



Safety, Health, and Environmental Guidelines for EPS and RMER II®

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GENERAL

Flint Hills Resources expandable polystyrene is shipped in the form of small polystyrene beads which contain a low percent of a volatile, flammable blowing agent. Polystyrene itself is flammable, although more difficult to ignite than the vapors of the blowing agent. The blowing agent vapors are flammable only when mixed with air within the range of 1.5 to 7.8 percent by volume. As this range is relatively broad, such mixtures can frequently occur under ordinary handling conditions. Not only the beads, but also the pre-expanded foam particles (prepuff) and the molded or extruded foam pieces can, until much of the residual blowing agent dissipates, supply enough vapor to form a flammable mixture. The mixture, when unconfined, is not "explosive". The mixture is explosive only when confined. Upon ignition the rate of flame propagation is very high and the flame appears to move in a flash but without explosion.

In view of these characteristics, attention must be given to certain safety provisions and practices specific to the safe handling of Flint Hills Resources expandable polystyrene and to the production and storage of foamed polystyrene, including regrinding and storing of scrap. If reasonable safeguards are provided and proper precautions are practiced, these materials can be handled and stored safely.

FLAMMABILITY

Raw expandable polystyrene resin, expanded polystyrene prepuff, and expanded polystyrene molded products must be considered combustible when directly exposed to fire of sufficient intensity and heat. Therefore, they should not be stored or installed near open flame or ignition sources.

The modified grades of expandable polystyrene contain flame-retardants designed to decrease flammability due to accidental ignition from a small flame source. The expanded polystyrene molded from these resins have been tested in numerous small scale fire tests and meet the requirements of the nation's building codes and applicable industrial, federal, and state requirements.

THE RESULTS OF THESE TESTS ARE NOT INTENDED TO REFLECT HAZARDS UNDER ACTUAL FIRE CONDITIONS.

Flammability Characteristics of Molded Expanded Polystyrene

Recommended Maximum Use Temperature: 165°F (75°C)

Melting Point: As a thermoplastic, polystyrene does not exhibit a true melting point. It will begin to soften at about 212°F (100°C) and, as more heat is applied, melting occurs.

Flash Ignition Temperature*: The lowest initial temperature of air passing around a molded sample of expanded polystyrene at which a sufficient amount of combustible gas is evolved to be ignited (ASTM D 1929). 698°F (370°C)

Self Ignition Temperature*: The lowest initial temperature of air passing around the specimen at which, in the absence of an ignition source, the self-heating properties of polystyrene lead to ignition or ignition occurs of itself. (ASTM D1929) 752°F (400°C)

Potential Heat of Building Materials ** A property-type measurement of the heat that could be potentially released from building materials when exposed to high heat exposure of 1382°F (750°C). (NFPA -259) 17,293 BTU Grade 40
17,269 BTU Grade 54

* results as reported in Radco Test report No. RAD-2725 dated Feb. 2001

** results as reported in SwRI project report No. 01.030490303 dated July 2000

SPECIAL SAFETY PROVISIONS

1. Store and open containers, Super Sacks, or Flexible Intermediate Bulk Containers (FIBC) only in a well ventilated area which is free of open flame, sparks, lighted cigarettes, or other fire hazards.
2. Care should be exercised when opening containers, Super Sacks, or FIBC's, remembering the possibility of the presence of ignitable vapors.
3. Opened containers, Super Sacks, or FIBC's should stand undisturbed for ten minutes to allow dissipation of vapor accumulation between the contents and the top of the container, Super Sacks, or FIBC's. Once opened, containers, Super Sacks, or FIBC's of raw material should be completely emptied. Appropriate measures should be taken at all times to reduce exposure to fumes and vapors.
4. If a partially used container, Super Sacks, or FIBC's of beads must be stored, the liner must be tightly wrapped around the remaining beads to minimize the free air space above the beads.
5. Personnel should, under no circumstances, be permitted to lean over or reach into open containers, Super Sacks, or FIBC's.
6. Storage of either beads or pre-expanded foam particles (prepuff) in partially filled drums should be avoided. The larger the free space above the solids, the larger is the volume of the blowing agent-air mixture which, if ignited, might well be expected to give a larger flash fire. Partially filled containers, Super Sacks, or FIBC's should be opened with extreme care to prevent ignition by spark or frictional origin. After opening, allow containers, Super Sacks, or FIBC's to stand to dissipate vapors before moving. Mild air currents accelerate such vapor dissipation. Appropriate measures should be taken at all times to reduce exposure to fumes and vapors.
7. All equipment used in handling and processing the material should be electrically grounded. This material will develop a static charge rapidly.
8. Non-metallic scoops, etc., should be used for transferring the material. (Plastic buckets with metal handles are NOT acceptable.)
9. Because the flammable vapors of the blowing agent are heavier than air, they may flow across the floor and accumulate in low places. Proper ventilation should, therefore, be extended to these places.
10. Bins or storage containers should be made of cloth or wire screen to allow constant escape of blowing agent and to prevent accumulation of large quantities of a flammable mixture above the content.
11. Scrap grinders should have a magnetic separator over which the material passes before entering the grinder. Ferrous metal pieces can cause frictional sparks which can ignite the contents not only within the grinder body but also within the scrap storage bin.
12. Waste EPS and expanded polystyrene should be kept for at least 24 hours before disposal to allow dissipation of the blowing agent. The appropriate means for dispersing the blowing agent should be site-specific and consider all applicable regulations. Appropriate measures should be taken at all times to reduce exposure to fumes and vapors. Only open top or well vented trucks should be used to haul waste EPS. Compactor-type waste trucks should be avoided. Compaction can cause frictional sparks and subsequent ignition of the blowing agent vapors which are being squeezed out at the same time.
13. You should ensure all employees are appropriately trained in all safety practices involving the handling, storage and processing of expandable polystyrene.

Safety needs vary from facility to facility and this is only meant to point out some of the many practices that may be implemented to provide a safer work environment. You should develop the rules and guidelines that best fit your facility regarding the safe handling, storage, and processing of this product.

Flexible Intermediate Bulk Containers (FIBC)

EPS is transported in Flexible Intermediate Bulk Containers (FIBC). For more information on FIBC usage and handling, you can go to the Flexible Intermediate Bulk Container Association's website at www.fibca.com. Additional information on usage of FIBC's is printed on the bags by the bag manufacturer.

HEALTH CONSIDERATIONS

1. Polystyrene is an inert plastic. There are no known incidents of health problems associated with skin or eye contact. Although an extremely unlikely route of entry, polystyrene is biologically inert when ingested. Reference is made to the Flint Hills Resources OSHA Material Safety Data Sheet for further information.
2. Expandable polystyrene contains pentane as a blowing agent. Pentane, as a volatile flammable liquid, provides a slight hydrocarbon odor to the expanded polystyrene. Recommended exposure limits for pentane vapors in the workplace are found in the Material Safety Data Sheet (MSDS).
3. During the manufacturing of molded expanded polystyrene from expandable polystyrene resin, the majority of the pentane is used and emitted. Adherence to the MSDS is recommended.
4. COMBUSTION TOXICITY-Expanded polystyrene is an organic compound consisting of carbon and hydrogen and, consequently, one would expect that the products of combustion would be predominantly carbon dioxide and carbon monoxide. This was shown in studies in the late 1970's utilizing Military Specification M-14-G wherein the following results were obtained:

COMPOSITION OF THE PRODUCTS OF COMBUSTION (PPM)

<u>Product</u>	<u>Expanded Polystyrene</u>
Hydrogen Chloride	0
Aldehydes as HCHO	0
Ammonia	0
Carbon Monoxide	less than 10
Carbon Dioxide	500
Oxides of Nitrogen	4
Cyanides of HCN	0

5. Additional toxicity information related to expandable polystyrene products produced by Flint Hills Resources, LP can be found on the Material Safety Data Sheet.

ENVIRONMENTAL CONSIDERATIONS

Overview

Expanded polystyrene is made from styrene monomer and hydrocarbon blowing agents. Molecules of styrene monomer are linked together to form the polymer called polystyrene. Styrene has been produced synthetically since the 1930's from ethyl benzene, which is derived from byproducts of natural gas and petroleum processing.

Expanded polystyrene is currently approved by the Federal Food and Drug Administration for use in food contact packaging.

Polystyrene, expandable polystyrene, and expanded polystyrene products are environmentally safe when handled properly. Raw beads, prepuff, regrind, and small molded parts can obstruct sewers and waterways if handled improperly. They have been found in the digestive tract of fish. You should institute appropriate good housekeeping practices to prevent environmental concerns.

Disposal

Expanded polystyrene products are considered inert and are generally accepted by landfills. See Special Safety Provisions for additional information on waste EPS.

Recyclability

The very nature of polystyrene as a thermoplastic, which allows it to be continuously melted and reformed, makes EPS a highly recyclable product. Collecting expanded polystyrene for recycling presents a challenge making consumer participation critical to recycling success.

Flint Hills Resources is committed to recycling from our plants and in community programs nationwide. Recycling, however, is not the sole solution to responsible waste management. An integrated, balanced approach involving source reduction, recycling, and waste to energy conversion is required for effective control of waste.

Heavy Metals

In 1989, the Coalition of Northeastern Governors adopted model legislation to ban the sale or distribution of any package, packaging material, or product in packaging that contains inks, dyes, pigments, adhesives, stabilizers, additives, or other components to which lead, cadmium, chromium has been intentionally added during the manufacturing process. By May of 1992, 11 Northeastern states had enacted legislation based upon the model legislation of CONEG. Many other states nationally have followed suit.

Flint Hills Resources does not intentionally add lead, mercury, cadmium, and hexavalent chromium to Flint Hills Resources expandable polystyrene products.

Clean Air

The Environmental Protection Agency's Air Quality Control Act establishes limits of ozone concentration in the lower atmosphere. Some specified hydrocarbon compounds participate in ozone formation. Pentane is one of those compounds, called Volatile Organic Compounds (VOC). Control of pentane emissions during processing of expandable polystyrene is required in some areas of the country. Expandable polystyrene typically contains between 3-7% by weight of pentane. Processors should review their local air quality control regulations to ensure compliance. Other VOC's may be present in this product and the Material Safety Data Sheet (MSDS) should be evaluated to determine those substances and the amount present.

Flint Hills Resources does not intentionally add Class I or Class II chlorofluorocarbons. (CFC's) to their expandable polystyrene products.

Compliance with the Clean Air Act should be made considering all components, blowing agents, etc. to determine if there are any additional requirements that need to be addressed.

Regulatory Information

The product described herein may require global product registrations and notifications for chemical inventory listings or for use in specific applications. The MSDS of this product should be consulted to help determine the proper shipping description. If material shipped by FHR, LP is altered or modified, different regulatory requirements may be required.

Summary

This bulletin was developed to provide information that may assist you in your efforts to consider and determine the appropriate measures regarding the safe handling and use of EPS. Additional information can be found on the FHR, LP Material Safety Data Sheet (MSDS) for EPS. Again, you need to determine if you should deploy any of these potential risk mitigation measures, and to the extent you decide to deploy them, they need to be made by you to be site-specific, i.e. tailored by you to best meet the specifics of your location, personnel, equipment, use, etc.

For additional information on this product, please contact:

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REFERENCES

- National Fire Protection Association, Standard NFPA-704, Identification of Fire Hazards of Materials
- NFPA Standard 231, Standard for General Storage

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