

Carriage of Direct Reduced Iron (DRI) by Sea – Changes to the IMO Code of Safe Practice for Solid Bulk Cargo

Members will be aware of the general concerns that exist with regard to the carriage of Direct Reduced Iron (DRI) by sea. These concerns have increased significantly since the loss of life arising from the carriage of DRI on board the *Ythan* (2004) and the deliberate sinking by the French Authorities of the *Adamandas* (2003) with her cargo and bunkers on board.

The explosion and accompanying tragic loss of life on the *Ythan* resulted from the interaction between the vessel's cargo of "HBI Fines" and the fresh water (moisture) contained in the cargo at the time of loading. At the time of the incident the IMO Code of Safe Practice for Solid Bulk Cargo (the Code) categorized two types of DRI, namely hot moulded briquettes or hot briquetted iron (subsequently re-designated as DRI (A)), and pellets, lumps etc. (subsequently re-designated as DRI (B)). The DRI/HBI fines cargo could not in reality be categorized as either (A) or (B) under the Code and the expert advice was to treat it as the more dangerous and reactive type of DRI (B).

Following the above mentioned incidents and their subsequent investigation, the IMO Subcommittee on Dangerous Goods, Solid Cargoes and Containers (DSC) considered amendments to the relevant Schedules of the Code as part of a review of the Code. The Marshall Islands, Intercargo and the IG proposed that DRI Fines should be individually classified and designated DRI (C) and both DRI (B) and (C) should be carried under an inert (nitrogen) atmosphere with a maximum allowable moisture content of 0.3% in respect of DRI (C). It was recommended by the DSC at its 12th session held in September 2008 that these (and other minor) amendments be adopted by the IMO through the IMO Maritime Safety Committee (MSC). The MSC adopted the recommendations in November 2008 and the Code was renamed the International Maritime Solid Bulk Cargo Code (IMSBC Code).

The main changes to the Code in relation to the carriage of DRI (A), (B) and (C) can be summarised as follows:

DRI (A), Briquettes, hot-moulded

- ▶ a maximum limit on the moisture content of 1% cargo is to comprise essentially whole briquettes. Fines of less than 6.35mm and dust are limited to 5% .
- ▶ concentration of hydrogen to be measured throughout the voyage. If it exceeds 25% LEL appropriate precautions to be taken.
- ▶ surface ventilation only shall be conducted as necessary. When mechanical ventilation is used, the fans shall be certified as explosion-proof and shall prevent spark generation.
- ▶ wire mesh guards shall be fitted over inlet and outlet ventilation openings.

DRI (B), Lumps, pellets, cold-moulded briquettes

- ▶ average particle size is limited to 6.35mm to 25mm. Fines of less than 6.35mm and dust are limited to 5%
- ▶ loading conveyors are to be dry.
- ▶ prior to loading, an ultrasonic test or another equivalent method with a suitable instrument shall be conducted to ensure weather tightness of the hatch covers and closing arrangements.
- ▶ moisture content must be less than 0.3% and must be monitored during loading.
- ▶ any cargo that has already been loaded into a cargo space and which subsequently becomes wetted, or in which reactions have started, shall be discharged without delay.
- ▶ carriage is only permitted under an inert gas blanket.
- ▶ the ship shall be provided with the means of reliably measuring the temperature at several

points within the stow, and determining the concentrations of hydrogen and oxygen in the cargo space atmosphere on voyage whilst minimizing the loss of the inert atmosphere.

- ▶ the ship shall be provided with the means to ensure that the requirement to maintain the oxygen concentration below 5% can be achieved throughout the voyage. The ship's fixed CO₂ fire-fighting system shall not be used for this purpose. Consideration should therefore be given to providing vessels with the means to top up the cargoes spaces with additional supplies of inert gas having regard to the duration of the voyage.
- ▶ the ship shall not sail until the master and a competent person are satisfied that:
 - ▶ all loaded cargo spaces are correctly sealed and inerted,
 - ▶ the cargo temperatures have stabilised at all measuring points and are less than 65°C, and
 - ▶ concentration of hydrogen in the free space has stabilised and is less than 0.2% by volume.
- ▶ Oxygen concentration shall be maintained at less than 5% throughout duration of voyage.

DRI (C), By Products, Fines

- ▶ average particle size is less than 6.35mm, and there are to be no particles greater than 12mm in size.
- ▶ the reactivity of this cargo is extremely difficult to assess due to the nature of the material that can be included in the cat-

egory. A worst-case scenario should therefore be assumed at all times.

- ▶ carriage requirements are largely identical to those for DRI (B), including the 0.3% limit on moisture and carriage under an inert gas blanket.

Attached for assistance is a more detailed summary of the carriage requirements for DRI under the IMSBC Code but it should be noted that it is necessary to comply with all of the relevant provisions of the Code.

In light of the and above members, when carrying DRI (B) or (C), should satisfy themselves that the nominated vessel is capable of maintaining oxygen levels at a concentration of below 5% throughout the voyage.

The Code will remain recommendatory until January 2011 at which point it will become mandatory.

If members have any questions or concerns relating to the carriage of DRI they should contact their Club.

All Clubs in the International Group have issued a similar circular.

Yours sincerely,
The Swedish Club



Lars Rhodin

Encl.

- ▶ DRI Carriage Requirements

DRI Carriage Requirements

All types of DRI

- ▶ Fines are now defined as particles up to 6.35mm ($\frac{1}{4}$ " in size.
- ▶ Cargo spaces shall be clean, dry and free from salt and residues of previous cargoes. Wooden fixtures and combustible materials shall be removed.
- ▶ The carrier's representative is to have reasonable access to stockpiles and loading installations for inspection.
- ▶ Prior to loading, the shipper shall provide the Master with a certificate issued by a competent person stating the cargo is suitable for shipment and that it conforms with the requirements of the Code in terms of particle size, moisture content and temperature.
- ▶ A similar certificate shall be provided after loading relating to the whole consignment.
- ▶ The shipper shall provide comprehensive information on the cargo and safety procedures to be followed in the event of an emergency.
- ▶ No cargo shall be loaded or transferred during precipitation and non-working hatches shall be kept closed.
- ▶ The cargo shall not be accepted when its temperature is in excess of 65°C, or its moisture content exceeds the permitted value, or if the quantity of fines exceeds the permitted value, where appropriate.
- ▶ The cargo temperatures shall be monitored during loading and recorded in a log.
- ▶ The cargo shall be trimmed in accordance with the relevant provisions of the Code.
- ▶ Adjacent tanks other than double bottom tanks shall be kept empty during the voyage.
- ▶ Weather tightness shall be maintained throughout the voyage.
- ▶ The bilge wells shall be clean and dry and protected from ingress of cargo.
- ▶ Precautions shall be taken to protect personnel, equipment etc. from the dust of the cargo.
- ▶ During handling of the cargo, "NO SMOKING" signs shall be posted and no naked lights or other ignition sources permitted.
- ▶ Suitable precautions shall be taken before entering cargo spaces, which be depleted of oxygen and/or contain a flammable atmosphere.
- ▶ The ship shall be provided with a detector suitable for measuring hydrogen in an oxygen depleted atmosphere and for use in a flammable atmosphere.
- ▶ Cargo temperatures and hydrogen concentrations in hold atmospheres shall be measured at regular intervals during the voyage.
- ▶ If the hydrogen concentration exceeds 1% or the cargo temperature exceeds 65°C, appropriate safety precautions shall be taken. If in doubt, expert advice shall be sought.
- ▶ Bilge wells shall be checked regularly for the presence of water.
- ▶ All records of temperature, hydrogen and oxygen measurements, where appropriate, are to be retained on board for 2 years.
- ▶ The hydrogen concentration shall be measured in the holds prior to opening the hatch covers.

DRI (A), Briquettes, hot-moulded

- ▶ The moisture content shall be less than 1%.
- ▶ The cargo shall comprise essentially whole briquettes and the addition of fines shall be prohibited.
- ▶ Fines shall comprise no more than 5% by weight.
- ▶ Weather deck closures and hatch covers shall be inspected and tested to ensure integrity and weather tightness.
- ▶ Surface ventilation only shall be conducted as necessary and air shall not be directed into the body of the cargo. When mechanical ventilation is used, the fans shall be certified as explosion-proof and shall prevent spark generation. Wire mesh guards shall be fitted over inlet and outlet ventilation openings, and the escaping gases shall be unable to enter living quarters.
- ▶ During discharge, the application of a fine spray of fresh water is permitted only when the cargo is to be stored in an open area.

DRI (B), Lumps, pellets, cold-moulded briquettes

- ▶ The average particle size shall be from 6.35mm to 25mm, with fines no more than 5% by weight.
- ▶ The shippers' certificate shall state the date of manufacture for each lot of cargo.
- ▶ The certificate issued after loading shall confirm that the moisture content has not exceeded the permitted value.
- ▶ The cargo shall be certified as having been aged for at least 3 days, or treated so as to achieve the same reduction in activity.
- ▶ The cargo shall be kept dry at all times. Any cargo that has been wetted, or known to have been wetted, shall not be loaded.
- ▶ Loading conveyors shall be dry.
- ▶ Prior to loading, an ultrasonic test or another equivalent method with a suitable instrument shall be conducted to ensure weather tightness of the hatch covers and closing arrangements.
- ▶ The moisture content shall be less than 0.3% by weight and shall be monitored during loading.
- ▶ Any cargo that has already been loaded into a cargo space and which subsequently becomes wetted, or in which reactions have started, shall be discharged without delay.
- ▶ The breakage of briquettes and lumps shall be minimised and the addition of fines shall be prohibited.
- ▶ Carriage is only permitted under an inert gas blanket.
- ▶ Prior to loading, provision shall be made to introduce a dry inert gas at tank top level. Nitrogen is preferred. All vents and openings shall be sealed to prevent the loss of the inert atmosphere.
- ▶ On completion of loading of a cargo space it shall be immediately closed and sufficient inert gas introduced to achieve an oxygen concentration of less than 5% throughout the cargo space.
- ▶ The ship shall be provided with the means of reliably measuring the temperatures at several points within the stow, and determining the concentrations of hydrogen and oxygen in the cargo space atmosphere on voyage whilst minimizing the loss of the inert atmosphere.
- ▶ The oxygen concentration shall be maintained at less than 5% throughout duration of voyage. The ship shall be provided with the means to ensure that this requirement can be achieved throughout the voyage. Consideration shall be given to topping up with addi-

tional supplies of inert gas: the ship's fixed CO₂ fire-fighting system shall not be used for this purpose.

- ▶ The ship shall not sail until the master and a competent person recognised by the national administration of the port of loading are satisfied that:
 - ▶ All loaded cargo spaces are correctly sealed and inerted;
 - ▶ The cargo temperatures have stabilised at all measuring points and are less than 65°C; and
 - ▶ The concentration of hydrogen in the free space has stabilised and is less than 0.2% by volume (i.e. 5% LEL).
- ▶ The cargo spaces shall remain tightly sealed and the inert condition maintained throughout the voyage.
- ▶ The ship shall be provided with a detector suitable for measuring oxygen in a flammable atmosphere.
- ▶ Oxygen concentrations shall be measured at regular intervals during the voyage.
- ▶ During precipitation, all cargo discharge operations shall be suspended and holds containing cargo shall be closed.

DRI (C), By products, Fines

- ▶ The average particle size shall be less than 6.35mm, and there shall be no particles greater than 12mm in size.
- ▶ "The reactivity of this cargo is extremely difficult to assess due to the nature of the material that can be included in the category. A worst-case scenario should therefore be assumed at all times."
- ▶ The cargo shall be kept within the permissible moisture content at all times.
- ▶ The carriage requirements are identical to those for DRI (B), including the 0.3% limit on moisture, with the following exceptions:
 - ▶ The shippers' certificate does not need to state the date of manufacture of each lot of cargo;
 - ▶ The cargo shall be certified as having been aged for 30 days.
 - ▶ Any cargo that has already been loaded and which subsequently is exposed to additional fresh water or seawater over its natural moisture content and becomes wetted, or in which reactions have started and its temperature has exceeded 120 °C, shall be discharged without delay.