Sampling of Bulk Liquid Cargoes

Introduction

Sampling is a vitally important factor in the custody transfer of bulk liquid cargoes. Acquisition and subsequent care and retention of representative samples can provide an important means of rebutting unfounded allegations of cargo contamination. This applies equally to chemical, petrochemical, petroleum product and crude oil shipments.

Cargo surveyors attending the loading or discharge of any given cargo are often working on behalf of shippers or consignees (or both, on a joint basis) and are not obliged to provide samples to the ship, albeit that it is common practice to place samples in the custody of the Master at the loadport for delivery to the disport receivers. However, these samples are not the property of the ship and only on rare occasions are official-sealed custody transfer samples provided. Whether samples are provided by the cargo interests to the ship or not, it is recommended that the vessel's crew draw samples for the ship's protection.

Retention and sealing

Due to the inability of the ship's officers to undertake analysis of samples, only the most obvious contamination problems will be apparent at the outset, such as:

i) change in colour
ii) the presence of water (if water is not soluble in the cargo)
iii) foreign particulate matter
iv) odour taint

Samples taken at the initial stages of cargo operations showing such obvious cargo quality deviations should give cause to halt cargo operations in order to carry out further investigations and to note protest.

All samples drawn should be sealed, labelled, retained and recorded. Wherever possible, samples drawn by ship's crew should be clearly labelled with the following:

- Ship's Name Operational Status i.e. before loading, after loading, before discharge.
- Product Sample Source i.e. tank number, manifold number. Sample Type i.e. top, middle, bottom, dead bottom, running, composite
- Identity of Sampler i.e. surveyor, crew member. Date and Time
- Location i.e. port, berth, anchorage. Seal Number.

Seals are customarily applied to samples taken by an independent surveyor in order to preserve sample provenance in the event of dispute. Nowadays, seals are widely available and relatively inexpensive and it is increasingly common for ships to be equipped with their own seals. Alternatively, some owners use self-sealing tamper-evident bottle closures which may not be individually numbered but, nonetheless, preserve sample provenance.

Marked samples should be retained in a dedicated locker, ideally for at least 12 months. Space considerations may make this impractical in which case the samples should be retained for as long as possible. However, where the cargo is known or expected to be the subject of dispute, samples should be retained for at least 12 months in any event. Samples should not be exposed to extremes of temperature and should be kept in darkness. When no longer required, disposal should be by appropriate means, many owners use the services of local cargo surveyors who invariably have disposal methods already in place.

Sample bottles

Sample bottles vary in size and in the materials from which they are made. Glass and plastic bottles can be dark or clear. Most samples can generally be stored in clear glass bottles. Light sensitive samples, however, should be stored in brown bottles. Certain samples, such as Caustic Soda or Potash require plastic containers. Petroleum productcrude oil samples are often retained in lacquered-lined tinplate containers. These types of containers are, in general, unsuitable for retention of chemical cargo samples. Where possible, a range of containers should be available.

Sample bottle closures vary in the chemical resistance of the sealing insert. Wax methylated spirit type should only be used for petroleum product crude oils. Aluminium foil faced cardboard discs are unsuitable for acid or alkaline samples. Preferred inserts are polypropylene or PTFE.

Sample bottle size may be determined, to some extent, by storage capacity, balanced against the need to retain sufficient sample volume to allow analysis in the event of a dispute arising. Generally, 500ml is a realistic compromise.

Where to take samples

During the custody transfer of a bulk liquid cargo, the principal sampling points where cargo quality can be adequately monitored are:

i) Loadport Shore tank(s)
ii) Shoreline Sample following any 'packing' or flushing operation
iii) Vessel's manifold at commencement of loading and spot checks during loading
iv) Vessel's cargo tanks First tops
v) Vessel's cargo tanks post loading
vi)  Vessel’s cargo tanks pre-discharge
vii) Vessel’s manifold at commencement of discharge
viii) Dispatch Shore Tank(s) pre and post discharge

Ideally, all of these samples should be taken on each cargo carrying voyage, but in any event, onboard ship samples iii) to viii) should always be taken by the crew for protection of the Owner’s interests. Further samples might be considered, such as iii), following change-over of shore tanks at a mid-loading stage.

**Method of drawing samples**

Samples should be drawn in compliance with industry practice as set out in publications such as those issued by ASTM, API, BS, ISO or EI (see references below). In general, a ‘running’ sample taken by use of a bottle and sample cage is the preferred method of obtaining a representative sample in a homogeneous bulk cargo. Where the cargo may not be homogenous, careful zone sampling is required to produce a representative composite sample. The properties of some chemical cargoes require that special sampling procedures are adopted such as excluding air, using specialist sample valves or indeed ‘closed’ sampling methods due to the toxicity or flammability of the cargo. Here, the sampling procedure is prescribed by the specialist equipment in use but general guidelines have recently been drafted by the EI and API. Appropriate safety procedures must be observed and the sampler protected from exposure to the cargo during sampling.

**Conclusion**

It is unquestionably the case that a vessel’s adherence to the above sampling procedure can provide the necessary evidence to rebut cargo quality claims in circumstances where unfounded allegations are made against shipowners. A rigorous sampling system should form an essential part of a vessel’s ISM Operational Procedures.

**References**

ASTM E 300  Standard Practice for Sampling Industrial Chemicals.
BS 3185  Methods for Sampling Petroleum Products.
BS 5309  Methods for Sampling Chemical Products.
IP  Petroleum Measurements Manual Part IV Sampling - Section I Manual Methods
ISO 5655 Animal and Vegetable Fats and Oils - Sampling
EI HM52 – Measurement and sampling of cargoes on board tank vessels using closed and restricted equipment

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1. Safety: Colour is not an issue on all cargoes. Toxic and highly odorous cargoes should not be tested for colour.
2. API surveyors should be summoned.
3. horny bottles impede inspection of the sample for colour/heat/stickiness. It is suggested that clear glass bottles are used initially and, after inspection, the sample transferred to a dark brown bottle for storage.