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MATERIAL SAFETY DATA SHEET FOR BUNKER (RESIDUAL) FUELS

Section 1 – Identification of the substance or mixture

Product Name	Residual Fuel oil; Bunker Fuel Oils
Reference	ISO 8217 Grades RMA to RML
Synonyms	Bunker C, Fuel Oil No.s 4,5 or 6 in USA
Application	Heavy fuel oil for large slow speed marine diesel engines, steamships and as blending stock for intermediate marine diesel fuels.
Company Identification	

Section 2 – Hazards identification

Hazard Identification	The normal conditions of use and storage of this product afford little opportunity for a health hazard, provided skin contact is avoided. This product contains low concentrations of polycyclic aromatic hydrocarbons, some of which are known, from experimental animal studies, to be carcinogenic. Prolonged and repeated skin contact may therefore cause dermatitis such as erythema, oil folliculitis or oil acne or warty growths which over a period of years may become malignant. Exposure to high concentrations of mist from this product may cause irritation to the eyes or mucous membranes and even a remote risk of cancers of internal organs. High concentrations of hydrogen sulphide, a very toxic and potentially lethal gas, can sometimes develop in confined or poorly ventilated spaces associated with this product. The odour of hydrogen sulphide does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Handling precautions must be strictly observed.
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Section 3 – Composition/Information on Ingredients

Chemical Composition	A blend of mainly residual and middle distillate components of paraffinic, naphthenic, or aromatic hydrocarbons originating from straight run, catalytic and thermal cracking refining processes. Flow improver additives may be included (generally ethylene vinyl acetate co-polymers)
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Section 4 – First aid measures

Inhalation	In emergency situations use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention. <i>Note to Physicians:</i> Administration of 100% oxygen and supportive care is the preferred treatment for poisoning by hydrogen sulphide gas.
Skin Contact	Wash thoroughly with plenty of water, using soap if available. Remove contaminated clothing. In case of burns through contact with hot product, cool with plenty of running water. Get medical attention.
Eye Contact	Rinse immediately with plenty of water until irritation subsides. Splashes of hot product should be immediately flushed with clean water until irritation subsides. Get medical attention.
Ingestion	If swallowed, DO NOT induce vomiting; keep at rest and call a physician.

Section 5 – Fire-fighting measures

Extinguishing Media	Use water fog, foam, dry chemical powder, carbon dioxide (CO ₂) to extinguish flames.
Fire and explosion Hazards	Combustible material, low hazard. The product can form flammable mixtures or can burn only on heating above the flash point. However, in a small percentage of residual fuels, light hydrocarbon components can generate flammable headspace gases not detectable by the flash point test. Residual fuel headspaces should therefore be regarded as potentially flammable and suitable precautions, as outlined in the OCIMF (Oil Company International Marine Forum) bulletin dated December, 1989 and in Chapter 23 of the revised 3rd edition of ISGOTT (International Safety Guide for Oil Tankers and Terminals), should be taken.
Special Fire-Fighting Procedures	Water fog or spray, to cool fire-exposed surfaces (e.g. containers) and to protect personnel, should only be used by personnel trained in fire fighting. Cut off "fuel"; depending on circumstances, either allow the fire to burn out under controlled conditions or use foam or dry chemical powder to extinguish the fire. Respiratory and eye protection required for fire fighting personnel exposed to fumes or smoke.
Hazardous Combustion Products	Highly dependent on combustion conditions. Smoke, sulphur oxides, carbon monoxide and carbon dioxide in the event of incomplete combustion. Possible release of hydrogen sulphide during heating or hot storage. Unidentified organic compounds will be evolved when this material undergoes combustion. Combustion may form oxides of Sulphur.

Section 6 – Accidental release measures	
Protective Measures	Eliminate all sources of ignition in vicinity of spilled material.
Spill Management	Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Section 8. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Land Spill	Shut off source taking normal safety precautions. Prevent liquid from entering sewers, water courses or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation. Take measures to minimise the effects on ground water. Recover by skimming or pumping using explosion-proof equipment, or contain spilled liquid with booms, sand, or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
Water Spill	Confine the spill immediately with booms. Warn other shipping. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. Disperse the residue in unconfined waters, if permitted by local authorities and environmental agencies.
Reporting	Report spills to local authorities as appropriate or required.

Section 7 – Handling and Storage				
Specific Use	Fuel Oil			
General Handling Information	Avoid contaminating soil or realizing this material into sewage and drainage systems and bodies of water. In bulk storage the product may require heating for pumping, centrifuging and atomizing at the burner. The design and operation of the fuel system must comply with national legislation and recognized codes of good practice.			
Precautionary Measures	Warn personnel involved in gauging and sampling of storage tanks that the headspace is potentially flammable due to the possible presence of light hydrocarbon gases. Safety precautions include the grounding of all metallic equipment used for sampling, ullaging and temperature measurement. Precautions must be taken also against inhalation of hydrogen sulphide in case it is present in the headspace. Electrical equipment and fittings must comply with local fire prevention regulations for this class of product.			
Special precautions	When heating to normal handling temperatures, avoid local overheating. Provide adequate ventilation if fumes are being developed.			
	Load/unload Temperature	Up to 60 ° C	Storage Temperature	Up to 60 ° C

Section 8 – Exposure controls/personal protection

General Considerations	Consider the potential hazards of this material, applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering control or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.	
Engineering Controls	Use in a well-ventilated area.	
Personal Protection	<i>Eye/Face Protection</i>	No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
	<i>Skin Protection</i>	Wear protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots and complete facial protection depending on operations conducted. Suggested materials for protective gloves include: Nitrile Rubber, Polyvinyl Alcohol (PVA) (Note: Avoid contact with water as PVA deteriorates water), Viton
	<i>Respiratory Protection</i>	No respiratory protection is normally required. Determine if airborne concentrations are below the occupational exposure limit for hydrogen sulphide. If not, wear an approved positive pressure air-supplying respirator.
Occupational Exposure Limit	An exposure limit for high boiling aromatic oil of 0.2mg/m ³ (TWA, 8h-workday), measured as benzene solubles (Analysis according to US NIOSH Method 5023, NIOSH Manual of Analytical Methods, 3 rd Edition). For Hydrogen Sulphide, 10ppm (14mg/m ³) (Analysis using Draeger or similar detector tube).	

Section 9 – Physical and Chemical Properties

Typical Physical Characteristics	Appearance	Black, medium to high viscosity liquids having characteristic petroleum odour
	Density (liquid at 15° C) kg/l	Varies with grade – typically 0.95 to 1.01
	Viscosity at 100° C CST	Varies with grade – typically 10 to 55
	Vapour pressure kPa at 20° C	Non-volatile
	Vapour density at 1 Bar (Air=1)	Heavier than air
	Evaporation rate (n-butyl acetate=1)	Non-volatile
	Flash Point (Pensky-Martens Closed Cup) °C	60 minimum
	Boiling range ° C	230 - 600
	Auto ignition Temperature (in air) ° C	250 minimum
	pH	Not applicable
	Solubility in water	At 20° C negligible

Attention: the data above are typical values and do not constitute a specification

Section 10 – Stability and Reactivity

Stability and Reactivity	Chemical Stability (Thermal, Light, etc)	Material is considered stable under normal ambient temperatures and anticipated storage and handling conditions of temperature and pressure
	Incompatibility	Avoid contact with strong acids or oxidizing agents such as liquid chlorine, concentrated oxygen, nitrates, peroxides, etc
	Hazardous decomposition products	Product does not decompose at ambient temperature. At elevated temperatures it decomposes with Hydrogen Sulphide
	Hazardous Polymerization	Hazardous polymerization will not occur

Section 11 – Toxicological Information		
Effects of over exposure	<i>Inhalation</i>	Negligible hazard at ambient/normal handling temperatures. In high concentrations and/or at elevated temperatures, vapour or mist is irritating to mucous membranes, may cause headaches and dizziness, may be anaesthetic and may cause other central nervous system effects. Contains small amount of hydrogen sulphide which can accumulate to dangerous levels in the air space above the material.
	<i>Skin Contact</i>	Prolonged or repeated contact may dry and defat the skin, leading to irritation and possibly dermatitis. Prolonged or repeated contact may also lead to more serious skin disorders, including skin cancer. Exposure to hot material may cause thermal burns.
	<i>Eye Contact</i>	Hot splashes may cause eye burns and permanent tissue damage.
	<i>Ingestion</i>	Minute amounts aspirated into the lungs during ingestion or vomiting may cause severe pulmonary injury and death.
	<i>Chronic</i>	Lifetime skin painting tests indicate that materials of similar composition have produced skin cancer in experimental animals. The relationship of these results to humans has not been fully established. Contains polynuclear aromatic hydrocarbons (PNAS). Prolonged and/or repeated skin contact with certain PNAs has been shown to cause skin cancer. Prolonged and/or repeated exposures by inhalation of certain PNAs may also cause cancer of the lung and of other sites of the body.
Toxicity Data	<i>Acute</i>	The exact composition of this product may vary and the potential health hazards described were based upon the possible components.
	<i>Chronic</i>	Based on what is known of this product and of materials of similar composition and refining history, this product would be expected to have carcinogenic potential.

Section 12 – Ecological information	
In the absence of specific environmental data for this product, this assessment is based on information for general hydrocarbon components found in residual fuels.	
Ecotoxicity	This material is expected to be harmful to aquatic organisms. The product has not been tested.
Mobility	No data available.
Persistence and degradability	May cause long-term adverse effects in the aquatic environment. The product has not been tested.
Potential to bio accumulate	Bio concentration Factor: No Data available Octanol/Water Partition Coefficient: No Data available

Section 13 – Disposal Considerations
This product contains hazardous ingredients listed in Section 2. Collect and dispose of it at an authorized disposal facility, in conformance with national and local regulations, and in accordance with directives on hazardous waste.

Section 14 – Transport information	
The description shown may not apply to all shipping solutions. Consult appropriate Dangerous Goods Regulations for additional description requirements (e.g. technical name) and mode-specific or quantity-specific shipping requirements.	
ADR/RID Shipping Description	Not regulated as dangerous goods for transportation under ADR/RID
ICAO/IATA Shipping Description	Not regulated as dangerous goods for transportation under ICAO/IATA
IMO/IMDG Shipping Description	Not regulated as dangerous goods for transportation under IMO/IMDG

Section 15 – Regulatory information	
Regulatory lists searched	EU Directive 76/769/EEC: Restrictions on the marketing and use of certain dangerous substances EU Directive 90/394/EEC: Carcinogens at work EU Directive 92/85/EEC: Pregnant or breastfeeding workers EU Directive 96/82/EC (Seveso II): Article 9 EU Directive 96/82/EC (Seveso II): Articles 6 and 7 EU Directive 98/24/EC: Chemical agents at work
Chemical Inventories	Components comply with following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), IECSC (China), PICCS (Philippines), TSCA (United States)

Section 16 – Other information	
Revision Statement	This is a new Material Safety Data Sheet
Revision Date	July 01, 2010
Source of Key Data	The recommendations presented in this Material Safety Data Sheet were compiled from actual test data (when available), comparison with similar products, component information from suppliers and from recognized codes of good practice.

The above information and recommendations are, to the best of knowledge and belief, accurate and reliable as of the date hereof, but are offered without guarantee or warranty. They relate to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Conditions of use of the material are under the control of the user; therefore, it is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use.