The Pitfalls of the Carriage of Coal

The purpose of this article is to highlight some of the important steps and precautions which a ship owner should be aware of when carrying coal cargoes and to provide a brief commentary on the various parties' legal positions in the event that loss or damage occurs.

The two main dangers to which owners should be alert are the emission of methane and self-heating. Coal carried in bulk can emit methane, a flammable gas, when mixed with air. Methane-air mixtures containing between as little as 5% - 16% methane may constitute an explosive atmosphere, which can easily be ignited. Methane, being lighter than air, may gather in the upper portions of closed hold space(s). If hold space surrounds are not tight, methane can leak through into adjoining/adjacent cargo holds, thus significantly increasing the prospect of loss/damage to both cargoes and vessel.

Some types of coal may be liable to self-heating, which can lead to spontaneous combustion in cargo holds where flammable and toxic gases, including carbon monoxide, may be present. In addition, some coals may be liable to react with water, producing acids which can cause corrosion. Flammable and toxic gases, including hydrogen, may also be produced. Coal may also be subject to oxidation, leading to the depletion of oxygen and an increase in carbon dioxide.

There are a number of precautions an owner may take to minimize methane emission and self-heating and to protect against the consequences. Prior to loading, the shipper or his appointed agent should provide in writing to the master details of the characteristics of the cargo and the recommended safe handling procedures; for loading and transport of the cargo. As a minimum requirement, the cargo’s contract specifications for moisture content and sulphur content should be stated. Confirmation should also be required on whether the cargo may be liable to emit methane or self-heat.

The master must be satisfied that he has received such information prior to accepting the cargo. If the shipper has advised that the cargo is liable to emit methane or self-heat, the master should additionally refer to the “special precautions”, which should have been provided by the charterer.

Before and during loading, and while the material remains on board, the master should observe the following:
1. All cargo spaces and bilge wells should be clean and dry. Any residue of waste material or previous cargo should be removed (including removable cargo batters) before loading.
2. All electrical cables and components located in cargo spaces and adjacent spaces should be free from defects. Such cables and electrical components should be safe for use in an explosive atmosphere or positively isolated.
3. The ship should be suitably fitted and carry on board appropriate instruments for measuring the following without requiring entry in the cargo space:
   3.1 Concentration of methane in the atmosphere.
   3.2 Concentration of oxygen in the atmosphere.
   3.3 Concentration of carbon monoxide in the atmosphere.
   3.4 The pH value of cargo hold bilge samples.
4. The shipboard instruments should be regularly serviced and calibrated and ship personnel should be trained in the use of such instruments.

It is recommended that means be provided for measuring the temperature of the cargo in the range 0°C to 100°C. Such arrangements should enable the temperature of the coal to be measured while being loaded and during the voyage without requiring entry into the cargo space.

The ship should carry on board the self-contained breathing apparatus required by SOLAS regulation II-2/1. The self-contained breathing apparatus should be worn only by personnel trained in its use.

Smoking and the use of naked flames should not be permitted in the cargo areas or adjacent spaces and appropriate warning notices should be posted in conspicuous places. Burning, cutting, chipping, welding or other sources of ignition should not be permitted in the vicinity of cargo spaces or in other adjacent spaces, unless the space has been properly ventilated and the methane gas measurements indicate it is safe to do so.

The master should ensure that the coal cargo is not stowed adjacent to hot areas.

Prior to departure, the Master should be satisfied that the surface of the material has been trimmed reasonably level to the boundaries of the cargo space, to avoid the formation of gas pockets and to prevent air from permeating the body of the coal. Access casings leading into the cargo space should be adequately sealed. Shippers should ensure that the master receives the necessary co-operation from the loading terminal.

The atmosphere in the space above the cargo in each cargo hold should be regularly monitored for the presence of methane, oxygen and carbon monoxide. Records of these readings should be maintained. The frequency of the testing should depend upon the information provided by the shipper and the information obtained through the analysis of the atmosphere in the cargo space.

Unless expressly directed otherwise, all holds should be surface ventilated for the first 24 hours after departure from the loading port. During this period, one measurement should be taken from one sample point per hold. If after 24 hours the methane concentrations are at an acceptably low level, the ventilators should be closed. If not, they should remain open until acceptably low levels are obtained. Measurements should be continued on a daily basis.

The hatches should be closed immediately after completion of loading into each cargo hold. The hatch covers can also be additionally sealed with a suitable sealing tape. Surface ventilation should be limited to the absolute minimum necessary to remove any methane which may have accumulated. Forced ventilation should not be undertaken. On no account should air be directed into the body of the coal, as air could promote self-heating.

The master should ensure, as far as possible, that any gases which may be emitted from the materials do not accumulate in adjacent enclosed spaces. The Master should also ensure that enclosed working spaces, e.g. store-rooms, carpenter's shop, passage ways,
tunnels, etc., are regularly monitored for the presence of methane, oxygen and carbon monoxide. Such spaces must be adequately ventilated.

Regular hold bilge testing should be systematically carried out. If the pH monitoring indicates that a corrosion risk exists, the master should ensure that all bilges are kept dry during the voyage in order to avoid possible accumulation of acids on tank tops and in the bilge system.

If the behaviour of the cargo during the voyage differs from that specified in the cargo declaration, the master should report such differences to the shipper. Such reports will enable the shipper to maintain records on the behaviour of the coal cargoes, so that information provided to masters can be reviewed and amended in the light of transport experience.

Since the dangers are well known, it might be considered that an owner agreeing to carry coal should bear the risk of anything going wrong. However, charterparty provisions governing loading operations, dangerous cargoes and the implied indemnity given by a time charterer will usually operate to the disadvantage of the charterer in the event of an incident.

Where charterers are responsible for cargo operations under clause 8 of the NYPE form (ie, the words “and responsibility” are not added) problems which are caused by loading overheated coal and/or improper trimming will be the responsibility of the charterers. Where owners may need to be cautious is:
a) if clause 8 includes the words “and responsibility” thereby making owners responsible for the loading and trimming operations[1], or
b) if SURFACE VENTILATION is not properly carried out.

In any case, if overheated coal is loaded and the owners have no special knowledge of this, they may be able to argue that the charterers are in breach of a further obligation[2] not to load dangerous goods without giving the owners notice of their dangerous nature. Similar considerations apply under a voyage charter, where the charterers will normally be responsible for loading operations. The implied indemnity given by a time charterer to owners for following charterers’ orders[3] may also operate in owners’ favour here.

An illustration of these principles can be found in the “Athanasia Communis”[4]. Two vessels were chartered by the same charterers on the NYPE form. They each loaded coal and, shortly after sailing, each was damaged by an explosion caused by the ignition of an air methane gas mixture. The owners failed to prove that the cargo had properties that made it unusually dangerous compared to other types of coal cargo, but it was still the case that charterers’ orders to load the coal fell within the scope of the implied indemnity. The owners of “Athanasia Communis” only failed because it was found that the explosion had been caused by a crew member lighting a match for a cigarette; the owners of the other vessel, the “Georges Chr. Lemos” succeeded in their claim against the charterers.

Failure on the part of the owners/master/crew to carry out precautionary measures as outlined above may lead to allegations that the vessel was not cargo worthy (and, hence, unseaworthy) and/or that the cargo was not properly cared for, in breach of Article III, Rules 1 and 2 of the Hague-Hague-Visby Rules. Such allegations might be used by cargo interests in bringing claims for loss of cargo in the event of an explosion and/or by both cargo interests and charterers to defend claims by the shipowner for damage to the vessel and expenses.

Where problems arise during a voyage, the master should take prudent action to ensure the safety of the vessel and cargo. Where smoke, fire or exessive cargo temperature is evident, this may involve calling at an unscheduled port to ascertain the scope of the problem and take remedial steps where necessary. If the charterers are responsible on one or more of the grounds outlined above, the vessel will remain on hire (or charterers will be liable for damages for detention if on voyage charter) and the charterers would be liable for expenses incurred. Where these expenses are substantial, consideration may be given to declaring General Average (following advice from an average adjuster) which would give owners the opportunity to obtain security from cargo interests for the expenses, up to the amount of cargo’s General Average contribution.

[1] the “Shunjiro Maru No. 5”[65] 1 LLR 568
[2] Whether at common law - see the “Athanasia Communis”[90] 1 LLR 277; under an express term of the charter; or under Article IV, Rule 6 of the Hague-Hague-Visby Rules if the Rules are incorporated into the charter
[3] Clause 8 of the NYPE form and the “Island Archer”[93] 2 LLR 366 and [94] 2 LLR 227
[4] 1 LLR 277