



Ship Type: Bulk Carriers Trade Area: Ukraine

Bulletin 224 - 12/01 - DRI / Hot-Moulded Briquettes - ex Ukraine

A recent shipment of Ukrainian Direct Reduced Iron (DRI) / Hot-Moulded Briquettes (HMB) has come to our attention, in as much as one of our Member's vessels had to call into a port of refuge for assistance after their cargo was observed to be significantly heating up. The briquettes were loaded below the specified size (broken), probably as a result of poor handling.

The production of DRI (IMO Bulk cargo Code ref BC015) is a process in which iron ore is crushed, partially freed from unwanted material and then pressed in the form of pellets. These pellets are then subjected to hot reducing gases, prepared from the partial burning of methane or similar gases. This process – to remove the oxygen – is carried out at temperatures just below the melting point of iron, leaving a rigid sponge-like structure, known as DRI pellets.

By reason of its sponge-like nature, the pellet has an enormous surface area relative to its mass. Oxidisation of iron is a surface phenomenon – the larger the surface area relative to the mass, the more reactive is the product. As far as reasonably possible, DRI should not be dropped from a height into the hold, thus damaging the pellets and increasing their surface area. The rate of oxidisation is accelerated by the presence of water, even more so by the presence of water containing chloride ions (seawater). This oxidisation is mainly exothermic – heat is produced – cases have occurred where the entry of seawater into bulk DRI has resulted in the pellets actually catching fire. Another product of the oxidisation process is hydrogen gas, which is highly explosive.

A second form of DRI is prepared as a powder, which is subsequently compressed into briquettes (ref BC016). These have a very small surface area relative to their mass and are subsequently less reactive.

Prior to loading onto a vessel, briquettes may be stored uncovered, exposed to rain – which is not in itself too much of a problem provided that they are not *obviously* wet when loaded. The bottom layers on the quay prior to loading are likely to be excessively wet and should be rejected if obviously so. However, if it rains during loading, operations should cease. A fine spray is often used during discharge operations to keep the dust down, so rain would not be a problem.

On completion of loading and prior to sailing, it is recommended, if weather and time permit, that the holds be left open for as long as possible to allow the cargo to cool. The temperature of the stow is to be monitored – if in excess of 65°C, sailing should be postponed until it is clear that the temperature is falling. If it continues to rise, the Master should seek P&I assistance. Should the temperature rise abnormally on passage, the Master should make for a port of refuge and seek P&I assistance.

It is recommended that DRI is carried either in an inert atmosphere – the preferred gas is nitrogen, but if this is not available, carbon dioxide may be used – or treated with an oxidation and corrosion-inhibiting process. Ideally, the inert gas should be injected at the bottom of the stow, from several outlets so as to force out the air in the stow. The amount of inert gas used in the stow should be sufficient to maintain an oxygen concentration below 5% by volume and hydrogen content below 1% by volume.

It is recommended that when carrying HMB, effective ventilation of cargo and adjacent spaces be maintained whenever possible. The forced-air equipment should be intrinsically safe.

For more information, contact UK P&I Club Loss Prevention Dept., or refer to LP Bulletin 5-6/97, LP News issue 8 - 12/97, Carefully to Carry no.12 –12/86 & issue 5 – 12/97.

Source of information: UK P&I Club – Loss Prevention Dept., IMO BC Code