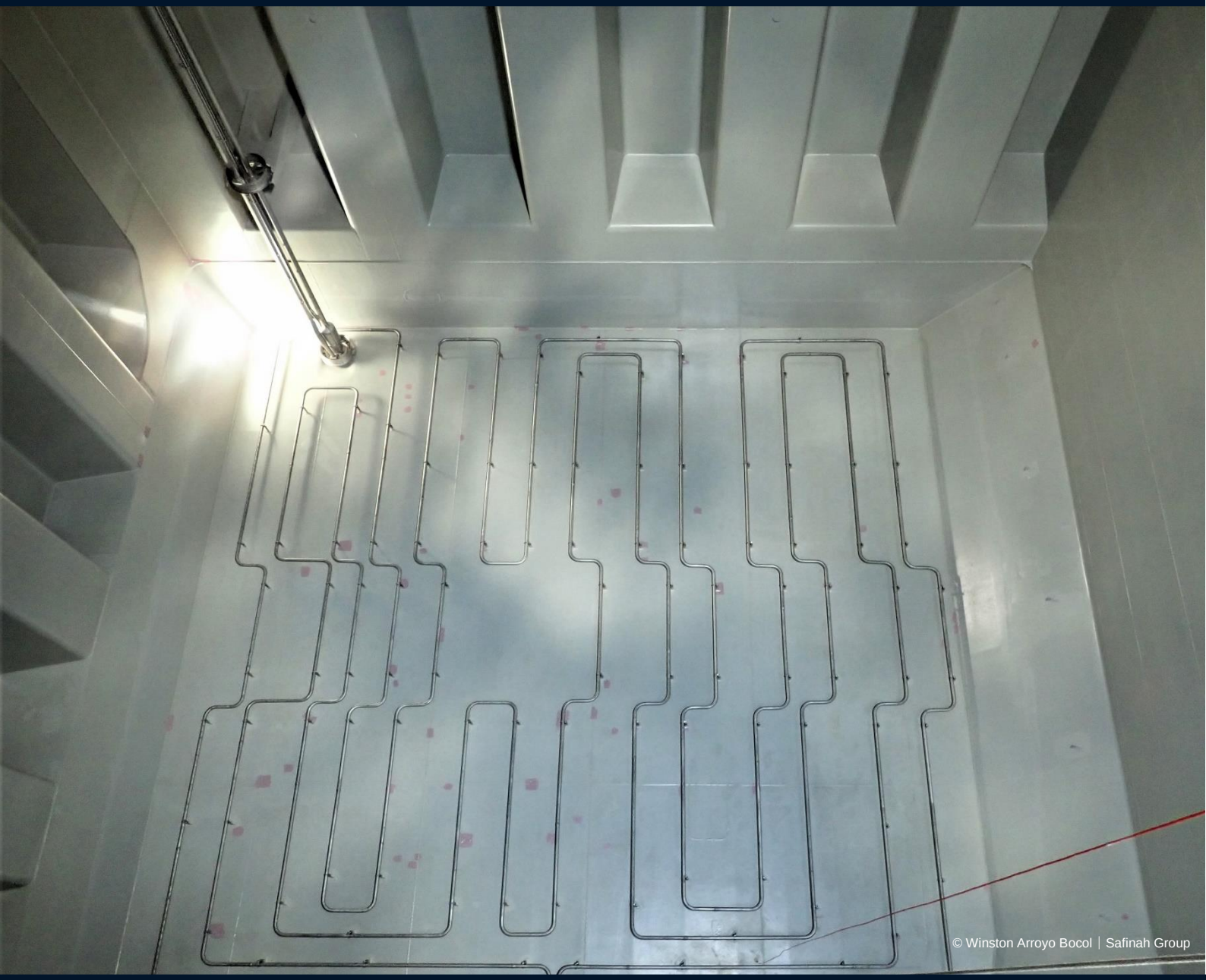
INSURANCE MARKET COATING CLAIMS: FOCUS ON TANK LININGS

Safinah Technical Information Paper

By Special Projects Team, Safinah Group



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Background

Safinah Group (Safinah) provides independent technical coating advice and consulting services to the following markets:

- Marine – commercial and naval;
- Protective – offshore O&G, renewable energy, infrastructure including rail transport and port facilities amongst others;
- Mega-yacht;
- Chemical, Coatings and Disruptive Technologies;
- Naval Architecture and Engineering.

Safinah's Technical Team comprises over 20 field personnel stationed in Asia, Europe and the Americas to meet the needs of our world-wide clients. The Technical Team conducts around 4,000-man days of ship surveys and dry-dock inspections annually. Apart from survey and inspection work, Safinah handles all aspects of marine coating issues, from specification development / review to maintenance / repair programme development, coating application oversight and bespoke training. The Technical Team is supported by a team of 19 experienced consultants comprising paint formulating chemists, analytical chemists, passive fire protection (PFP) specialists, naval architects and shipyard engineers. The Consulting Team undertakes assignments related to coating issues and failure investigations; and provides regular support to clients as experts in coating claim disputes.

General Coating Failures

Coatings are a complex combination of raw materials. For optimal performance the substrate preparation, application and curing need to be closely supervised to ensure that the appropriate conditions have been met. Coatings applied to ships are expected to protect the structure from damaging effects of sunlight, salt, extreme temperature, abrasion, chemical attack and fouling in various combinations and still retain their protective function. In the case of chemical cargo tanks, tank linings must be resistant to reactive, corrosive and aggressive chemical cargoes to prevent mild steel tanks from being damaged; and cargoes from being cross-contaminated.

The demanding application and operating conditions of tank linings can lead to premature failures or defects that adversely impact their in-service performance. As a result, determining the cause of coating failures can be challenging.

To identify the root causes and mechanisms of a coating failure, all potential contributing factors should be assessed together with a detailed history of the coating life (application records, cargo carriage history, cleaning regimes, etc.). Over the past 21 years our consultants investigated a significant number of coating failures. A summary of the main root causes is shown in Figure 1.

Most coating failures are anecdotally attributed to poor surface preparation and application. However, as Figure 1 shows, most failures (>70%) are a result of poor structural design, in-service operational procedures and coating related decisions (coating specification and product selection). Other root causes are poor planning and scheduling of coating related work, process (preparation and application) and chemistry (paint formulation). A brief discussion of the main causes is provided below:

- Structural Design: If the structure to be coated is very complex (e.g. with multiple edges), the chances of premature coating failure increase. Coating on edges was found to be approximately 7 times more likely to fail prematurely as opposed to coating on a flat plate [1]. While claims can be minimised, it is unlikely that key factors, e.g. the ability to change the structural design of a ship, can be influenced.

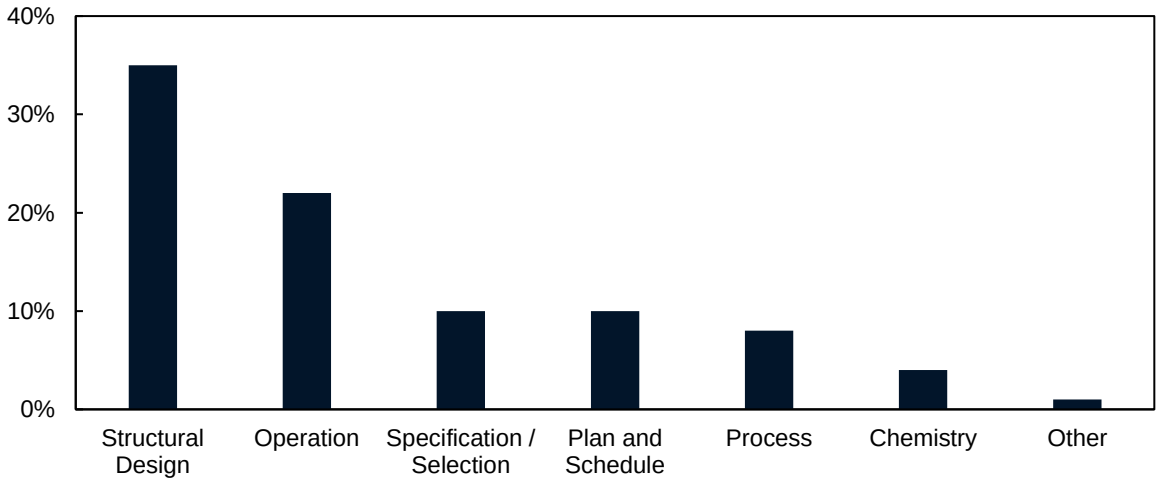

Figure 1: Main causes of coating failure (%) based on Safinah investigations

- Operation (in-service operational procedures): Cargo tanks used for carrying oils and chemicals need to be cleaned between carriage of different cargoes to prevent contamination. The cleaning process can expose the coatings to seawater and various chemical agents. This process, if not controlled, could result in the failure of the coating itself due to chemical attack and / or hydrolysis. In-service operations are increasingly found to result in premature failures as the demand for rapid turnaround times increases.
- Specification / Selection: Generic specifications issued by paint suppliers or yards, are not specific to each project, and often do not include considerations such as ship type, new build or repair location, trade region and cargoes to be carried. Safinah recommends the development of a project specific *Functional Specification* based on the actual project needs. Specifications should be carefully reviewed and audited prior to acceptance to minimise the risk of premature failures. A critical step of the process is the selection of optimal products to meet the identified needs. However, the selection is often left to the paint suppliers' sales teams which may not result in an optimal solution.

Other factors that contribute to premature failures can be summarised as follows:

- Plan and schedule: It is critical that the coating work is properly integrated into the build or repair programme, to ensure that: (1) it is carried out in the correct conditions; (2) suitable time and resources are allocated to achieve the required finish quality. It is important to minimise the damage to newly coated surfaces during the ongoing build or repair programme.
- Process: The techniques used for surface preparation and application are mature and their capability well understood. However, suitable resources should be appointed to ensure delivery of the required quality of application. The control of the quality of the application is often left to the discretion of the paint supplier rather than an independent entity.

- Chemistry: Paint companies offer a range of products and therefore a range of performance from "workhorse" products to "high-performance" ones. To achieve optimal in-service performance, the product best suited for the specific project should be selected. New technologies, often marketed as superior performance alternatives to existing products, can result in premature failures if the testing regimes are not suitably adapted to adequately test long-term performance under a variety of environmental conditions.

2019 in Review: Vessel Inspections and Claims

Generally, the dry-dock work overseen by Safinah's Technical Team covers:

- Tank linings;
- Anti-fouling;
- Anti-corrosion.

In 2019, Safinah's Technical Team supervised more than 150 vessel dry-dockings and was requested to survey more than 45 vessels in relation to issues with tank linings. The Consulting Team handled over 30 assignments, many of which resulted in legal disputes or insurance claims.

Chemical Tanker Focus

Over the last 5 years Safinah's Technical Team has handled a total of 573 chemical tank coating projects and conducted over 450 surveys of chemical tanks covering all main tank lining types from major coating suppliers. Since 2008, as the average vessel size increased, the demand for chemical tank coatings (excluding stainless steel tanks) has grown at about 7% per annum.

Over the last 3 years, Safinah's Consulting Team has observed an increased number of coating failures and claims related to tank linings (Figure 2). It should be noted that some claims covered more than one ship. The main highlights can be summarised as follows:

a. Tank linings dominated the investigations carried out accounting for over 50% of all claims/failures;
b. Anti-fouling related issues are the second major source of claims;
c. Anti-corrosion related issues are the third major source of claims.

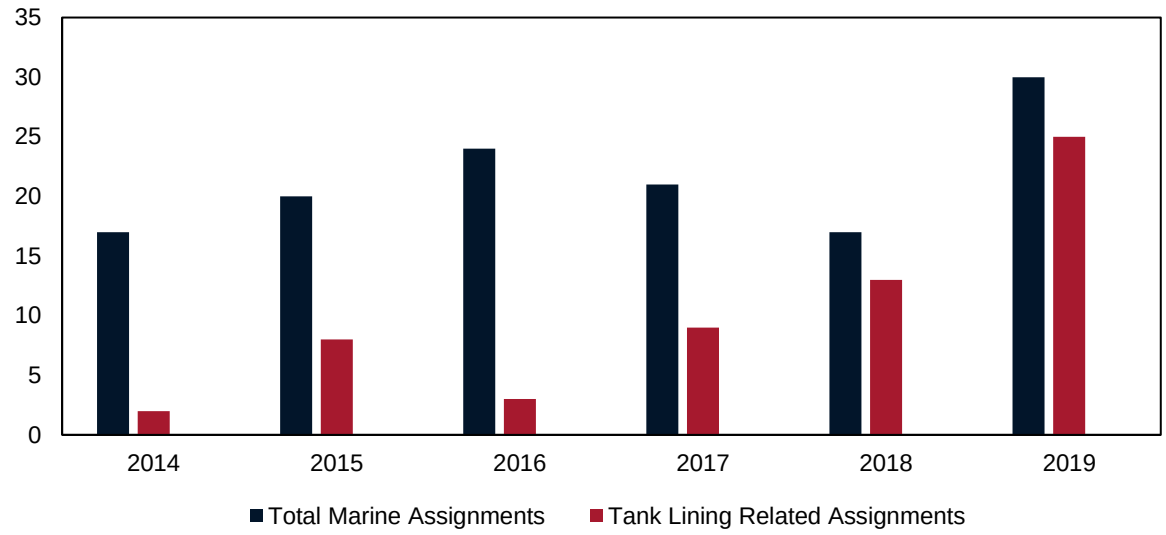

Figure 2: Number of marine and tank lining assignments handled by Safinah's Consulting Team

In 2019, Safinah's Teams handled chemical tank surveys and assignments for more than 75 vessels. Furthermore, tank linings on over 60 additional ships may potentially be suffering from similar issues. These failures were caused by different factors such as inadequate testing regimes or greater in-service operation stress the coatings are not capable of withstanding long-term, which can be attributed to poor specification and product selection.

Pressures on Tank Coatings

Over the last 10 years the needs of the tank lining market have placed emphasis on the following key operational requirements:

- Flexibility in terms of cargo cycling;
- Resistance to a greater number of cargoes;
- Quicker cleaning/turnaround times;
- Tighter specifications for cargo purity;
- Better analytical techniques for cargo purity.

The coatings must generally be approved by the Charterer. However, acceptance usually relies solely on the paint company claims regarding in-house testing and marketing / sales literature. Safinah believes this process needs to be improved to ensure that it provides a more robust approach to assessing coating capabilities and likely in-service performance.

Cost of Repairs

For cargo tanks the cost of physical repairs can range from $50-$100 per

square meter (sqm), depending on where the work is to be carried out, location of defects / failure, complexity of structure, total area affected and other factors[1].

According to Safinah's database, the average Chemical Tanker in the fleet is about 20,000 dwt with a total cargo tank area of about 12,000 sqm. On average, tank lining repair costs for a similar vessel would be in the range $2,000,000 – $3,000,000 for a full refurbishment[1]. If a failure leads to a dispute, then considerable legal and expert witness costs arise. An increased number of claims has been observed in recent years and based on Safinah's experience the average cost per claim has also increased.

Usually, it is the tank tops that are most affected because of the newbuild and repair processes as well as cargo handling and cleaning operations. Repairs are typically in the range of $120,000 - $150,000 on average[1]. However, often the scope of work is increased after the repair yard, paint company and contractor have surveyed the areas and provided their recommendations. In Safinah's experience this can result in an unnecessary overspend of up to 15% - 25%, therefore it is essential to assess the scope of work properly in advance to minimise the overall cost of repair. Many repair yards have a minimum area tariff. Therefore, even if only a small area needs to be repaired, the resultant cost per square meter could be very high as a result.

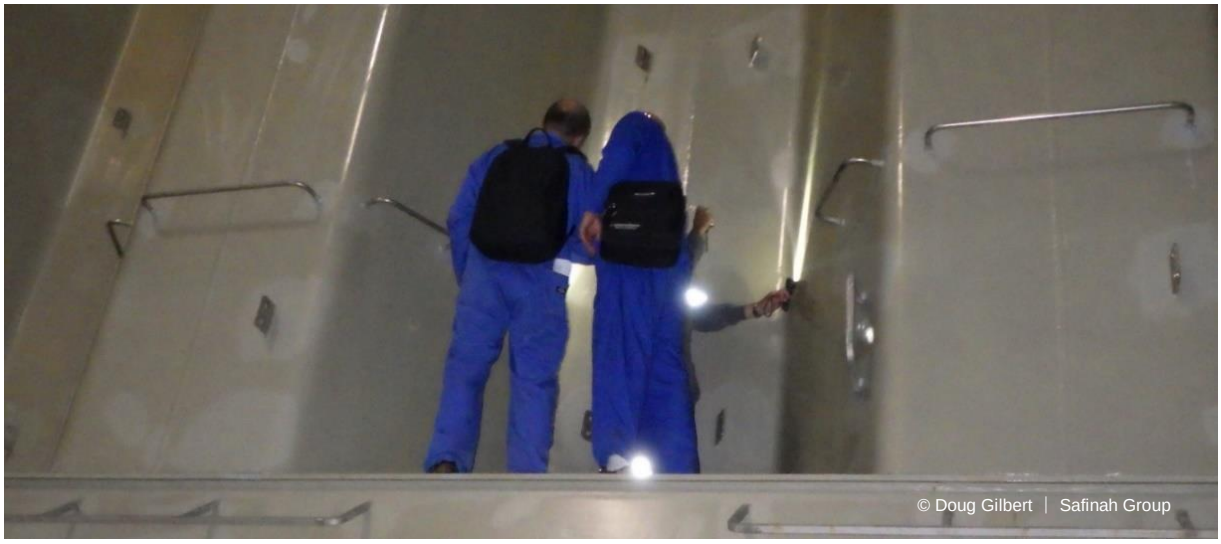

Figure 3: Cargo tank inspection

[1] This estimate excludes any third-party inspection, staging requirements, dry-docking fees and off hire costs, etc.

Involving independent experts in repair supervision can add $20,000 - $50,000 to the above costs (excluding travel and subsistence). Such costs are easily recovered by developing adequate repair programmes and ensuring that all conditions required for optimal in-service performance are met.

The scope of work for repair supervision could include the following activities:

- Pre-survey to assess issue;
- Specification review;
- Development of detailed scope of work;
- Agree work procedures in advance;
- On site supervision;
- Final report writing and submission.

The investigation of any failure by Safinah's Consulting Team generally comprises the following key activities:

- Desk-based assessment to inform the preliminary opinion;
- Physical survey and sample collection;
- Sample analysis (optical microscopy);
- Any analytical work (beyond optical microscopy);
- Travel and subsistence costs (usually at short notice);
- Review of survey results and interpretation of analysis results - report writing;
- Meetings / final presentation of findings as required;
- Repair recommendations - method and extent;
- Repair specification and optimal product selection.

References

1. Broderick, D.R., *A structural design methodology to reduce structural complexity to improve coating application and performance in water ballast tanks*. 2016, PhD. University of Newcastle upon Tyne Newcastle upon Tyne, UK.

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