Product Safety Assessment

BETAFOAM™ Automotive Two-Component Foam Systems

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Names

- BETAFOAM™ acoustical foam
- BETAFOAM structural foam
- BETAFOAM Structural Foam Inserts (SFI)
- BETAFOAM polyurethane foam
- BETAFOAM automotive two-component foam systems
- BETAFOAM™ isocyanate
- BETAFOAM™ polyol
- BETAFOAM prepolymer
- NVH foams

Product Overview

- BETAFOAM™ automotive foam systems are a family of two-component, water-blown polyurethane foams manufactured by Dow Automotive, a business unit of The Dow Chemical Company (“Dow”). These highly durable foams strongly adhere to electro-coated metal surfaces. Dow Automotive markets BETAFOAM isocyanates and BETAFOAM polyols for on-site foam fabricating, as well as prefabricated parts called BETAFOAM Structural Foam Inserts (SFI). These foams are also referred to as “NVH” materials because they are intended to reduce noise, vibration, and/or harshness.¹,² Once the foam components are mixed and cured, they are a solid foam substance and are no longer in the original chemical form. For further details, see Product Description.

- Cured BETAFOAM polyurethane foams are incorporated into vehicles during assembly to minimize interior noise levels, improve vehicle stiffness, and enhance crash performance (improve vehicle safety). BETAFOAM™ acoustical foams provide barrier protection against airborne noise. BETAFOAM structural foams are cavity-filling foams that increase vehicle stiffness and crashworthiness.¹,³ For further details, see Product Uses.

- **Health Overview** – BETAFOAM isocyanates, BETAFOAM polyols and BETAFOAM foams have very different properties and thus health considerations. Cured foams are no longer liquid chemicals and are not the same substance as the original components.
  - **BETAFOAM™ isocyanates** may cause moderate irritation with slight, temporary corneal injury when in contact with the eye. Prolonged skin contact may stain the skin and cause slight irritation with local redness or an allergic skin reaction. Prolonged skin contact is not likely to result in absorption of harmful amounts.⁴
  - **BETAFOAM polyols** may cause severe irritation with chemical burns and corneal injury, possibly resulting in permanent impairment of vision, even blindness when in contact with the eye. Elevated temperatures may generate vapor levels sufficient to cause eye irritation.

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irritation. Prolonged skin contact may cause moderate irritation with local redness, but is unlikely to result in absorption of harmful amounts. Vapor from heated material may irritate the nose and throat.\(^5\)

- **BETAFOAM\(^\text{TM}\) polyurethane foams** that are cured could scratch the eyes or skin. During manufacturing, vapors or fumes generated from downstream thermal operations, such as welding or torch-cutting, may cause eye and respiratory irritation.\(^6\)

- **BETAFOAM structural foam inserts (SFIs)** are fabricated articles. BETAFOAM isocyanates and BETAFOAM polyols are used to manufacture them and these materials are consumed (used up) in the foaming and fabrication process. BETAFOAM SFIs are no longer the same substance as the original components and have no known adverse health affects.

- For further details on these products, see Health Information.

- **BETAFOAM foam products** are intended for industrial use only. Worker exposure is possible in a manufacturing facility or at facilities using these foams. Exposure is minimized through engineering controls and the use of personal protective equipment.\(^4,5\) BETAFOAM Structural Foam Inserts are used in assembling motor vehicles. For further details, see Exposure Potential.

**Physical Hazard Overview** – BETAFOAM\(^\text{TM}\) isocyanates, BETAFOAM polyols and BETAFOAM foams have very different properties and thus physical hazards.

- **BETAFOAM isocyanates** are highly reactive materials that must be handled only by trained personnel. They are stable under recommended storage conditions. Elevated temperatures cause them to become more reactive. Decomposition or self-polymerization may occur, causing a build-up of heat and pressure in closed systems. Avoid contact with acids, alcohols, amines, water or moist air, ammonia, bases, metals, and strong oxidizers.\(^4\)

- **BETAFOAM polyols** are thermally stable at typical use temperatures. Avoid contact with strong acids, strong oxidizers, and metals such as bronze or zinc.\(^5\)

- **Cured BETAFOAM foam systems** and **BETAFOAM\(^\text{TM}\) structural foam inserts** are chemically stable with no known physical hazards. For further details, see Physical Hazard Information.

### Manufacture of Product

**Locations** – Dow Automotive manufactures BETAFOAM\(^\text{TM}\) isocyanate components at facilities in the Freeport, Texas; BETAFOAM polyol components in Chattanooga, Tennessee; and BETAFOAM structural foam inserts in Bay City, Michigan.

**Process** – BETAFOAM automotive two-component foam systems are formulated using proprietary materials and technology. The foam is produced by the reaction of a diisocyanate and a polyol as shown below. Water present in the polyol component also reacts with the diisocyanate to generate carbon dioxide, which serves as a gaseous “blowing agent” to create the viscous froth that fills cavities and eventually cures into foam. Foam products marketed by Dow are produced from these materials for use by its customers.

\[
\begin{align*}
\text{Polyol} & \quad \text{Diisocyanate} \\
\text{HO-R-OH} & \quad \text{O=C=NR-N=C=O} \\
\rightarrow & \quad \text{O-R-O-C-N-R-N-C=O} \\
\text{HO-R-OH + O=C=NR-N=C=O} & \quad \text{Polyurethane}
\end{align*}
\]

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Product Description

BETAFOAM™ automotive two-component foam systems are a family of water-blown polyurethane foams manufactured by Dow Automotive. They are produced—usually during vehicle assembly—by the rapid mixing of a diisocyanate and a polyol in the presence of water under high-shear conditions. After mixing, the materials expand to rapidly fill target cavities or molds with an off-white to tan-colored polyurethane froth. The foams cure at room temperature, become rigid when set (cured). The foams are capable of filling most shapes and contours and adhere strongly to metal surfaces. Dow Automotive markets BETAFOAM isocyanates and BETAFOAM polyols for assembly-line foam fabricating. Dow also markets prefabricated BETAFOAM structural foam inserts (SFI) that are ready to install parts for motorized vehicle assembly.

For more information, see the relevant product Safety Data Sheet or contact the Customer Information Group.

Product Uses

BETAFOAM automotive two-component foam systems minimize interior noise levels, improve vehicle stiffness, and enhance crash performance. During vehicle assembly, BETAFOAM isocyanate and BETAFOAM polyol are pumped at a controlled temperature into mixing equipment. The resulting foamy, viscous liquid is injected either manually or robotically into the inner cavities of the vehicle, conforming to the shape of the cavity. When cured, the foam strongly adheres to the metal surfaces.

BETAFOAM acoustical foam systems are injected into wheel wells, sail panels, cowl bars, pillars, and roof joints to seal the vehicle from external noise and prevent noise from resonating through vehicle cavities.

BETAFOAM structural foam systems are injected into body-side joints, sills, pillars, the underbody cross-car structure, frame rails, door panels, engine cradles, lateral rails, and hydro-formed reinforcements to increase vehicle stiffness and crashworthiness, thereby improving occupant safety. BETAFOAM structural foam inserts are placed inside structural automotive parts to improve vehicle stiffness, crashworthiness and occupant safety.

Exposure Potential

BETAFOAM automotive two-component foam systems are used in automotive manufacturing. Based on the uses for these products, the public could be exposed through:

- **Workplace exposure**[^3,5] – BETAFOAM isocyanates and polyols are manufactured in closed systems using engineering controls that prevent the escape of liquid or vapors and minimize release to the environment. The chance of exposure is further reduced by proper use of personal protective equipment. Workers who produce these products and those using them during vehicle assembly may be exposed during maintenance, sampling, testing, or vehicle application. Facilities that manufacture or use these products should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. See Health Information.

- **Consumer exposure to BETAFOAM automotive two-component foam systems** – These products are intended for industrial use only. Consumers may be operating a vehicle manufactured with cured BETAFOAM automotive two-component foam systems. However, by the time the vehicle reaches the consumer, the polyurethane foam has fully cured.

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Environmental releases

In the event of a spill of uncured BETAFOAM™ automotive two-component foam systems, the focus is on containing the spill to prevent contamination of soil, ditches, sewers, waterways, or groundwater. See Environmental, Health, and Physical Hazard Information.

Large release – Industrial spills or releases are infrequent and generally contained. If a release of one or more of the uncured components does occur, consult the Safety Data Sheet for further instruction.

- Isoyanate spills – Contain the spilled material if possible. Isolate the area. Evacuate personnel, keeping upwind of spill and out of low-lying areas. Ventilate the area. Use appropriate safety equipment. Absorb material with dirt, vermiculite, sand, or clay. Do not use cement powder. Collect in suitable and properly labeled open containers. Do not place in sealed containers.
- Polyol spills – Dike the area to contain the spill. Isolate the area and use appropriate safety equipment. Absorb material with absorbents such as cat litter, sand, or sawdust. Collect recovered material in suitable and properly labeled containers.
- Polyurethane foam spills – Scoop up hardened foam and dispose of according to the city, state, country, or geographic regulations.

In case of fire – Keep people away and deny unnecessary entry. Stay upwind, keeping out of low areas where vapors can accumulate. Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam extinguishers (alcohol-resistant ATC foams are preferred). Do not use a direct water stream as it may spread the fire. Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire-fighting clothing. Avoid contact with these materials during fire-fighting operations. If contact is likely, change to full chemical-resistant, fire-fighting clothing with self-contained breathing apparatus. Follow emergency procedures carefully. See Health and Physical Hazard Information.

For more information, review the relevant Safety Data Sheet.

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Health Information

BETAFOAM™ Isocyanates

Eye and skin contact – Eye contact with this material may cause moderate irritation with slight, temporary corneal injury. Prolonged skin contact may stain the skin and cause slight irritation with local redness. Prolonged skin contact is unlikely to result in absorption of harmful amounts. Skin contact may cause an allergic reaction. Animal studies have shown that skin contact with isocyanates may play a role in respiratory sensitization.

Inhalation – At room temperature, exposure to vapor is minimal due to low volatility. Excessive inhalation of mist, spray, or vapor from heated material may cause irritation to the nose, throat, and lungs and other adverse effects. Overexposure to isocyanates may cause fluid in the lungs and decreased lung function. Concentrations below the exposure guidelines may cause an allergic respiratory response in individuals already sensitized to it. Symptoms may be asthma-like such as coughing, difficulty breathing, and tightness in the chest.

Ingestion – This material has low toxicity if swallowed, but it is not intended for human consumption. Harmful effects are not anticipated from swallowing small amounts.

Repeated exposure – Tissue injury in the upper respiratory tract and lungs has been observed in laboratory animals after repeated excessive exposures to similar materials.

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**BETAFOAM™ Polyols**

*Eye and skin contact* – Some BETAFOAM polyols contain components that are very dangerous to the eyes. Eye contact may cause severe irritation with corneal injury, possibly resulting in permanent impairment of vision, even blindness. Chemical burns may occur. Elevated temperatures may generate vapor levels sufficient to cause eye irritation such as discomfort and redness. Vapor from amines may cause swelling of the cornea resulting in blurred or hazy vision. Bright lights may appear to be surrounded by halos. These effects may be delayed and typically disappear spontaneously. Avoid skin contact. Prolonged skin contact may cause moderate irritation with local redness but is unlikely to result in absorption of harmful amounts. BETAFOAM polyols contain components that have caused allergic skin sensitization in guinea pigs.

-Inhalation – At room temperature, exposure to vapor is minimal due to low volatility. Vapor from heated material may cause irritation of the nose and throat.

-Ingestion – These polyols have low toxicity if swallowed. However, swallowing may result in gastrointestinal irritation or ulceration.

-Repeated exposure – Some BETAFOAM polyols contain components that have caused adverse effects in laboratory animals following repeated excessive exposure.

**BETAFOAM Polyurethane Foams and BETAFOAM Structural Foam Inserts**

Eye or skin contact with these rigid foams could scratch (abrade) the eyes or skin. Skin absorption or ingestion is unlikely. At room temperature, vapors are minimal due to physical state. Vapor or fumes generated in downstream thermal operations, such as welding or torch cutting, may cause eye and respiratory irritation.

For more information, review the relevant Safety Data Sheet.

**Environmental Information**

**BETAFOAM™ Isocyanates**

Isocyanates react with water forming predominately insoluble polyureas (solids that do not dissolve in water). Polyureas appear to be stable. Because isocyanates react with water, the measured ecotoxicity to fish and other aquatic organisms is that of polyurea. Polyurea is practically nontoxic to fish and other aquatic species on an acute basis (exposure to a single, high concentration).

**BETAFOAM Polyols**

BETAFOAM polyols are a blend of components. What follows is an overview of the environmental impact of these components. Detailed information is available on the relevant Safety Data Sheet.

-Toluenediamine, ethylene oxide, propylene oxide polymer – Based on test guidelines, this material cannot be considered to be readily biodegradable. However, these results do not necessarily mean that the material is not biodegradable under environmental conditions. The bioconcentration potential (tendency to accumulate in the food chain) is low. Based on information for a similar material; material is practically nontoxic to fish on an acute basis.

-Glycerol propylene oxide polymer – No bioconcentration is expected because of the relatively high molecular weight. This material is readily biodegradable and practically nontoxic to fish and other aquatic organisms on an acute basis.
**Propylene glycol** – This material is readily biodegradable. The bioconcentration potential is low. Propylene glycol is practically nontoxic to aquatic organisms on an acute basis.

**Aminoethylpiperazine (minor component)** – This material is expected to biodegrade very slowly in the environment. The bioconcentration potential is low. Aminoethylpiperazine is slightly toxic to fish and other aquatic organisms on an acute basis.

**Pentamethyl diethylene triamine (PMDETA) (minor component)** – This material cannot be considered to be readily biodegradable. Its bioconcentration potential is low. PMDETA is slightly toxic to aquatic organisms on an acute basis (single, large exposure).

**Aminoethylethanolamine (minor component)** – This material is readily biodegradable with low bioconcentration potential. It is slightly toxic to aquatic organisms on an acute basis.

**Bis-(N,N-dimethylaminoethyl)ether** – The bioconcentration potential is low, and its potential for mobility in the soil is very high. It is slightly toxic to fish and other aquatic organisms on an acute basis.

**BETAFOAM™ Polyurethane Foams and BETAFOAM Structural Foam Inserts**

For detailed ecological data, write or call Dow’s Customer Information Group at 800-309-0988 in North America, 800-3-694-6367 in Europe or 603-7958-3392 in the Pacific region.

For more information, see the relevant [Safety Data Sheet](#).

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**Physical Hazard Information**

**BETAFOAM™ Isocyanates**

Isocyanates are highly reactive chemicals that must be handled only by those trained in their use. Store isocyanates in a dry place under nitrogen. Elevated temperatures cause diisocyanates to become more reactive. Isocyanates can react with itself at temperatures greater than 160°C (320°F). Avoid moisture. Isocyanates react slowly with water releasing carbon dioxide which causes a pressure build-up in closed systems. Elevated temperatures accelerate this process. Avoid contact with acids, alcohols, amines, water or moist air, ammonia, bases, and strong oxidizers. Avoid contact with metals such as aluminum, zinc, brass, tin, copper, and galvanized metals. Avoid unintended contact with polyols.

**BETAFOAM Polyls**

Polyls are thermally stable at typical use temperatures. Store in tightly closed, properly vented containers. Exposure to elevated temperatures can cause polyls to decompose, creating pressure build-up in closed systems. Avoid contact with strong acids, strong oxidizers, and metals such as bronze or zinc.

**Cured BETAFOAM Polyurethane Foams and BETAFOAM Structural Foam Inserts**

Cured foams and fabricated parts are chemically stable with no known physical hazards. Avoid contact with strong oxidizers.

For more information, see the relevant [Safety Data Sheet](#).

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**Regulatory Information**

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of BETAFOAM™ automotive two-component foam systems. These regulations may vary by city.
state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

Additional Information

- Safety Data Sheets (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://automotive.dow.com/automotive/after/contact/index.htm)

For more business information about BETAFOAM automotive two-component foam systems, visit the Dow Automotive web site at http://automotive.dow.com/.

References

4. **BETAFOAM 87100 Isocyanate Material Safety Data Sheet**, The Dow Chemical Company, ID No. 50341/0000
5. **BETAFOAM 87120 Polyol Material Safety Data Sheet**, The Dow Chemical Company, ID No. 5085/1001
7. **BETAFOAM 87100/87124 Structural Foam**, Technical Data Sheet, Dow Automotive
9. **BETAFOAM Structural Foams**, Dow Automotive, Form No. 299-50163-207 HMG/GG.
10. **BETAFOAM 87124 Polyol Material Safety Data Sheet**, The Dow Chemical Company, ID No. 51185/1001

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