

Pyrolysis Fuel Oil

Product Summary

Pyrolysis Fuel Oil (PFO) is an industrial product that consists of a mixture of naphthalene, polycyclic aromatic hydrocarbons, indene, and dicyclopentadiene. It also contains small quantities of benzene, 1-pentene, undecane, styrene, toluene, xylene, ethylbenzene, isoprene and biphenyl.

PFO is a product of the ethylene manufacturing process at NOVA Chemicals' Joffre, Alberta facility. It is used as a chemical intermediate to produce chemical products or industrial fuel. This is an industrial grade product either used on-site, where it is produced, or shipped to other manufacturing sites for additional processing. When shipped between industrial sites, this product is transported as a liquid in closed systems by tank cars (rail). PFO is stored in a bulk storage tank equipped with a floating roof to minimize the vapour space. During tank car loading, the tank car vapour space is vented to a vapour combustion unit to ensure safe loading of product and reduction of volatile emissions.

All components of PFO are expected to have low order of acute inhalation, oral and dermal toxicity. Inhaling high concentrations of the vapour can irritate breathing airways, cause headaches, dizziness and sleepiness. Repeated skin exposure can cause the skin to dry and crack and increase therefore a chance of skin disease.

This product is considered hazardous by the Canadian Hazardous Products Regulations, 2015 and OSHA Hazard Communication Standard, 2012.

Product Use Information

This product is used as chemical feedstock or industrial fuel. There are no known consumer uses for NOVA Chemicals' PFO.

Human Exposure

Occupational exposure to PFO is minimal under normal operating conditions because PFO is used in a closed system process unit. There are limited circumstances where occupational exposure could occur, e.g. accidental releases, storage, handling, sampling operations, and fugitive emissions from process equipment (such as pumps or valves). Permitted occupational exposure to the largest component, naphthalene, is limited to 10 parts per million (ppm) or 52 mg/m³ exposure averaged over 8-hours of work or a 40-hour work week in most of Canada and in the United States. Workplace air quality measurements taken by NOVA Chemicals in typical industrial operations indicate that good equipment design, maintenance and good operating practices and procedures minimize exposure to levels well below 10 ppm. The AIHA has recommended a workplace environmental exposure level of 2 ppm for isoprene.

General population exposure to PFO from industrial facilities is limited because industrial air emissions are subject to federal and state/provincial environmental regulations. Due to the low volatility of this product, human exposure would probably occur only in unusual situations. OSHA and ACGIH have also established guidelines for other components (e.g. dicyclopentadiene, benzene, styrene, toluene, xylene, biphenyl) found in this product.

Health Information

PFO is expected to have low acute toxicity by inhalation, oral and dermal routes of exposure. It is irritating to the skin and eyes, but it is not classified as a skin sensitizer. Based on exposure dose, PFO may cause headache, sore throat, coughing, breathing difficulties, chest pressure, central nervous system effect, nausea, sleepiness and dizziness. Prolonged skin exposure to the product may dry the skin and cause cracking. Repeated exposure to PFO may decrease hemoglobin concentration and increase in erythrocyte sedimentation rate in blood. The product can cause cancer. It is a confirmed animal carcinogen with unknown relevance to humans. It also might have low mutagenic potential.

Health hazards of concern from exposure to naphthalene include hemolytic anemia, cataracts, and respiratory toxicity towards the respiratory tract (both noncancer and cancer effects). Mechanism of action is not known but it is generally thought to involve steps of bioactivation leading to electrophilic and/or reactive free radical reactive intermediates. Observations of predominantly benign respiratory tumors in mice provide suggestive evidence for the carcinogenicity of naphthalene, but the evidence is insufficient to assess the carcinogenic potential of naphthalene in humans. Benign tumorigenic responses in mice to naphthalene likely involve a nongenotoxic mechanism leading to cytotoxicity and subsequent regeneration. No quantitative cancer dose-response assessments for naphthalene were derived due to the weakness of the evidence that naphthalene may be carcinogenic in humans. On the basis of this data, naphthalene had been classified by International Agency on Research Cancer (IARC) as a 2B possibly carcinogenic to humans. It was also classified by the US National Toxicology Program (NTP) as Reasonably Anticipated to be a Human Carcinogen.

Dicyclopentadiene is considered an irritant to skin and eyes. It is not genotoxic and not carcinogenic. For human health, the risk for workers is expected to be low because of the frequency of exposure is very limited and personal protective equipment is worn. The risk to general population through indirect exposure are also very low.

The critical effect of chronic benzene exposure is an increased risk of cancer. Chronic benzene exposure has been shown to cause myelodysplastic syndrome which can progress to leukemia. Benzene can also cause chromosomal aberrations in humans.

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Prolonged exposure to styrene in humans results in effects on the central nervous system (CNS), such as headache, fatigue, weakness and depression, hearing loss and peripheral neuropathy. Several epidemiologic studies suggest there may be an association between styrene exposure and increase risk of leukemia and lymphoma. Recently, IARC reclassified styrene as 2A probably carcinogenic to humans.

Environmental Exposure

Environmental exposure to PFO can occur through accidental spills, fugitive emissions, leakage or release of vapours into the atmosphere during tankage, delivery, or transfer for storage. Emissions from storage and loading equipment is controlled by using a floating roof storage tank and routing vapours from loading equipment to vapour combustion units.

Pyrolysis Fuel Oil does not readily evaporate, although the components of the product that are more volatile will evaporate from the soil or water and enter the atmosphere where they will be degraded. The higher molecular weight components of a product have very low water solubility and will not volatilize from the soils or surface waters. Consequently, these heavier compounds will remain on the soil and in the water, and will eventually settle to the sediment. These heavier compounds will biodegrade by microorganisms in the soils and sediments. PFO is considered toxic to aquatic life and will accumulate on the surface of plants, waterfowls and mammals, resulting in serious injury and possible death. The aromatic compounds (benzene and ethylbenzene) of PFO tend to partition into the polar phase of the environment and migrate through the soil to the groundwater. However, these components of the PFO are also the most biodegradable.

Industrial volatile organic compound emissions and spills are regulated in Canada and in the United States and must be reported to regulatory agencies.

Ecological Information

The aquatic toxicity data suggest that the components of this product will exhibit an acute aquatic hazardous to the fish, aquatic invertebrates and aquatic plants. Acute toxicity values for the fish and invertebrates range from 3.2 mg/l and 2.16 mg/L. For green algae acute toxicity is 2.96 mg/L. Prolong exposure to aquatic organisms is also toxic with long lasting effect. This product is not easily biologically decomposable.

Physical Hazards

PFO is a dark coloured, oily liquid with a pungent odour whose odour threshold is < 1 ppm. It is insoluble in water. This product is classified as a flammable liquid in the workplace and as flammable for transportation. PFO burns readily when heated, and sparks or flames may ignite releasing hot liquids, vapours or mists. If released from containment, product may be ignited by uncontrolled heat, sparks or flames. The vapour is heavier than air and may collect in low areas. The vapours can travel for some distance; if vapours come into contact with ignition sources, the flame may then be propagated along the vapour trail back to the source and cause an explosion. Containers exposed to fire conditions may explode. Any equipment used in areas of handling or storage of the heated product must be approved for flammable liquids and properly grounded for control of static electricity.

Risk Management at NOVA Chemicals

Risk management priorities focus efforts and improvements in process design, operation and maintenance of our industrial facilities and transportation pipelines to prevent accidental releases and minimize the potential for fires or explosion. Use of suitable packing materials and sealing technology minimizes releases from pump seals, valve packings, pipe connections or gaskets. Ongoing preventive Leak Detection and Repair (LDAR) programs are in place at the Joffre, Alberta production and storage facility. Emergency response teams are prepared and equipped to respond to on-site and off-site incidents. Processes are designed to eliminate possible ignition sources and undergo periodic detailed Process Hazard and Risk Assessment Reviews (HAZOPs).

All processing, storage, and transport are conducted in closed systems designed to minimize the potential for exposure or releases to the environment. Industrial hygiene programs periodically review all workplace potential exposures to ensure controls are in place and effective. Personal protective equipment is used to prevent exposure in those situations where exposure cannot be controlled using engineering controls or other methods.

NOVA Chemicals continues to carefully review all relevant information on the safety and suitability of the Pyrolysis Fuel Oil and other petrochemical products for their known and intended end uses. In addition, NOVA Chemicals is committed to sharing information on the safe handling and end use of our products with customers and other interested parties. Safety Data Sheets (SDS) are provided to our customers and can be accessed by interested members of the public electronically at the NOVA Chemicals' website at www.novachemicals.com.

NOVA Chemicals is a member of the American Chemistry Council (ACC) and the Chemistry Industry Association of Canada (CIAC). Through these and other industry associations, we actively monitor and participate in public regulatory processes impacting this product. We also seek to better understand health and environmental challenges related to all our products. We actively support

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industry sponsored product testing initiatives and other industry initiatives supporting responsible actions, sound science and life cycle stewardship of our products.

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For detailed information on this product, please review the product Safety Data Sheet (SDS). In the case of an emergency involving this product, please call our 24-hour hotline at 1-800-561-6682 or 1-403-314-8767.

For more information on this product risk profile, please contact us at 1-412-490-4063 or email us at stewardp@novachem.com.

For more information on any NOVA Chemicals' product, please contact us at the nearest location below during business hours or visit our website at www.novachemicals.com.

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