

## Bulletin 334 - 11/03 - Problems with Expandable Polymeric Beads - Worldwide

Expandable Polymeric Beads are a moulding material in the form of granules or beads, approximately 3mm diameter. The beads or granules may contain between 5% and 8% of a volatile hydrocarbon, chiefly pentane. During the moulding process the beads are heated causing expansion and fusion forming the familiar polymeric packaging material. During storage or transport the material will release a portion of the pentane. The rate of this release is increased with a rise in temperature. The beads have been found to generate flammable concentrations of gas in enclosed spaces and have been involved in several major explosions - in one incident causing severe damage to a container ship.



Expandable beads are included in the IMO Dangerous Goods Code, under Class 9 (Miscellaneous dangerous substances and articles). Various packaging is recommended in the IMO Code, including outer drums and inner plastic packages. Intermediate bulk containers include composite fireboard or plastic materials.

The Code of Federal Regulations 49 CFR – Chapter 1 – Part 173 describe various packaging materials but state that, except for transportation by highway and rail, the packaging must be capable of containing any evolving gases from the contents during normal conditions of transport.

The IMO Code states that Storage and Segregation is Category “A”, On Deck or Under Deck but mechanical ventilation should be provided for under deck stowage to prevent the formation of a flammable atmosphere. The Code advises that during storage a small proportion of the pentane may be released to the atmosphere and this proportion is increased at elevated temperatures. There is also a cautionary note relating to the opening of the doors if the material is carried in containers.

Reputable manufacturers of polymeric beads are well aware of the hazards of storage and transport of the beads and provide detailed lists of precautions to be observed. They provide detailed warning labels to be fixed to drums and freight containers, labels in several different languages and graphic symbols.

The recommended storage should be in a well-ventilated space and preferably below 20C. Warehouse storage below 20C may be a relatively simple operation. However, stowage in the holds of an ocean vessel may not be as simple. Stowage should at least be away from heated bunker tanks or engine room bulkheads. Research has indicated that temperatures in ships’ holds might be of the order of 65C+ in some tropical areas. Obviously adequate hold ventilation with “suitable equipment” should be stressed

because the arcing of an electric fan motor may readily ignite a flammable concentration of pentane in air.

Deck temperatures in tropical climates can also exceed the recommended limits for safe stowage of the beads. However if the cargo is containerized, the containers can be placed in a central area of the stow and thus be insulated from the effects of direct sunlight. This arrangement will obviously create extra movement during loading and discharge, but can nevertheless assist toward safe carriage. Pentane released from containers in deck stowage will be dispersed by wind and movement of the vessel and should not create flammable or explosive conditions outside the containers.

Manufacturers are well aware of the problems of release of pentane into freight containers. Recommended ventilation periods are suggested prior to entry and un-packing the container. The pentane hazard is real, they emphasise that if opened in a container yard, the containers should not be sited near drains, because pentane released when the doors are opened could enter the drains creating a potential fire hazard at some nearby location.

We would like to remind Members that from the 1<sup>st</sup> January 2004, the IMDG Code will become mandatory under international law as IMDG Code Amendment 31. Please refer to [LP Bulletin 306](#) for further information.

Source of information: Cliff Mullins (Minton, Treharne & Davies Limited)  
through the Carefully to Carry Committee