F A G E R D A L A W O R L D F O A M S

Fagerdala USA, Inc.

GECET® Expandable Engineering Resins

RECOMMENDED SAFETY, HEALTH AND ENVIRONMENTAL GUIDELINES

I. GENERAL

GECET resin is shipped in the form of beads, which contain 3 to 7 percent of a volatile, flammable, blowing agent. GECET resin is itself 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 (blowing agent content usually less than 4%) and the molded or extruded foam pieces (blowing agent content usually less than 1.5%) can supply enough vapor to form a flammable mixture, until much of the residual blowing agent has dissipated. The mixture, when unconfined, is not “explosive”. The mixture is explosive only when confined. Upon ignition, when unconfined, its 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 Fagerdala USA-Peru, Inc. GECET resin and to the production and storage of foamed GECET resin, including regrinding and storing of scrap. If reasonable safeguards are provided and proper precautions are practiced, these materials can be handled and stored safely.

II. CONSTRUCTION AND EQUIPMENT

1. Building should be of substantial, fire resistant construction.
2. Areas for various services such as raw material storage, production, finished product storage and grinding and storage of scrap should be separated by fire walls. Fire doors should be either self-closing or kept closed.
3. Sprinklers capable of delivering adequate water density from a water supply of adequate volume, as determined by the local fire and insurance authorities, are recommended. The number and type of sprinklers will vary with the height of the building, its construction, its area, and its location.
4. An adequate number of hand fire extinguishers, preferably carbon dioxide, and hand water supply hoses should be strategically located for quick use. (Weigh carbon dioxide extinguishers at least every three months and mark

weight and date on tag).

5. Adequate ventilation at floor level, preferably forced, should provide for at least six changes of air per hour to keep blowing agent vapor concentration below 1000 part per million, i.e. 10% of the lower flammability limit and below the 8-hour time weighted OSHA permissible exposure limit.
6. Exhaust fans with ducts to outdoors should be provided at critical locations such as scrap grinders, cutting tables and pre-expanders.
7. Electrical equipment such as motors, stop-art push buttons, disconnect switches and wiring should conform to local building code requirements.
8. Good electrical bonds and grounding of all metal equipment, as well as transfer lines, storage bins and scrap grinders are essential.
9. An adequate number of conveniently located and properly sized waste and trash boxes should be provided. They should be equipped with gravity closing lids and should preferably be made of non-combustible material. Vents to outdoors are desirable for blowing agent vapor dissipation.
10. Pre-expanded particles should not be passed directly through the impeller of an air blower. Any blockage of flow downstream from the blower causes accumulation in the blower. The revolving impeller may generate enough frictional heat in the accumulation to start a fire, which can spread to storage bins. Such a fire is particularly difficult to detect early and to extinguish.

III. GENERAL HOUSEKEEPING AND SAFE PRACTICES

1. Establish and maintain aisles of adequate width.
2. Keep all floor areas clean of litter.
3. Practice housekeeping at the level of which the plant can be shown with pride to any unannounced visitor.
4. Establish and enforce a “NO SMOKING - NO MATCHES - NO LIGHTERS - NO WELDING” rule without fail. This restriction may appear to be unnecessary in certain areas, but as blowing agent vapors are about 2½ times heavier than air, they fall to the ground and in quiet air can crawl along the floor and convey fire from one area to another.
5. Have several persons stand by with extinguishing equipment in hand if such spark-producing operations as welding or cutting must be carried out. Never let a welder work alone. Be sure area is clean and vapor crawl is absent.
6. Avoid open flames such as lanterns. Lift truck exhausts should be directed upward.
7. Bonding and ground connection failure can produce sparks. All grounds should be tested periodically.
8. Tools such as scoops and shovels should be of materials such as wood or non-conductive plastic to eliminate the possibility of sparks.
9. Clothing should be non-static accumulative, and shoes should have conductive soles. Avoid fabrics of synthetic fibers.

10. Fire drills can be an invaluable aid. Trained personnel are less likely to panic if an emergency should occur.
11. Periodic checks of various locations in the plant under full operating conditions by local gas company representative with his “explosimeter” are recommended.

IV. SPECIAL SAFETY PROVISIONS

1. Store and open containers 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, remembering the possibility of the presence of ignitable vapors.
3. Opened containers should stand undisturbed for ten minutes to allow dissipation of vapor accumulation between the contents and the top of the container. Once opened, containers of raw material should be completely emptied.
4. If a partially used container of pellets 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.
6. Storage of either pellets or pre-expanded foam particles in partially filled drums should be avoided. The larger the free space above the solids, the larger the volume of the blowing agent-air mixture which, if ignited, might well be expected to give a larger flash fire. Partly filled containers should be opened with extreme care to prevent ignition by spark or frictional origin. After opening, allow containers to stand to dissipate vapors before moving. Mild air currents accelerate such vapor dissipation.
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 dissipation of blowing agent and to prevent accumulation of large quantities of a flammable vapor mixture above the contents.
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 GECET resin should be kept outdoors for at least 24 hours before disposal. Containment in an open mesh bin will allow dissipation of blowing agent. Only open-top or well-vented trucks should be used to haul waste GECET resin. 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. Fires have occurred when waste GECET resin has been loaded in compactor-type trucks now commonly used to haul waste to disposal sites.

13. All employees should be periodically indoctrinated in all safety practices involving the processing of expandable polystyrene.

These recommended safety practices are not all inclusive. Safety needs vary from facility to facility, and these guidelines are only meant to outline some of the many practices that should be implemented to provide a safe work environment.

V. HEALTH CONSIDERATIONS

1. GECET resin 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, GECET resin is biologically inert when ingested. Please refer to Fagerdala USA-Peru, Inc. Corporation's OSHA Material Safety Data Sheets for further information.
2. GECET resin contains pentane as a blowing agent. Pentane is a volatile, flammable odorless liquid. Recommended exposure limits for pentane vapors in the workplace are found in the Material Safety Data Sheets (MSDS).
3. During the manufacturing of GECET foam from expandable GECET resin, 80 to 90% of the pentane is used and emitted.

VI. ENVIRONMENTAL CONSIDERATIONS

1. GECET expandable resins, and expanded GECET resin products are environmentally safe when handled properly. Raw pellets, prepuff, regrind, and small molded parts can obstruct sewers and waterways. Good housekeeping practices will help prevent environmental concerns.
2. 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), even though its role in ozone formation is extremely minor. Control of pentane emissions during processing of expandable GECET resin is required in some areas of the country. Processors should review their local air quality control regulations to ensure compliance.

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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