THE SWEDISH CLUB CASEBOOK

3

Cargo - tankers

3.1 Hazardous chemical: Cargo contaminated cargo by tank coating

It was winter with temperatures around 2°C. The chemical tanker was in port loading a cargo of mixed xylenes (MX) (ref Marpol Annex II) in all its six cargo pair tanks. The previous cargo had been ethylene dichloride (EDC) (ref Marpol Annex II) which the vessel had carried on the two previous voyages.

During the voyage to the loading port the vessel carried out tank cleaning. The loading was uneventful, and the vessel departed the following day and proceeded towards the discharge port.

Sampling

The vessel berthed and a cargo surveyor came on board to carry out sampling. The cargo in all tanks was found to be off-specification regarding chloride content.

Coating

During the investigation into the contamination, the coating on the cargo tanks was identified as the cause of the contamination.

The tanks were coated with phenolic epoxy and it is believed that the coating was applied properly and in compliance with the requirements set out by the manufacturer of the paint.

Such organic coatings absorb significant quantities of solvent-like cargo into the paint layer and subsequently desorb (release) these residues following discharge of the cargo. It is this property of absorption and desorption into and out of organic coatings that has led to a significant amount of cargo contamination claims, which is also believed to be the cause in this case.

It should be noted however, that epoxy systems are resistant to strong acids and alkalis and do not generally absorb significant quantities of oil-like substances. These types of substances remain on the surface of the paint from where they can be removed using conventional cleaning techniques.

Cargo lines

As part of a change in cargo grade, a tank cleaning operation requires all cargo lines to be flushed to remove all traces or remnants of the previous cargo. Additionally, vent lines leading from the cargo tanks to the pressure/vacuum relief valves (P/V valves) also need to be flushed. This is done by opening the flange between the P/V valve and the vent piping for each tank and using a hose to flush this line. During the carriage of cargo, vapour from the tank can accumulate and condense within the vent line. These lines are designed to be self-draining to the cargo tank and any condensation will trickle back to the cargo tanks. It cannot be confirmed if this was done or not during the tank cleaning.

The cargo was finally discharged to shore tanks and sold at a salvage price with a considerable loss.

What can we learn?

- The condition of the coatings in the cargo tanks had been allowed to deteriorate and this allowed cargo seepage and accumulation between the coating and the substrate. Combined with the absorption of the cargo of EDC into the phenolic epoxy coating, this seems to be the likely cause of contamination of the mixed xylene cargo with chlorides.

- All tank coatings should be inspected by a manufacturer's paint technician and the damaged coatings repaired in accordance with the manufacturer's instructions. It would also be prudent for the owner to have the coating assessed by the manufacturer to ensure that the chemical resistant properties of the coating are adequate for the intended trade of the vessel.

- A coating resistance list should be placed on board the vessel and made available to the crew. This list should always be referred to and for all loading operations. Where the coating resistance list states that the coating has 'limited resistance' to a cargo, it must be ensured - as far as practically - that two successive loadings of aggressive cargoes are avoided and, charterers for the following voyage should be advised of the possibility of contamination and an indemnity sought. The owner's chartering department should also be made aware of potential risks when fixing the vessel.

- Tank cleaning procedures and guidance provided by the owner in their procedures should be revised to include not only the need to refer to published industry guidelines such as Dr Verwey's Tank Cleaning Guide or the Miracle Tank Cleaning Guide, but also to include guidance on the behaviour of different types of cargoes carried on chemical tankers and their effect on tank coatings.

- The crew needs to be trained in tank cleaning and tank coating maintenance.

3.2 Petro: Naphtha was off spec

The chemical tanker had loaded naphtha in port A. 10,000 MT of the naphtha was to be discharged in port B, and the balance to be discharged in port C. Before loading began the cargo tanks had been inspected by a surveyor and accepted. Not all the cargo tanks were used for the naphtha cargo.

Previous cargo

The vessel had previously carried EDC (ethylene dichloride). During loading of the EDC cargo, both the CPP1 (clean petroleum product) manifold on the port side and the port side's common pipeline had been used.

During loading of the naphtha, the manifold connection was changed from the CPP1 to the port side's common manifold. It is unknown whether the CPP1 manifold was drained during the shifting of the loading arm.

After discharging the EDC the tanks were ventilated. The ventilation took approximately 10 days to complete. After this the EDC tanks and the CPP1 manifold were subsequently washed with water, according to the Chief Officer. First the tanks were washed with sea water and finally with fresh water.

Loading the naptha

The same CPP1 manifold and pipeline that was used for the EDC cargo was used during the loading of the naphtha cargo.

After loading the naphtha in port A the vessel sailed to port B and discharged 10,000 MT of naphtha. The cargo receiver in port B decided to mix the 10,000 MT into a shore tank which already held 23,000 MT of naphtha.

The vessel departed from port B and sailed to discharge the balance of the cargo in port C.

Contamination

Contamination was later discovered in port B when the cargo was discharged from the shore tank to the refinery. The cargo from the shore tank to the production line was immediately stopped.

The vessel's cargo samples were taken and analysed. All the samples were found to be within specification. There was no contamination to the cargo on board, which had been loaded in port A.

Analysis of the shore tank's samples were however off-spec and were contaminated by organic chloride which was not produced at the refinery of port B. The cargo receiver in port A also confirmed that they had not handled any EDC cargo and that no such cargo was made at the refinery – the terminal in port B only receives naphtha cargoes.

The EDC cargo was not handled at port A which was the naphtha loading port.

This made it most probable that the contamination was from the vessel, as the previous cargo loaded had been EDC.

Discharge at port C

It was noted that there was no contamination to the naphtha cargo when it was discharged in port C. Here the discharging was via the foremost manifold of the CPP common line on the port side. The port side's CPP1 manifold, which had been used for the EDC cargo and naphtha cargo in port B, was not in use.

EDC in manifold

It is likely that the EDC remained confined inside manifold CPP1 following the change of the manifold connection from CPP1 to the port side's common manifold and contaminated the naphtha cargo in port B during discharging. The organic chloride was identified by the analysis of the shore tank to be ethylene dichloride (EDC).

The cargo receiver in port B later sold the naphtha at a public auction at a considerable loss which the shipowner had to pay.

What can we learn?

- It is unlikely that the cargo tanks were insufficiently cleaned after carriage of the EDC. Although not recorded in the cargo record book, the Chief Officer stated that the cargo tanks were correctly washed after the ventilation.
- It is likely that the CPP1 manifold was insufficiently cleaned by means of ventilation and/or washing. The contamination likely occurred when loading of naphtha commenced at port A via the manifold CPP1 and flushing the EDC material from the manifold into the first tanks opened to receive the cargo. As a result of the higher density, the EDC contaminant probably settled at the bottom of the cargo tanks, forming a very thin layer and/or pockets, allowing it to remain undetected upon completing the loading operation at port A and prior to the start of discharging at port B.
- The procedures carried out for ventilation and tank cleaning were not correctly recorded in the cargo record book and were only described by the Chief Officer when he was interviewed. It is imperative to keep correct records in the cargo record book.
- It is important to have good record keeping as per company SMS for tank cleaning.

3.3 Vegetable oil: Crude palm oil was contaminated with palm kernel oil

The vessel had loaded crude palm oil and palm kernel oil and the cargo was to be delivered to three different consignees in the discharge port.

Abnormal ullage readings

A couple of days into the voyage the Chief Officer was in the cargo control room and noticed abnormal ullage readings for the 4S & 2S cargo tanks. The ullage of 4S increased and the ullage of 2s reduced by the same amount. He opened the suction valves of 2S and 4S but closed the vales again as cargo tanks 4S and 2S were on the same discharge line. This stopped the increase of cargo into cargo hold 4S.

Cargo pair tanks

The vessel's cargo procedures covered the carriage of four different grades in its six cargo pair tanks and the slop tank.

These pairs were on the same discharge line and had one cargo pump per cargo tank group.

- One cargo in No 1 (P&S) and No 3 (P&S) - the same line should be for the same cargo.
- One cargo No 2 (P&S) and No 04 (P&S) - the same line should be for the same cargo.
- One cargo No 05 (P&S) & 06 (P&S) - the same line should be for the same cargo.

Each group had a separate cargo pump which pumped the cargo to a separate cargo manifold crossover.

Incorrect procedures

However, different grades of cargo had been loaded in the different cargo pairs. Cargo tank 4S was loaded with crude palm oil and 2S was loaded with palm kernel oil. This is not the normal procedure. As stated above the same cargo should be in cargo tanks 2S and 4S as they are on the same cargo line.

Internal leakage

As the 2S and the 4S shared the same discharge line, any internal leakage from the hydraulic valve would allow the cargo to contaminate the other tank.

An analysis of the crude palm oil cargo in 4S was carried out at a laboratory where it was confirmed to be contaminated with palm kernel oil.

The vessel discharged the non-contaminated and contaminated cargo into two different shore tanks. The claim was settled for more than USD 600,000.

What can we learn?

- This case highlights the importance of not deviating from the normal loading procedures. If the vessel had loaded as per the normal loading pairs it would not have been an issue if a valve between the tank pairs was leaking, or open by mistake, as the cargo would have been the same in the tank pairs.

- As an act of omission and commission, the possibility of inadvertently opening and closing both valves at the same time in the cargo control room cannot be ruled out during the voyage.

Glossary of common industry abbreviations

Term	Meaning
AB	Able seaman
AIS	Automatic identification system
ARPA	Automatic radar plotting aid
COLREGS	International Regulations for Preventing Collisions at Sea
COSWP	Code of Safe Working Practices for Merchant Seafarers
CPA	Closest point of approach
CSM	Cargo securing manual
ECDIS	Electronic chart display information system
ETA	Estimated time of arrival
GM	Metacentric height
GPS	Global positioning system
IHO	International Hydrographic Organization
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
IMSBC Code	International Maritime Solid Bulk Cargoes Code
ISM	International Safety Management Code
JRCC	Joint rescue coordination centre
MOU	Memorandum of understanding
NM	Nautical miles
OOW	Officer on watch
PA	Public address system
PMS	Planned maintenance system
SMS	Safety management system
SSAS	Ship security alert system
SSP	Ship security plan
STS	Ship-to-ship (transfer)
TML	Transportable moisture limit
UHF	Ultra high frequency (radio)
VDR	Voyage data recorder
VHF	Very high frequency (radio)
VTS	Vessel traffic serice

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