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FEATURE

Unexpected Corrosion Problems by Organic Fat Charged in Loading Tanks of a Cargo Ship

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Abstract A failure analysis has been conducted on board a cargo ship to assess the extent of corrosion damage. The damage was classified as unusual by the ship owner since the material, an organic fat (namely tallow), was usually loaded into stainless steels on board tanks without any noticeable corrosion problems. The corrosion phenomenon was classified, by the technical crew, as pitting on the bottom of two tanks, particularly the 6p (port tank) and the 6s (starboard tank). The pitting was defined as anomalous since only two tanks were affected and a total of five tanks were made of same stainless steels and loaded with same organic fat mixture. Corrosion pits were found during final inspection by the captain, following load discharge and tanks cleaning operations. The initial inspection was carried out while the cargo ship was harboured at Algeciras (Spain). Because of the observations, the ship remained in harbour for 3 days awaiting inspection by qualified technicians to evaluate the possibility of resuming navigation. The cargo ship was then inspected by one of the authors in collaboration with two metallurgists acting as consultants to the ship owner. The purpose of the inspection was to investigate on damage phenomena, to evaluate the integrity of cargo structures and to decide on two possible options: resuming navigation or immediately ordering a very expensive stop for urgent maintenance. This paper was structured to show documentation (some details have been omitted for propriety reasons) and visual inspection results used to establish failure mechanisms and probable failure-root causes. These results enabled a decision for the cargo ship to resume travel to next dockyard for maintenance operations.

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Case History

In the following, some document details and company names are omitted for confidentiality.

On October 4th during the normal operation of a cargo ship in the port of Houston, USA, cleaning was carried out on tanks 6w (i.e., tanks 6p and 6s), 7w (i.e., tanks 7p and 7s) and 9s. This was followed by the inspection of the same tanks, ending at 11.25 a.m. on the same day. The inspection certificate ("Tank Cleanness Certificate") was issued on October 4th by Cleaningtankers who certified that the structures were completely clean and intact. Following the cleaning operations, organic material derived from animal fat (commercially known as tallow) was loaded into tanks 6w, 7w and 9s. The composition, origin and corresponding handling procedures for the material are fully described on the "Material Safety Data Sheet", shown in Table 1.

The material was loaded into the tanks. The material consisted of two types of tallow. The type and quantity of tallow stowed inside the tanks were:

- 993.87 m^3 of light tallow in tank 6p;
- 988.71 m^3 of light tallow in tank 6s;
- 993.24 m^3 of dark tallow in tank 7p;
- 988.26 m^3 of dark tallow in tank 7s;
- 494.71 m^3 of light tallow in tank 9s.

The stowed material was unloaded when the cargo ship reached the port of Evyaport, its first destination after crossing the ocean from Houston.

During loading, based on the requirements forwarded to the Captain by the Tallow-Company specific quantities of