Insight Article

Understanding the different direct reduced iron products

The term direct reduced iron, or DRI, has a generic meaning which covers a number of products with a variety of properties and hazards.

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There has been a disturbing increase in the number of potential life threatening incidents involving the carriage of direct reduced iron (DRI). Gard Loss Prevention Circular No. 07/2003 provided general advice on the carriage of this product.1 Since this circular was issued Gard has received several enquiries from members and clients asking about the carriage of this cargo and the actions to be taken to prevent any problems occurring during the voyage.

1. See also the article “The dangers of carrying direct reduced iron (DRI)” in Gard News issue No. 173.

Disturbingly, some enquiries relate to types of DRI which charterers and shippers do not consider as dangerous or restricted in any way. The terms used include “HBI”, “hot briquette”, “fines”, “remet” and “metallic fines”. These terms may well be an accurate description of the specific product but they are often used to avoid limitations agreed in charterparties for the carriage of dangerous cargoes.

It is important to note that the term DRI, generally used in charterparties, has a generic meaning, covering a number of products with a variety of properties and hazards. It also covers a technical description of a specific type of refined iron ore.

These products must be grouped under the genus of direct reduced iron (DRI BC 015 or HBI BC 016) for the purposes of the IMO Code of Safe Practice for Solid Bulk Cargoes (BC Code). This article is intended to help masters and owners understand what may or may not be offered to them and what precautions should be taken.

DRI – Direct reduced iron

Normally in the form of sponge pellets or lumps varying between 6 and 25mm nominal diameter, but often 8 to 12mm diameter. The IMO BC Code classes this product as “a material that is hazardous only when in bulk” (MHB). It can be found under the BC Code as BC015. If this product becomes wet it can significantly overheat and emit hydrogen gas. Thus it must be carried under inert conditions. Nitrogen gas is normally used and is applied to the holds by way of a temporary manifold fitted to the tank top prior to loading. Thermocouples must also be positioned in the cargo on the tank top and elsewhere throughout the stow at different heights to monitor the temperature. Gas monitoring of the holds, normally for hydrogen and oxygen, must also be undertaken throughout the voyage. The product must be kept dry at all times prior to and during carriage. The product should be treated as DRI, BC 015.

HBI – Hot briquetted iron

This material is manufactured from DRI product, which is compressed at temperatures exceeding 650° C to form briquettes between about 90 and 130mm long, 80 to 100mm wide and 20 to 50mm thick. This product is a much safer form of DRI than DRI pellets. It is far more resistant to overheating if it becomes wet. During a voyage it can still generate small amounts of hydrogen. Inerting is not required by the BC Code but adequate surface ventilation is required. It should be treated as HBI BC 016, provided there is no additional qualification to the HBI (see below).

CBI – Cold briquetted iron

CBI is manufactured from the various residual products produced during the manufacture of associated ferrous products and semi-refined raw materials including DRI (DRI fines but also other residuals). Some manufacturers cold briquette their own DRI pellets so that they can be fed into their particular furnace. CBI briquettes are produced at temperatures below 650° C and a binder is often used. Because the briquetting operation is carried out at a temperature lower than is used for HBI, some of the critical characteristics of DRI, such as porosity, relatively large surface area and a reactive surface, remain in the CBI to some degree. Thus essentially CBI can have the same or very similar properties to DRI pellets and should be treated in exactly the same manner, as the propensity to overheat and generate hydrogen, if it becomes wet, still remains. The original source of the material used to manufacture CBI is obviously of significance – if this can not be verified then the CBI should be treated in a similar manner to DRI, BC 015.

DRI fines

These are the by-product of the DRI manufacturing process, pellets or briquettes, and are often 4mm in diameter or less. Although smaller than normal DRI pellets, this product is essentially DRI pellets and will behave in a similar manner, so it should be treated with the same caution: it should be kept dry at all times, the holds should be inerted and temperature and gas monitoring should be carried out. One added potential hazard with this product is that it may not have been stored under ideal dry conditions at the plant, as should be the case with normal DRI, and therefore there may be wet pockets of DRI fines within the cargo, which can subsequently cause problems during the voyage. Therefore, it should be treated as DRI, BC 015 and the storage history should be obtained.

HBI fines

This is a term used by shippers to describe ordinary DRI fines possibly in an attempt to achieve a reduction in the carriage requirements as afforded to real HBI. The fines can be either simple DRI fines which have been completely misdescribed by the shipper, or fines produced during production of HBI. If the fines have been produced after the HBI briquetting process then it is possible that they may be in a relatively safe form and could be treated in a similar manner to HBI briquettes. However, if the fines have been produced prior to the HBI briquetting process, they may potentially be similar to a DRI pellet product. If the history of the fines is not known then they should be considered as DRI fines and treated in the same manner as DRI, BC 015.

Remet fines

This is another term used by shippers to describe DRI fines. They are not “re-melted” fines, as the name could – and may be intended to – suggest, for the obvious reason that if the product had been produced by a (re)melting process (which DRI is not) then it would not be in the form of fines. If a ship is offered a cargo of this description there is a very high chance of the product being DRI fines and it should therefore be treated as DRI, BC 015.

Remet fines (HBI)

As with ‘remet fines’, remet fines (HBI) should be treated as DRI, BC 015.

As with 'HBI fines', metallic HBI fines should be treated as DRI, BC 015.

Other names

Shippers have used other qualifications for DRI fines which exclude the abbreviation "DRI", such as "Orinoco iron remet fines" and "Orinoco remet fines in bulk". These should all be treated as DRI, BC 015.

Conclusion

It is a requirement of SOLAS Chapters VI and VII and of the IBC Code that the master must be provided with all relevant documentation related to the carriage of the intended cargo. Owners should be wary of any bulk cargo offered for shipment under trade names or abbreviated names and always insist on a full product description, including technical and alternative names. Future versions of the BC Code are likely to maintain the current two categories of DRI but differentiate between the two types by referring to them as DRI "A" or "B".

In summary, if any iron bulk cargo is offered as "fines" and is described with terminology such as "HBI", "remet", or any other wording not found in the relevant section of the BC Code, it should be treated as a DRI product as detailed in the BC Code No. 015. The onus is on the shipper to show that the fines have not originated from DRI manufacture, and without that evidence the ship is entitled to insist on applying the more stringent requirements of BC Code 015 to the loading and carriage.

If the vessel has any doubts about any particular DRI loading it is recommended that independent advice be obtained from an expert. Gard is happy to assist in this regard, and in any other way it can.

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Any comments to this article can be e-mailed to the Gard News Editor .

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