

Carefully to Carry

Bitumen – natural and rock

Advice on the carriage of a bulk cargo referred to by shippers as bitumen/asphalt rock or natural bitumen/asphalt

The terms bitumen and asphalt are interchangeable. They both refer to black or dark-coloured solids or very thick liquids that have been distilled from crude oil. The 'distillation' process can occur within a refinery, resulting in processed bitumen/asphalt. It can also happen naturally, either when crude oil is exposed to heating and/or biological activity within the deposit, or when it undergoes weathering at or near the Earth's surface. Either way, the distillation process separates the heavy molecular weight hydrocarbons, such as bitumen, from the lighter ones, such as methane and petroleum products.

Bitumen is extensively used in roadway construction as a 'glue' or binder in the production of asphalt concrete. To produce asphalt concrete the 'sticky' bitumen is heated and mixed with aggregates, such as rock chips, then laid and rolled to form the road surface. Common usage often refers to various forms of asphalt/bitumen as 'tar' or 'pitch'.

Formation of bitumen

In crude oil exploration, petroleum companies look for a 'classic' sequence of rocks, often referred to as a 'petroleum system'. The system consists of 'source rocks', 'reservoir rocks', and 'cap rocks'. The source rocks are rich in hydrocarbons, which migrate to accumulate in gaps and pores in the reservoir rocks. Cap rocks are located above the reservoir rocks and trap the hydrocarbons in the reservoir rock pores. Usually the source of the hydrocarbons will be crude oil, but in some places the origin is coal.

In some cases, the cap rocks may leak, allowing crude oil to move towards the Earth's surface. This crude oil can collect in large 'ponds' where the light hydrocarbons evaporate. In some places these hydrocarbon seeps lend their name to the area, such as the many 'Kerosene Creek(s)' in New Zealand. If the lighter hydrocarbons evaporate, it leaves behind the heavier hydrocarbons. This natural distillation forms bitumen deposits, such as the La Brea Tar Pits in Los Angeles and the Pitch Lake of Trinidad and Tobago.

The Pitch Lake is something of a tourist attraction as well as being commercially marketed as Trinidad Lake Asphalt (TLA). This product is considered a semi-solid or 'gel-sol' as it appears solid at room (ambient)



"The carrier shall properly and carefully load, handle, stow, carry, keep, care for and discharge the goods carried."

Hague Rules, Articles iii, Rule 2

Carefully to Carry Advisory Committee

This report was produced by the Carefully to Carry Committee – the UK P&I Club's advisory committee on cargo matters. The aim of the Carefully to Carry Committee is to reduce claims through contemporaneous advice to the Club's Members through the most efficient means available.

The committee was established in 1961 and has produced many articles on cargoes that cause claims and other cargo related issues such as hold washing, cargo securing, and ventilation.

The quality of advice given has established Carefully to Carry as a key source of guidance for shipowners and ships' officers. In addition, the articles have frequently been the source of expertise in negotiations over the settlement of claims and have also been relied on in court hearings.

In 2002 all articles were revised and published in book form as well as on disk. All articles are also available to Members on the Club website. Visit the Carefully to Carry section in the Loss Prevention area of the Club website www.ukpandi.com for more information, or contact the Loss Prevention Department.

temperatures but when left uncontained will slowly change shape to fill the space it is in and has a softening point at around 90°C. The TLA is cleaned and placed in drums until it cools and solidifies, ready for transport. TLA is not usually offered as a solid bulk cargo.

Other examples of commercially exploited natural bitumen/asphalt deposits are the various oil or tar sands such as those in Canada and Venezuela, and solid bitumen deposits in the Middle East North America and the North Sea. The tar sands require the sand to be separated from the bitumen/asphalt, enabling the cleaned hydrocarbons to be processed in the same way as crude oil. The extracted oil is transported in tankers and is not usually offered as a solid bulk cargo.

Bitumen rock

With the price of crude oil increasing, and the need to heat bitumen to enable mixing with aggregates during road construction, some companies have decided to exploit alternatives to refined bitumen. One of the alternatives is to utilize natural asphalt/bitumen deposits, where the 'glue' is already mixed into suitable rocks for construction purposes.

If a petroleum system (the crude oil and associated rock units) is uplifted to the Earth's surface, it will be subjected to erosion. The cap rocks may then be removed by erosion leaving the crude oil within the reservoir rocks exposed to biodegradation and evaporation, consequently forming the bitumen/asphalt. This appears to have happened to Buton Island, in South-East Sulawesi, Indonesia where natural bitumen/asphalt is found at the surface in association with limestone. These deposits differ from those in Trinidad and the oil sands in that the bitumen is naturally fused into limestone rocks. These deposits are locally referred to as Aspal Buton, or ASBUTON rock asphalt.

The resulting bitumen/asphalt and limestone mixture can be utilised directly (or mixed with traditional roading materials but with much less processing), and avoiding the need for excessive heating of the bitumen to enable mixing with aggregates during road construction. While the Indonesian deposits have been known since 1920, and it is estimated there are 300 million tonnes available, it is only recently that they have been extensively exploited and offered for shipment.

The ASBUTON deposits consist of about 20-30% bitumen/asphalt integrated into about 70-80% limestone and can be divided into several types, based on their physical characteristics. The two main deposits currently being exploited are:

- Kabungka (since 1980) – these are hard deposits (softening point is at about 100°C) with relatively low asphalt content. They break easily when crushed but do not release the asphalt without extensive heating.
- Lawele (since 2003) – these are soft deposits (softening point is at about 60°C) with relatively high asphalt content. They require slightly lower temperatures and readily deform during processing such that the asphalt coats the grains of limestone. This makes the grains better able to stick to other aggregates during the production of asphalt concrete. This variety is the main variety being exported to date.

When ASBUTON rock asphalt is dried and crushed to form a granular material, it is referred to as Buton Rock Asphalt (BRA), and it is this name which may be included on cargo documents when the product is presented for ocean carriage in bulk. Shippers may also refer to the product using the name of the source and then add BRA, for example 'Lawele BRA'. Alternatively, they may simply describe it by the general name, 'natural bitumen/asphalt'.

See for example:

<http://www.bai.co.id/index.htm>

<http://www.wika.co.id/group-of-companies/pt-sarana-karya/>



Note the 'rock-like' appearance of this material



This cargo is often loaded from barges

Application of the IMSBC Code

Shippers tend to describe their cargo with respect to its intended use, e.g., bitumen rock is intended for use because of the bitumen content. This has caused many owners and charterers of bulk carriers, along with their P&I Clubs to query the nature of the cargo when it is described as 'natural bitumen', as to most people who are familiar with bitumen shipments, this requires a tanker. Even more confusing, it appears that this product is more than 50% 'rock', so would be a solid cargo. All this tends to ring alarm bells with owners and P&I Clubs.

In our recent cases, the material has been declared variously as a Group C or Group B cargo but also with an FMP and TML declaration, indicating it is also a Group A cargo. This has also unsurprisingly rung even more alarm bells, particularly as the TML values provided have not changed over the last several years, and neither has the declared moisture content.

Natural bitumen/asphalt or bitumen/asphalt rock is not listed in Appendix 1 (the individual schedules section) of the IMSBC Code. Our advice would be to treat this

cargo like any other bulk cargo that is not listed in Appendix 1.

The IMSBC Code makes provision for the carriage of new and unlisted cargoes in Section 1.3. It is this Section which describes the processes which shippers should undertake to gain certification from the load port competent authority (CA). The IMO issued circular 1453 in July 2013 which details the guidelines for dealing with cargoes not listed in the Code to assist with the implementation of the requirements in the IMSBC Code.

Section 1.3 of the IMSBC Code states that for any bulk cargo which is not listed in Appendix 1, the shipper – prior to loading – must provide the IMO competent authority (CA) of the port of loading with details of the cargo characteristics and properties. The CA of the port of loading will assess the acceptability of the proposed cargo for safe shipment.

- If no specific hazards are identified, the port of loading CA can authorise shipment; and the flag state CA and disport state CA should be informed of this authorization.
- If hazards have been identified by the port of loading CA, then flag state CA and disport state CA should confer to agree the appropriate carriage conditions.

In either case, *the load port CA* should provide to the master a certificate that states the cargo characteristics and required conditions for carriage and handling. We would advise members not to accept any cargoes which are not listed in the IMSBC Code and not to accept any non-IMSBC Code cargo without the CA certificate.

To complete the procedures for dealing with unlisted cargoes, the IMO requires the competent authority of the port of loading to submit an application to the Organization, within one year from the issue of the certificate, to incorporate the new solid bulk cargo into appendix 1 of the IMSBC Code. This mandatory requirement is detailed in section 1.3.2 of the IMSBC Code.

One of the major problems we have encountered is that not every state that has shippers of this type of product actually has a competent authority and this seems currently to be an insurmountable obstacle. We would advise shipowners not to carry insufficiently characterized bulk cargoes.