfide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Central nervous system.

SYMPTOMS (including delayed and immediate effects)

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product contains trace amounts of Hydrogen Sulfide which may accumulate in confined

spaces. Inhalation of Hydrogen Sulfide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within minutes of continuous exposure. Above 500 ppm Hydrogen Sulfide may cause instantaneous loss of consciousness and immediate death.

Eye: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hot liquid product may cause serious thermal burns on direct contact.

Skin: May cause skin irritation. Signs/symptoms may include localized redness, swelling, and itching. Hot liquid product may cause serious thermal burns on direct contact.

Ingestion: Hot product may cause thermal burns. Signs/symptoms may include severe mouth, throat and abdominal pain, nausea, vomiting, and diarrhea, blood in the feces and/or vomitus may also be seen.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

Medical Conditions Aggravated By Exposure: Not available.

CHRONIC EFFECTS (from short and long-term exposure)

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Central nervous system.

Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. This product contains Polycyclic Aromatic Hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours, anemia, disorders of the liver, bone marrow and lymphoid tissues. Hydrogen Sulfide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation; and damage to cardiovascular system.

Carcinogenicity: May cause cancer. This material contains Polycyclic Aromatic Hydrocarbons (PAHs), some of which are animal carcinogens.

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Polycyclic Aromatic Hydrocarbons	A2	Not listed.	List 2	OSHA Carcinogen.	Listed.

Mutagenicity: Not available.

Reproductive Effects: Not available.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Not available.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: This material will float on water and resulting runoff may create a fire hazard.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Other Adverse Effects: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION

REGULATORY INFORMATION	ID NUMBER	EMERGENCY RESPONSE GUIDEBOOK	PROPER SHIPPING NAME	CLASS	PACKING GROUP	PLACARD
DOT Classification	Not applicable.	Not applicable.	Not regulated.	Not applicable.	Not applicable.	Not applicable.
TDG Classification	Not applicable.	Not applicable.	Not regulated.	Not applicable.	Not applicable.	Not applicable.
IATA/ICAO	Not applicable.	Not applicable.	Not regulated.	Not applicable.	Not applicable.	Not applicable.

Section 15: REGULATORY INFORMATION

CHEMICAL INVENTORIES

US (TSCA)
The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)
The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

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FEDERAL REGULATIONS

United States
This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Polycyclic Aromatic Hydrocarbons	Not listed.	Not listed.	Not listed.	313	Not listed.	Not listed.
Hydrogen Sulfide	500	100	100	313	U135	10000

SARA SECTION 311/312 - EPA HAZARD CATEGORIES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	–	–	–

State Regulations
California
California Prop 65:

WARNING This product can expose you to chemicals including Polycyclic Aromatic Hydrocarbons, which are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Section 16: OTHER INFORMATION

Disclaimer:
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Date of Preparation of SDS: November 7, 2019

Version: 2.0

GHS SDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700