Safinah Group
360° Coating & Engineering Experts

CAPEX and OPEX for coatings offshore

Introduction

There is a fine balance between the effort and emphasis placed on coatings in the Capital Expenditure Budget (CapEx), which often sees coatings as a low priority item as it is a very small percentage of the total project build costs while during operation the costs of combatting corrosion because of full or partial failure of the coating systems can add considerably to the operating costs and pose real risks to the availability/profitability of the asset.

One of the biggest drivers of operational costs (OpEx) through life is the amount of pre-thought and planning by the CAPEX team to consider expected operational lifetime of the coating and the subsequent demands of coating maintenance through life. This often leads to unnecessary increases in operating costs from very early years in the asset's life.

This paper sets out to explore the importance of the relationship between the effort required at new construction to minimize the through-life costs of maintaining the asset and repairing it through-life during which time the relative costs and risks associated with coating failure can dramatically increase compared to the initial Capex expenditure and in extreme cases adversely impact the life of the asset.

Main driver to costs through life.

Early divisions between CapEx and OpEx during the life of an asset mean that decisions made by the CapEx team with an aim to meet their budget and time constraints have a great influence on the through life operating costs than any OpEx expenditure may have.

A simple diagrammatic representation (see figure 1) can be used to illustrate this showing how the ability to influence cost open project diminishes with time when considering the role of coatings.

While the proportional contribution of the different elements will vary from project to project and depend on the type of asset there is no doubt from a coating perspective that in general the design and structural material selection for many projects, hinge around the use of mild steel particularly for a marine environment-based asset then much of the ongoing through life cost has already been fixed because of the inherent issues of using mild steel in a marine environment.

Coating factors other than corrosion are also important in the marine offshore environment such as fouling, UV resistance, mechanical resistance, temperature resistance and the containment of various products and chemicals in tanks to assist in the operational functions of the asset. The selection of coatings for the key functions such as:

- corrosion prevention
- fouling prevention
- cosmetic appearance
- chemical resistance

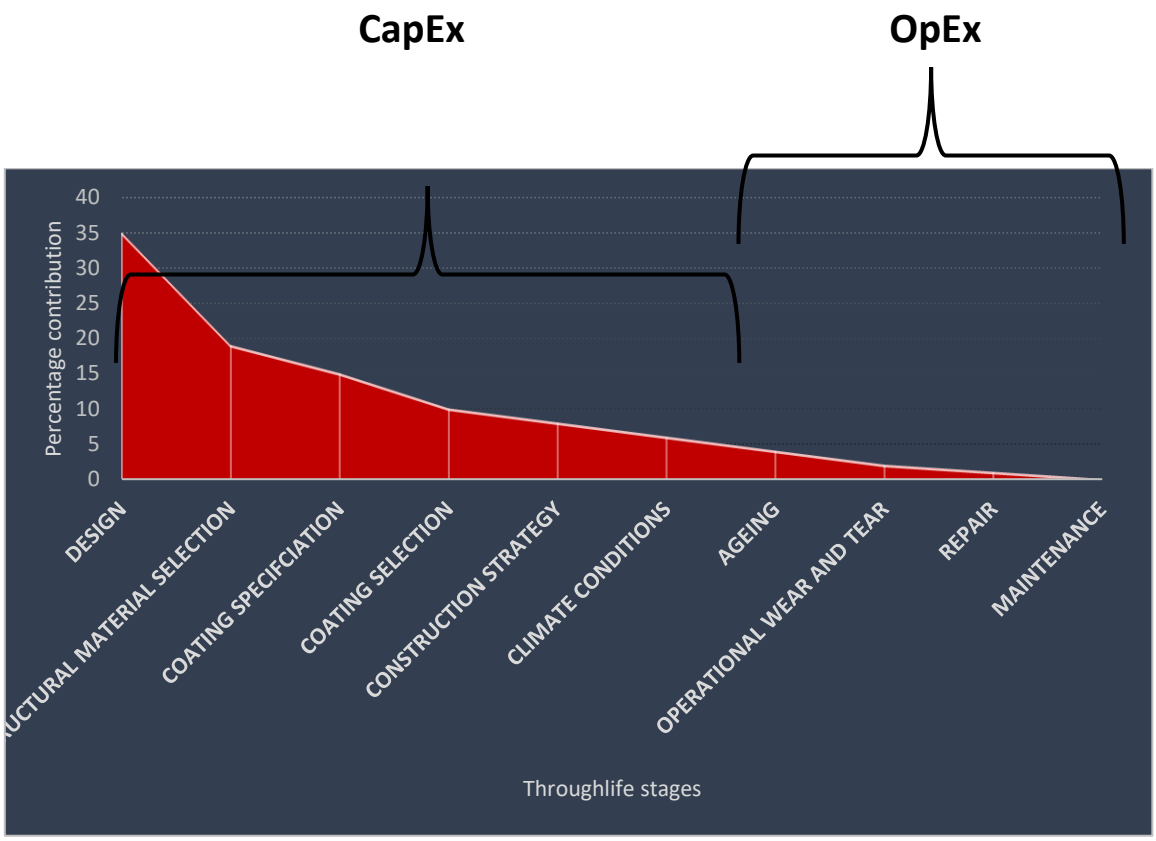


Figure 1. Diminishing ability to control costs as the project progresses from CapEx to OpEx.

Will vary and it is important at the CapEx stage that the functional needs of these different performance criteria are properly assessed and tailored for the structures operational environment offshore to enable proper product selection for achieving highest added value and lowest risk as opposed to lowest price, which is the more typical approach.

All critical considerations in the specification of a coating system must be considered when determining coating selection to meet the functional needs over the asset life, in service and during construction and possibly into the future increasingly at end of life.

At new build of course the full CapEx budget will be expended and likely exceed the quoted values for the following reasons:

- Accuracy of loss factors submitted in the quote.
- The specifications do not cover all areas and every part of the coating process e.g., fire hydrant signal red.
- Application rules and guidelines e.g., 80:20 or 90:10 will tend to result in over application.
- Weather conditions.
- The need for rework during construction.
- Owner change orders.

- Builder engineering change orders.
- Disruptions from delays or problems in other aspects of the project.

While some of these can be mitigated by consideration in the contract and the specifications, some aspects of cost creep cannot be easily predicted and therefore cannot be fully considered within the original CapEx budget.

The disconnect between the CapEx budget and the OpEx budget in many projects tends to result in poor decisions made that may assist in meeting CapEx budget targets but lead to significant cost impact on future OpEx costs through life.

Another key factor to consider at the new construction stage is that it is the first time surface preparation and application of a coating system that will dictate its performance through life and any subsequent touch-up and repair during new construction because of poor planning and integration of the coating system into the process will not only serve to weaken the performance of the system but will also add considerable costs and potentially time delays to the construction process and hence both the CapEx and OpEx expenditure as far as coatings are concerned.

The importance of this is best reflected in the table below which shows the increasing cost to apply and repair paint per square metre during different timeline stages of the asset life clearly shows the importance spending the time and effort at the CapEx stage to get the correct solution for coatings small incremental cost at the CapEx stage can result into significant additional costs through the life of the project with the most expensive cost per square metre arising in operation weather is full maintenance by on board personnel or repairs as part of some scheduled asset integrity management plan and /or requirements dictated by regulatory authorities.

Timeline	Cost index of application per sqm*	Possible failure	Cost index of repair per sqm compared to first time application*	Budget
First time application - On block/unit/fabrication surface prep and coating	1	Inspection failure at surface preparation or post application. Assumed repaired in-situ	3	CAPEX
Erection connections	6-14	Inspection failure at surface preparation or post application. Assumed repaired in-situ	18-40	CAPEX
Post float out/launch	24-50	Repairs from hot work damage etc.	50-100	CAPEX
Post installation on site	N/A	Maintenance work and repairs	100 - 4000	OPEX

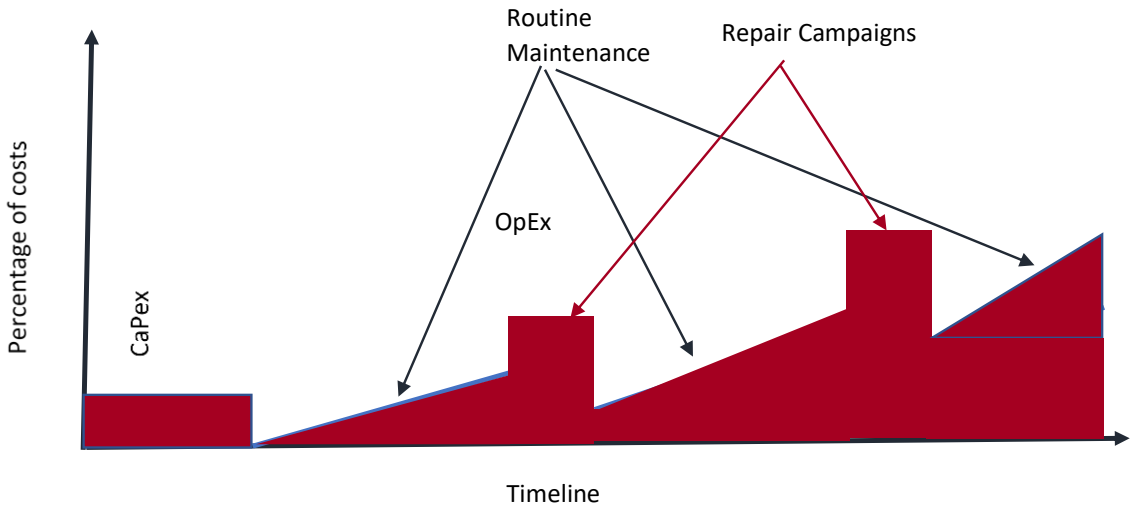
**note the costs shown here are direct costs for coating work only and not any associated costs for work disruption or loss of production etc.*

The cost index clearly depends on the type of structure the location of structure (i.e., accessibility), the equipment and facilities available and the associated logistics and weather windows available for work as well as the coating specification and products/schemes selected and applied.

On site routine maintenance is defined as work carried out by the full-time crew on board, while repair work implies shut down periods and the use of squads brought in specifically for the task.

Coating costs over time.

Through the life of an asset the expenditure on coatings will follow a pattern as outlined in the schematic below. With the budget at Capex for coating work often accounting to only a small percentage of the total Capex expenditure. Once in service the asset is subjected to routine maintenance. It is often stated that the work at new construction involves a painter and the first maintenance work involves a painter.

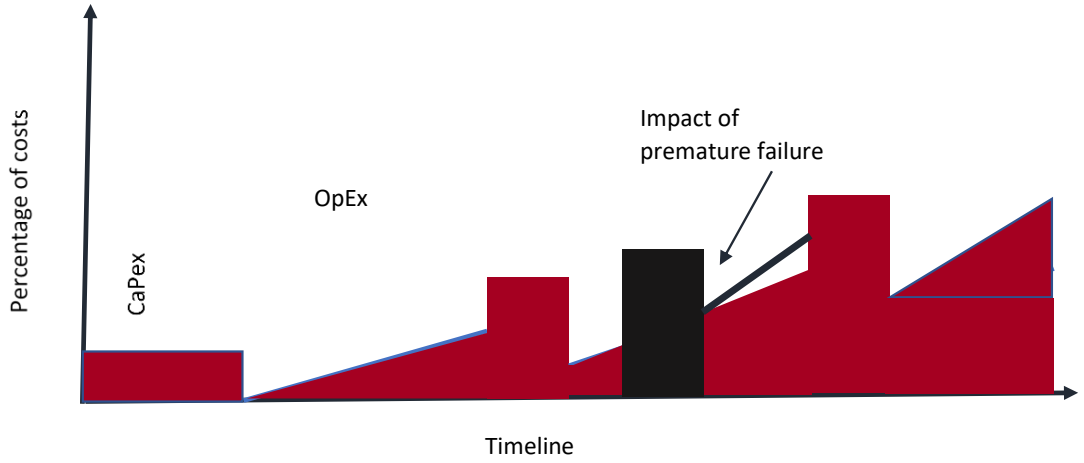


Of course, there are dangers of unplanned or premature coating failures at any time during the asset's life. Causes of such failures are varied but can be broadly categorized under the following headings.

- Poor design
- Poor material selection
- Poor specification
- Poor product selection
- Poor integration strategy
- Poor surface preparation and application
- Poor maintenance
- Poor repair campaign strategy
- Changes in operational criteria

Thus, it is well understood that overtime the operational costs and expenditure or OpEx will increase gradually. The regular maintenance of the asset offshore will of course be supplemented from time to time with repair campaigns that is scheduled asset integrity management work which can sometimes be done during off season or sometimes integrated into the reduced operational levels

of the asset. Any premature failures of the system which would by nature be UN scheduled and unplanned will only serve to increase the costs of any subsequent repairs and any ongoing maintenance activities and resulting in further disruptions to the operation of the asset.



Action to minimize overall costs.

Experience has shown that following purely generic paint specifications based on asset owner or paint manufacturers request or recommendations will seldom fit the purpose, nor provide the expected coating system lifetime. The best way to minimise the coating costs of the project through life is to firstly develop a functional paint specification for the new construction phase. A functional paint specification must consider the design, methods of production, the location of production and all the appropriate operational criteria such as temperatures, location, climate, maintenance and repair methods and strategies that are planned and then select the products that best suit the new build requirements and those that would best suit the operational requirements. This two-step approach enables a move away from coating specifications selected based on generic type and price but rather based on overall added value and risk reduction to the project, by properly integrating the coating activity into the construction and operation cycles to minimise total coating costs through life.

Once the structure in service offshore a suitable long-term strategy must be put in place for maintenance and repair and it is best guided by agreeing different levels of requirements based on degradation of the asset an example can be shown in the table below.

Rating	Quantity of Defects (Condition Rating)
0	none (i.e no descernable defects)
1	very few (small barely significant)
2	few (small but significant number of defects)
3	moderate number of defects
4	considerable number of defects
5	dense pattern of breakdown

For each rating category then an agreed approach to maintenance and repair can be developed so that it best fits the strategy of the asset and the intended ownership life an example of typical actions for the above rating bands is given in the subsequent table

Rating	Fabric Maintenance Level
0-2	Preventative (Periodic wash-downs)
3	Spot Repairs (Spot Cleaned by power tools and touched up to full dry film thickness)
4	Renovate (Spot repair then topcoat with an approved system)
5	Refurbishment (Removal Of Existing Coating with surface preparation and application of new coating in accordance with OC1-HESS-GNL-SPC-ENG-1264.

Safinah Services

Safinah Group offers a range of services to its clients to support in the specification selection of coatings and indeed conduct coating application management and scoping of subsequent repair and maintenance activities. Over 23 years Safinah group personnel have been involved in both onshore and offshore projects offering the full range of services from total project management control of coating works both onshore and offshore too auditing of coating works through to the provision of field personnel to provide oversight of the coating activities.

On several large complex projects, Safinah involvement in the development of the coating specification and selection at the CapEx stage has repeatedly shown not only overall CapEx savings to the project by the integration of the coating system of between 10-30%, while early involvement in developing OpEx strategies often show a reduction in the range of 10-20%.

This comprehensive set of services has provided Safinah with a large knowledge database of key risks, risk areas and the potential sequence of coating failures through an asset life to enable better judgments to be made about preventative maintenance and the correct timing of repair campaigns.

The range and variety of assets Safinah has worked on also enables us to provide a better understanding of the potential or likely causes of any subsequent coating failures and assist with assessing the extent of damage and the subsequent repair or maintenance requirements to bring the asset back to an acceptable level.

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