

PYGAS (AROMATIC CONCENTRATE/C5)**Product Summary**

Pyrolysis Gasoline (Pygas) is an industrial product that consists of a mixture of hydrocarbon products, predominantly C5 through C11. NOVA Chemicals' Pygas contains benzene at a concentration of 30 to 50%.

Pygas (also known as Aromatic Concentrate or C5) is a product of the ethylene manufacturing process at NOVA Chemicals' Joffre, Alberta facility as well as a feedstock for NOVA Chemicals' Corunna, Ontario facility. Pygas production occurs in closed systems and the product is transported in bulk by rail to other industrial sites in Canada and in the United States for additional processing. Pygas is typically stored in bulk storage tanks equipped with floating roofs, or vapours are vented to a vapour combustion unit to reduce emissions.

Based on testing of similar materials, this product exhibits low acute toxicity by oral, dermal or inhalation routes of exposure. The product contains substances, such as benzene, that individually are considered to be more toxic. However, the toxicity of this product in repeated exposure is less severe than benzene due to lower individual component concentrations, less component interaction and competitive inhibition.

Product Use Information

The primary use of the Pygas product is in the isolation of high purity benzene and other products. It has to be further processed prior to its use as a feedstock for making other industrial chemicals and plastics. There are no known consumer uses for NOVA Chemicals' Pygas.

Human Exposure

Occupational exposure to Pygas is minimal under normal operating conditions because Pygas 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 most toxic component, benzene, is limited to 0.5 parts per million (ppm) 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 0.5 ppm. The American Conference of Governmental Industrial Hygienists (ACGIH) has also established workplace biological exposure indices (BEI) for benzene as well as other components found in this product.

General population exposure to Pygas from industrial facilities is limited because industrial air emissions are subject to federal and provincial/state environmental regulations. These regulations cover not only emissions of benzene, but also emissions of other volatile organic compounds. Benzene exposure to the general population from production, transportation and use of Pygas is very low compared to exposure due to inhalation of contaminated ambient air, particularly in high motor vehicle traffic areas and around gasoline service stations or in a cigarette smoke environment. The Occupational Safety and Health Administration (OSHA) Benzene Standard, the ACGIH values for occupational exposure and Alberta's Ambient Air Quality Objectives and Guidelines apply to this product. OSHA and ACGIH have also established guidelines for other components (e.g. toluene, dicyclopentadiene, styrene, cyclopentadiene) found in this product.

Health Information

Evaluation¹ of scientific and health information on this product as a whole indicates that Pygas is considered to have low acute toxicity by oral, dermal or inhalation routes of exposure. In addition, it is unlikely that it would cause significant genetic toxicity. Although this product contains a substantial concentration of benzene, a known carcinogen, no genetic damage was induced by oral treatment of rats with a similar mixture that had up to 55% benzene demonstrating the inhibitory effects of other components in the mixture. Repeated dose studies of the Pygas stream reported skin irritation above 0.10 ml/kg but no other systemic toxicity occurred in rabbits, and the No-Adverse-Effect Level (NOAEL) was 4869 ppm in rats from inhalation exposure.

Benzene is a predominant component of this product; therefore, it is important to address the known health hazards of benzene. As an acute poison, benzene produces narcotic effects: the probable human oral lethal dose would be between 50 to 500 mg/kg (body weight per day). People who inhale benzene vapours over a prolonged period may experience harmful effects in the tissues that form blood cells especially the bone marrow. This can lead to anemia. Also long-term exposure to benzene can cause cancer of the blood-forming organs. Exposure to benzene has been associated with the development of a particular type of leukemia called acute myeloid leukemia (AML). Prolonged exposure of an aging population of workers to benzene can cause myelodysplastic syndrome (MDS) (abnormal growth of red, white or platelet stem cells in the bone marrow).

However, as it has been demonstrated in the area of genetic toxicity, the presence of biologically active components blended together can inhibit toxicity inducible by individual components. No significant reproductive effects were reported in multigenerational studies of a similar stream. Developmental effects from components in this product occurred primarily at doses that were maternally toxic as well; thus it is not considered to be a developmental toxicant.

Environmental Exposure

Environmental exposure to Pygas 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 typically controlled by using floating roof storage tanks or by routing vents from fixed roof storage tanks and loading equipment to control or recovery systems, or back

¹ Category Summary For High Benzene Naphthas Category, Prepared by the Olefins Panel of the American Chemistry Council, December 10, 2004, US High Production Volume Chemical Program.

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to the process. Among other reasons, the release of Pygas product from the process, storage and transportation equipment at industrial facilities is avoided because this stream is similar in flammability and volatility characteristics to gasoline. The above described sources of emissions from the Pygas product may present a potential for exposure to the public and to the environment adjacent to the industrial facilities that use or produce Pygas.

Pygas contains a significant concentration of benzene. The primary routes of environmental exposure to benzene are from contaminated ambient air, especially in areas with high motor vehicle traffic or in the vicinity of gasoline service stations. In addition, air close to manufacturing plants that produce or use benzene may contain elevated concentrations of benzene. Another source of exposure to benzene is from cigarette smoke.

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

Components of the Pygas product are very toxic to freshwater fish, invertebrates and freshwater algae. Calculated atmospheric half-lives of representative constituent chemicals identified a half-life of 0.9 to 65.8 hours as a result of indirect hydrolysis. This product is likely to biodegrade significantly.

Physical Hazards

Pygas is a volatile, pale yellow, flammable liquid that does not dissolve easily in water. Pygas has a pungent, unpleasant odour at very low concentrations. Pygas poses a serious fire and explosive hazard when exposed to heat or flame. Pygas 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. Industrially produced Pygas is kept within closed systems during production, storage, transportation and use to help minimize these risks.

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 preventative 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 rapidly 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 Pygas 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 Pygas. We also seek to better understand health and environmental challenges related to all of our products. We actively support 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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