

Corrosion Mitigation by Coatings

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20+ years experience working in oil and gas

- 2001-2004 Marine Engineer in the Merchant Navy
- 2004-2014 Stork Technical Service – FM Project Manager
- 2014-2021 BP - FM Coordinator
- 2021-Present Bilfinger UK - FM Lead

What is Fabric Maintenance in the Oil and Gas industry

Fabric Maintenance in oil and gas refers to repair and preservation of structure and pressure system coatings to ensure integrity

Fabric Maintenance prevents corrosion, degradation and wear which could lead to safety and or operational issues

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Bilfinger UK is a leading engineering and maintenance provider, supporting customers across the chemical & petrochemical, nuclear, oil & gas, pharmaceuticals & biopharma, power & energy, utilities, renewables and food & beverage markets. We enhance the efficiency of assets, ensuring a high level of availability and reducing maintenance costs.

We have extensive experience in offshore and onshore facilities; specialising in asset management services throughout all life cycle phases from consulting, engineering, manufacturing, assembly, operations, maintenance, and decommissioning.

This commitment is delivered by an experienced and highly competent workforce of over 4,500 employees operating from 13 offices in strategic industrial hubs, upholding the highest standards of safety, compliance and quality.





AN INTRODUCTION TO THE NEW BILFINGER UK

In 2022, Bilfinger UK merged with Bilfinger Salamis UK to create a new €400 million turnover business and one of the UK's largest tier one contractors.

The merger has combined the onshore and offshore capabilities of the two businesses to position us as a key contractor of choice for delivering large renewable energy projects as the UK transitions to net-zero.

The move has supported our diversification and growth strategy as we target new markets and has expanded the services and solutions we can provide to our customers.

BILFINGER IN 60 SECONDS

The business is part of the wider Bilfinger group, who are Europe's largest industrial services provider, headquartered in Germany, with a turnover of €3.461 billion and around 30,000 employees who are located across key international business units in Europe, North America and the Middle East.

DID YOU KNOW?

- Bilfinger provide 125 hydroelectric power plants and 250 dams across Europe
- The precision robots of Porsche get maintained by Bilfinger
- The supermagnets in the CERN particle accelerator are made by Bilfinger

Corrosion

Removing just one component of a corrosion triangle will suffice to prevent corrosion.

Typically, as an industry we rely on the presence of an external coating and/or cathodic protection.

The coating acts as a barrier to the environment therefore locations where coatings are damaged or missing will suffer external corrosion

Insulated pressure systems typically have a coating under the insulation.

Any extended exposure to wet insulation exacerbates the rate of coating degradation and the risk of corrosion under insulation (CUI).



Corrosion mitigation Coatings

There are many coating types but 3 examples used offshore are

Paint:

A thin film surface coating designed to protect metal surfaces from rust and corrosion. Paint is applied in liquid form before curing to form a solid film

Anti Corrosion Tape:

Petrolatum, Visco-elastic & Silicone Elastomer Inhibitor Fusion tape to name 3. ACTs can be a great alternative to liquid coatings where surface preparation is difficult or if a temporary protection is required. Minimal surface preparation and generally quick application

Corrosion Inhibiting Wax:

Effective corrosion protection where traditional means are not an option. Easy to apply and economical to use however a shorter lifespan (< 1 year)

Additional Reasons We Use Coatings

The choice of coating is typically risk based, specific to a maintenance situation, coating matching detailed client specifications and operational requirements, however other various factors play a decisive factor, to mention a few such as the age of the asset and the surrounding equipment

Aesthetics/Colour

Safety

Process Aids

Environmental Protection

Thermal protection / insulation

Fire Protection

Anti Fouling

Types of Liquid Coatings

Single Part Types:

There are various single part paints including:

Alkyd

Epoxy Ester

Chlorinated Rubber

Acrylated Rubber

Vinyl,

Bitumen

Two-Part Types:

There are various two part paints including:

Polyurethane

Epoxy

Polyester

Siloxanes

The two-part coatings tend to be used for corrosion protection

Different types of Coatings

Coating Types

Convertible Coatings:

Coatings which when applied and cured cannot be re-dissolved in their own solvents. Coating Types include Alkyd Resins, Epoxy Ester, Polyurethane, and Epoxy.

Non-Convertible Coatings:

Which when applied and cured **can** be re-dissolved in their own solvents. Coating Types include Chlorinated Rubber, Acrylated Rubber, Vinyl and Bitumen

Coating Material Properties

There are Many coating systems available.

Coating systems are generally chosen for their particular properties including:

Chemical resistance

Ultraviolet (UV) light resistance

Gloss and colour retention

Corrosion resistance

Water resistance

Reflectivity

Hydrocarbon resistance

Heat resistance

Permeability

In general no single coating can fill all the requirements

Anti Corrosion Tapes

Coating defects can be treated by the application of anti-corrosion tapes (ACTs) to minimize further coating breakdown and substrate loss until a full coating repair of the paint coating can be completed.

ACTs are designed to protect metal surfaces from corrosion by providing a barrier to the environment with some ACTs impregnated with corrosion inhibitor

ACTs can be used either reactively on damage found during inspections, or pro-actively on equipment at the time of installation (e.g. on new bolts and flanges).

ACTs



ACTs

Petrolatum Tape



ACTs

Visco Elastic ACT used on pressure systems for corrosion protection



- Visco Elastic ACT used on a deck



Surface Preparation (some examples)

Abrasive Blast Cleaning

Is the most popular and economical (productive) method of preparation for removing rust, millscale, scale and old coatings.

Abrasive blast cleaning is a superior method of surface preparation compared to mechanical forms of surface preparation and generally there is no better method where a high level of surface preparation is required. Includes 'dry' ice blasting.

Power Tool Cleaning

There are a variety of mechanical preparation tools such as needle guns, sanders, chisel guns, the bristle blaster and many more. Power tool cleaning can be advantages to reduce the effort for surface preparation in comparison with abrasive blasting.

Hand preparation

Surface preparation through the use of wire brushes, paint scrapers, sandpaper etc this is less effective but can be a good solution for specific scopes

UHP

UHP can be used for surface preparation where blasting is not possible. UHP can be automated but requires a large footprint and volume of potable water

Surface Preparation

Factors Effecting Coating 'Life Expectancy'

- Oil, grease and soil
- Chemical Salts
- Surface Corrosion
- Mill Scale
- Anchor Pattern (too rough and too smooth)
- Fabrication Defects (weld spatter, sharp edges)
- Condensation
- Existing Coatings

Dry Ice Blasting

Traditionally fabric maintenance execution is carried out with dry abrasive grit blasting. This can cause issues at site with visibility, grit containment and spent grit a risk to sensitive equipment

One of many alternatives is the use of dry ice in place of grit. Dry Ice blasting uses liquid Co₂ in concentrated pellets used as a blast medium.

Other types of blasting include:
sponge blasting, soda blasting, vapour blasting, plasma blasting and laser blasting.

Each have different pros and cons and each scope of work should be evaluated on merit



Plasma and Laser Blasting

Laser Blasting

Is a surface prep technique that uses high intensity laser beams to remove contamination, rust and coatings from the surface. The laser vaporizes the target substances and can even be set to remove one coat at a time on three coat system. Reduced environmental impact as there is no waste.

Plasma Blasting

Used high energy plasma to clean and remove organic contaminants. Doesn't remove rust however so more useful for inspection purposes

Fabric Maintenance Execution Approach



Area-Based Fabric Maintenance

Area-Based FM reinstates the coating condition of all equipment within the area.

All structures and pressure systems in a module, process area or geographic area are maintained at the same time.

This maximizes efficiency within an area and avoids repeat set-up and dismantling times.

Fabric Maintenance Execution Approach



Risk Based Anomaly Approach

It is not always possible to execute a area approach. Areas requiring repair can be large and take time to repair.

However, coating breakdown and corrosion in other areas continues and may reach an unacceptable condition.

The application of a find and fix strategy can provide reliable protection, for example power tool cleaning surface methods (e.g., ISO 8501 St 3).

Fabric Maintenance Execution Approach

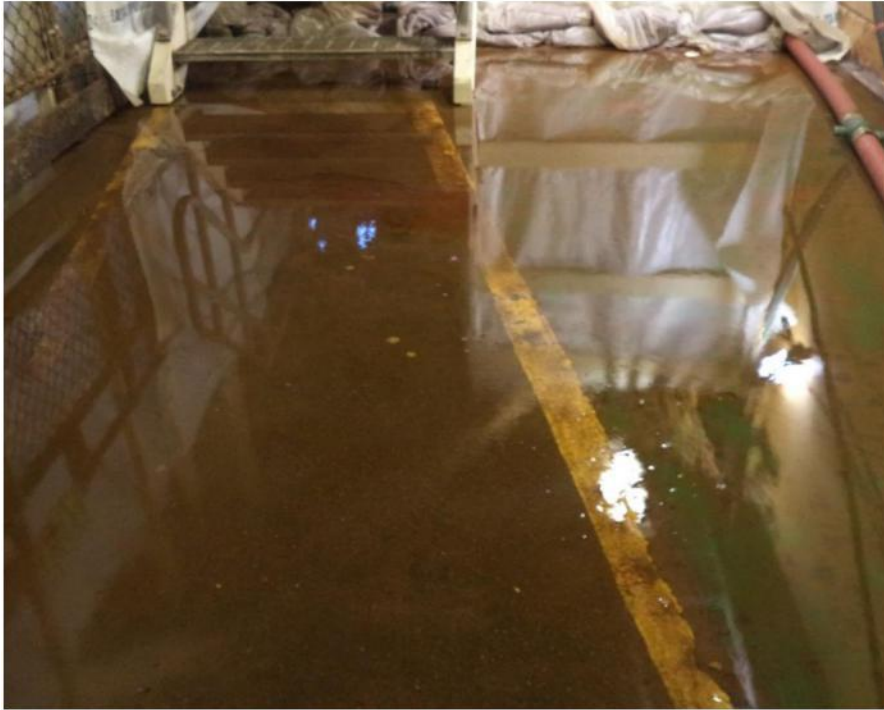


Rope Access

Rope access is regularly used for coating tasks in challenging locations where scaffolding is impractical or uneconomical

Mechanical or hand preparation and / or the use of ACTs are best suited to Rope access as habitats for grit containment are impractical when using Ropes.

Different types of Coating Non Slip



Not only providing corrosion protection this coating repair was used to level the deck to prevent water pooling which is an added hazard in winter to become a slip hazard when it freezes.

The non slip coating also highlights the primary escape route.

Different types of Coating Non Slip



Some area on a Oil and Gas platform will contain sensitive equipment where grit blasting is not an option for the risk of contamination.

Different types of Coating Non Slip



A closed circuit unit was used here to provide extremely high quality surface preparation with no dust or clean up required



Tile system laid. Extremely durable and simple to lay

Innovative solution



This crevice in the splash zone was of particular concern due to high pressure line with no inspection data in the crevice. Blasting was not an option as it wasn't confirmed as safe – coating system used to create profile to apply robust liquid rubber coating to protect area

Coating within Pot Water Tank



Vessel and tank internals often have coatings to prevent corrosion.

For potable water tanks it crucial to use coatings that are suitable for contact with drinking water as it needs to be safe for human consumption.







Thank you for your attention...

Q & A

