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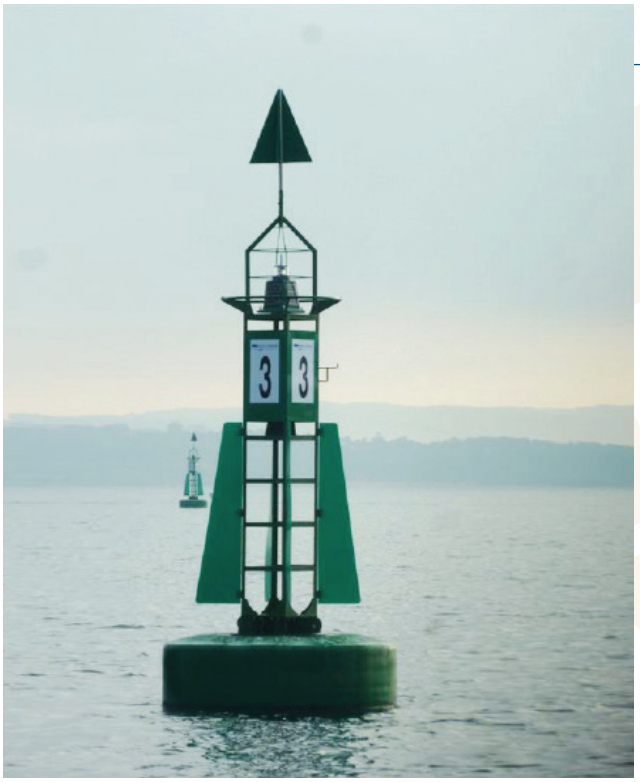

Image. Elastomer buoy

PLASTIC BUOYS

Plastic buoys may be defined as a floating aid with at least the buoy hull constructed of a plastic material.

The **IALA G1006** Guideline provides an overview and guidance for developing and selecting plastic buoys for different purposes, including information such as plastic material types, manufacturing techniques, quality control considerations, and standard test procedures commonly in use.

The plastic materials used on plastic buoys are usually lighter when compared to steel, this provides performance and installation advantages, but lightweight buoys require a careful design to avoid pitching and rolling issues which will detract from their operational effectiveness in waves, wind and current.

Plastics do not corrode, this is a huge advantage over steel buoys, and eliminates a big part of the maintenance procedures, leaving only cleaning and removal of marine growth.

The life cost of a plastic buoy is usually lower compared to steel buoys, due to his huge advantage in purchase, installation and maintenance costs. Additionally, they are easily recyclable.

Large plastic buoys are easy to transport, due to its modular construction.

The design lifetime of a plastic buoy can be shorter when compared to a steel buoy, but some technologies (elastomer buoys) can achieve equivalent or ever longer lifetimes than steel buoys.

The main types of plastic buoys available in the market nowadays are as follows:

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1. POLYETHYLENE PLASTIC BUOYS
2. GLASS REINFORCED PLASTIC (GRP)
3. POLYURETHANE / ELASTOMER COATED FOAM
4. BOYA DE ESPUMA DE IONÓMERO

1. POLYETHYLENE PLASTIC BUOYS

Polyethylene is a thermoplastic that behaves plastically at temperatures as low as 100ºC. This allows the material to be easily molded on pieces and easily repaired with little tools needed.

The more common process to form polyethylene pieces is the rotational molding process, which uses only heat to transform plastic resin into a finished shape. The alternative is the extrusion process, where plastic pipes and plates are formed using heat under high pressure which forms strong molecular chains resulting in greater strength, impact and abrasion resistance.

A lot of different types of polyethylene are used on the manufacturing of plastic buoys, including types from low density to ultra-high-density polyethylene. Only the medium or lower density plastics can be rotomolded, other plastic is manufactured by an extrusion process.

2. GLASS REINFORCED PLASTIC (GRP)

GRP is abrevation for Glass Reinforced Plastic which consists of glass fiber matt bonded by polyester resin.

Complex shapes can be produced by laying-up resin and glass reinforcement into a mould by hand (or spray machine). The cylindrical buoy body is normally formed by joining two half body shapes. It is important to note that the joint is often the weakest area of the body.

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The strength of GRP is dependent of the ratio of glass fibre to resin and thus this is another area which requires definition and quality control. High strength (required in ice conditions) can be achieved by the use of carbon or Kevlar fibres but the costs may be high. These fibres may be used in specific stress areas of the buoy.

The outer layer of resin, the gel coat, prevents water absorption into the glass reinforcement and should be protected from mechanical damage.

This is usually provided by some form of fendering.

3. POLYURETHANE / ELASTOMER COATED FOAM

These buoys typically consist of a thick, flexible marine grade polyurethane elastomer skin on a flexible closed cell foam core. They have the advantage of overall flexibility and resilience. The flexibility will also be an advantage when the buoy has to be serviced in rough weather.

The main feature of **elastomer buoys** lies in its lightweight float of high elasticity, manufactured with closed-cell polyethylene solid foam sheet (no water absorption) and spray coated with a 8 - 20 mm thick layer of coloured polyurethane elastomer.

Thanks to its solid construction, they are virtually unsinkable, even in case of a strong impact. Besides, they can withstand repeated collisions without deforming (recovery capacity). The elastomer polyurethane allows the application of an anti-fouling treatment.

These buoys have typically lower life cost, higher performance, and higher lifetime than any other buoy technology, being his slightly higher cost his only disadvantage.

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4. IONOMER FOAM BUOYS

The life and durability of ionomer foam buoys is entirely dependent on the quality of the foam used. The flexibility of the foam can provide good impact resistance but the resistance to aggressive abrasion is not good. This last factor is important for buoys which dry out on a hard bottom at a tidal site or may be subject to moving ice conditions.

A foam buoy hull can sustain considerable damage or loss of material without sinking. A damaged buoy cannot be repaired by the user. The material is not recyclable.

These buoys are usually constructed by wrapping closed-cell foam (ionomer foam which is produced in sheet form) around a central structural core. The layers of foam are heat sealed together during the wrapping process. The outer layer of the rolled foam can be “densified” through the application of pressure and heat to make a hard, smooth surface.

Color pigments are usually incorporated into the foam during the extrusion process, so the color is continuous throughout the entire hull and daymark.

The buoys include a structural steel framework, steel lifting and mooring eyes and stainless steel connecting hardware.

The manufacturing technique particularly lends itself to the production of one-off designs as a variety of body shapes can be made without the need for a mould. Buoys of this type are significantly lighter than steel buoys of the same size.

In following articles, we will talk with more detail of rotomolded polyethylene plastic buoys and elastomer buoys, as they are the principal technologies used and options available in the current Aids to Navigation sector.