Product Safety Assessment

*DOW™ Fuel Oil Products*

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**Names**

- CAS No. 68475-80-9
- CAS No. 68513-69-9
- CAS No. 68512-63-0
- CAS No. 68987-42-8
- DOW™ fuel oil products
- DOW™ Aromatic Oil (AO)
- DOW™ Fuel Oil Blend
- DOW™ Blend TN350
- DOW™ Quench Oil
- DOW™ LA Fuel Oil
- DOW™ LS Fuel Oil
- DOW™ Fuel Oil Blend, Low Sulfur

**Product Overview**

- DOW™ fuel oil products are mixtures of mainly aromatic and unsaturated C9 to C15 components that are intended for blending with other materials. These products originate from the high-temperature cracking of petroleum fractions and are separated from pyrolysis gasoline (pygas) during the production of benzene. Dow manufactures several fuel oil products: DOW™ Aromatic Oil, DOW™ Blend TN350, DOW™ Quench Oil, DOW™ Fuel Oil Blend, and DOW™ Fuel Oil Blend, Low Sulfur. For further details, see Product Description.

- DOW Fuel oil products are blended into bunker fuels (fuel for ships) or used as refinery fluxants (products that cut heavier fuels into a lighter grade). Some DOW fuel oil products can also be used as a source for naphthalene or dicyclopentadiene. For further details, see Product Uses.

- Worker exposure is possible at hydrocarbon processing facilities, at sites that blend these products into other fuels, or at sites that use them for recovery of naphthalene or other chemicals. Worker exposure may also occur during transport or handling. Exposure is minimized through engineering controls and the use of personal protective equipment. For further details, see Exposure Potential.

- Eye contact with DOW fuel oil products may cause slight to moderate, temporary irritation. Corneal injury is unlikely for most products, but may be slight to moderate for other products (request the relevant Safety Data Sheet using Contact Us). Vapors may irritate eyes. Prolonged or repeated skin contact may cause moderate to severe irritation, even a burn. During use, these materials may be handled at elevated temperatures; contact with heated material may cause thermal burns. These products contain naphthalene, which can be absorbed through the skin, potentially causing adverse effects. Excessive inhalation of these products may irritate the nose, throat, and lungs and/or cause central nervous system depression. Vapor concentrations are attainable that could be hazardous on single
exposure.\textsuperscript{4} This family of materials may contain components that have caused cancer in laboratory animals. Some products contain component(s) which, in laboratory animals, have shown effects on reproduction. For further details, see \textit{Health Information}.

- \textbf{DOW™ Fuel oil products} are combustible. The vapors are heavier than air and can travel long distances, accumulating in low-lying areas. Ignition and/or flashback may occur. These products are stable at typical storage and use temperatures. Exposure to elevated temperatures can cause products to decompose. Avoid contact with oxidizing materials.\textsuperscript{4} For further details, see \textit{Physical Hazard Information}.

\textbf{Manufacture of Product}

- \textbf{Capacity} – DOW™ fuel oil products are produced at facilities in Plaquemine and St. Charles, Louisiana; Freeport, Texas in the U.S.; and Terneuzen and Rotterdam, The Netherlands.
- \textbf{Process} – DOW fuel oil products originate from the high-temperature cracking of petroleum products. (Cracking means breaking large hydrocarbon molecules into smaller ones using heat.) These fuel oil products are separated by distillation.

\textbf{Product Description}\textsuperscript{2,3}

DOW™ fuel oil products are mixtures of mainly unsaturated C9 and higher hydrocarbons (“C” is carbon chain length) that originate from the high-temperature cracking of pygas. Fuel oil products range in appearance from a yellow oily liquid to a dark brown oil with a light to strong gasoline-like odor. The products do not mix with water and have a flashpoint above 60°C (140°F). Dow manufactures European and American fuel oil blends as identified below:

\textbf{U.S. fuel oil products:}
- DOW™ Fuel Oil Blend (also called LA Fuel Oil) – contains dicyclopentadiene (DCPD)
- DOW™ Fuel Oil, Low Sulfur (also called LS Fuel Oil) – contains low amounts of DCPD
- DOW™ Quench Oil – somewhat lighter fuel oil from the quench section of an ethylene cracker

\textbf{European fuel oil products:}
- DOW™ Aromatic Oil (AO) – a mixture of high-boiling aromatic components such as indene, methylindenes, and naphthalene
- DOW™ Blend TN350 – a mixture of C12 and higher components (ethylene cracker fuel oil or ethylene cracker residue)

\textbf{Product Uses}\textsuperscript{2,3,5, 6}

Commercial fuel oils are mixtures of components blended to obtain certain properties suitable for use as fuels. DOW™ fuel oil products are mainly used for blending into bunker fuels (fuel for ships) and as refinery fluxants (products that cut heavier fuels into a lighter grade). DOW™ Aromatic Oil,

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\textsuperscript{4}\textsuperscript{TM} Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow
DOW™ Blend TN350, DOW™ LA Fuel Oil, and DOW™ Freeport Fuel Oil may also be used as a source for naphthalene (or mixtures of naphthalene and methylnaphthalene). Naphthalene is used to produce concrete plasticizers, phthalic anhydride, and insecticides. DOW LA Fuel Oil may also be used as a source for dicyclopentadiene (DCPD), which is used in a variety of resin applications.

Exposure Potential

DOW™ fuel oil products are used in the production of industrial fuels and other products. Based on these uses, the public could be exposed through:

- **Workplace exposure** – DOW fuel oil products are manufactured in closed systems using engineering controls that prevent the escape of liquid or vapors and minimize release to the environment. The potential for exposure is further reduced through the use of personal protective equipment. Occupational exposure is possible at hydrocarbon processing facilities or facilities using these products as a source for naphthalene or dicyclopentadiene. Workers could be exposed during maintenance, sampling, testing, or other procedures. Worker exposure is also possible during formulation into bunker or other fuels and during transport and handling of these fuels. Facilities that manufacture or use DOW fuel oil products should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. The European Union (EU), various European countries, the American Conference of Governmental Industrial Hygienists (ACGIH), and the U.S. Occupational Safety and Health Administration (OSHA) have established occupational exposure limits for some of the individual components in DOW fuel oil products. These occupational exposure limits are used in the workplace to limit exposure to the components of this material. See Health Information and the relevant Safety Data Sheet.

- **Consumer exposure to products containing DOW fuel oil products** – Dow does not sell these products for consumer use. They are produced, transported, and processed within industrial facilities in which there is no expected consumer exposure. See Health Information.

- **Environmental release** – Environmental exposure to DOW fuel oil products is limited since the materials are produced, processed, and stored in industrial facilities in which the product is contained in closed systems, pipes, and storage vessels. Transport is by pipeline, barge, railroad tank car, or tank truck so that the material is typically contained within the transport container, except for accidental spills or leaks. Once DOW fuel oil products are blended, releases into the environment are limited to accidental spills and leaks. DOW fuel oil products are not intended to be released into the environment, but rather to be consumed / “burned” as a fuel or to be chemically processed. If they are used as a process intermediate, they are separated into components and are no longer present in their original form. DOW fuel oil products and fuel blended with these products are flammable liquids. In the event of a leak or spill, appropriate actions should be taken to avoid fire, contamination of the environment, and exposure to the pure material. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. A large spill or release can be hazardous due to the physical properties, effects to the environment, or health hazards associated with this product or its components. If a large release occurs, contact local and/or state or provincial authorities. See Environmental, Health, and Physical Hazard Information.

For more information, request the relevant Safety Data Sheet using Contact Us.
Health Information

Eye and Skin Contact – Eye contact with DOW™ fuel oil products may cause slight to moderate, temporary irritation. Corneal injury is unlikely, although slight temporary injury could occur. Vapors may irritate eyes. Prolonged or repeated skin contact may cause moderate to severe irritation, depending on product, even a burn. Symptoms may include pain, severe local redness, swelling, and tissue damage. Skin contact may result in an allergic skin reaction in a small proportion of individuals. DOW fuel oil products can contain up to 20% naphthalene. Human case reports suggest naphthalene may be absorbed through the skin in toxic amounts, especially in children. These products may be handled at elevated temperatures. Contact with heated material can cause thermal burns.

Inhalation – Prolonged, excessive inhalation of DOW fuel oil products may cause respiratory irritation (nose, throat, and lungs) and/or central nervous system depression. Vapor concentrations are attainable that could be hazardous on single exposure. Symptoms of excessive inhalation may include headache, dizziness, or drowsiness, progressing to lack of coordination and unconsciousness. Excessive inhalation may also cause nausea or vomiting.

Ingestion – These materials have low toxicity if swallowed. Toxicity from swallowing may be greater in humans than in animals. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Aspiration into the lungs may occur during ingestion or vomiting, resulting in rapid absorption and possible injury to other body systems. Ingestion of naphthalene has caused hemolytic anemia (premature destruction of red blood cells).

Repeated Exposure – These products contain components that have caused adverse effects on the central nervous system, liver, and peripheral nervous system following repeated exposure. Cataracts and other eye effects have been reported in humans repeatedly exposed to naphthalene vapor or dust. Repeated exposure to naphthalene can impair the body’s ability to transport oxygen.

Cancer – DOW™ Quench Oil contains benzene, which has been shown to cause cancer in humans and laboratory animals. Other components of some DOW fuel oil products—such as ethylbenzene, biphenyl, styrene, 1,3 butadiene, and naphthalene—have been shown to cause cancer in laboratory animals, but the relevance to humans is not known. In humans, there is limited evidence of cancer in workers involved in naphthalene production.

For more information, request the relevant Safety Data Sheet using Contact Us.

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Environmental Information

DOW™ fuel oil products are a complex mixture of many components. The following is an overview of the environmental impact of some of these components. Detailed information is available on the Safety Data Sheet.

Naphthalene, ethynaphthalene – The bioconcentration potential (tendency to accumulate in the food chain) for these materials ranges from high to moderate, and the potential for soil mobility is medium. Naphthalene is highly biodegradable under aerobic static laboratory conditions. Naphthalene is highly toxic to fish and other aquatic organisms on an acute basis (single exposure to large amount).
Biphenyl – The bioconcentration potential for biphenyl is moderate and the potential for mobility in soil is low. Biphenyl is readily biodegradable and is moderately toxic to aquatic organisms on an acute basis.

Dicyclopentadiene (DCPD) – The bioconcentration potential (tendency to accumulate in the food chain) is low. DCPD is not considered biodegradable based on laboratory test results. DCPD is toxic to fish and other aquatic organisms on an acute basis.

For more information, request the relevant Safety Data Sheet using Contact Us.

Physical Hazard Information

DOW™ fuel oil products are combustible. The vapors are heavier than air and can travel long distances, accumulating in low-lying areas. Ignition and/or flashback may occur. These products are thermally stable at typical storage and use temperatures. Minimize sources of ignition, such as static build-up, heat, spark, or flame. Exposure to elevated temperatures can cause these products to decompose. Decomposition products depend on temperature, air supply, and the presence of other materials. Avoid contact with oxidizing materials.

For more information, request the relevant Safety Data Sheet using Contact Us.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ fuel oil products. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Product Data Sheet, or Contact Us.

Additional Information

- Safety Data Sheet – request by using the Contact Us link below (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/aromatics/contact/index.htm)

For more business information about DOW™ fuel oil products, visit the Dow Aromatics web site at www.dow.com/aromatics/.

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References

1 Dow Aromatics Co-Products website – Products
4 Safety Data Sheets, The Dow Chemical Company; Aromatic Oil – E; Blend TN-350; Quench Oil; Fuel Oil Blend; Fuel Oil Blend, Low Sulfur.
5 Dow Aromatics Co-Products website – Applications
   (http://www.epa.gov/chemrtk/pubs/summaries/fueloils/c13435tp3.pdf)
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