Seawater Services

Seawater is widely used in numerous critical applications: Cooling systems, oil field water injection, offshore oil and gas platforms, power plants, desalination plants, etc., are among industrial facilities where seawater intensively impacts the performance of the involved equipment.

Desalination plants for fresh water supply and distribution using seawater for purifying contaminations, seawater drainage culvert pipe segments, pumps for circulating/transferring seawater into various applications, piping systems, valves, heat exchangers, transfer vessels, underwater piles, etc. are among numerous industrial seawater services.

Integrated seawater services are dependent on various factors for the efficiency of entire processes: The unified design, material selection and fabrication procedures, temperature, oxidizing compounds, flow regimes, bacterial growth, etc. are greatly influential on how the systems are affected by seawater. However, the properties of the seawater activate corrosion mechanisms and accelerate the consequent deterioration of the exposed components.

Corrosion in Saltwater

Detrimental characteristics of seawater influence chemical and electrochemical (redox) reactions with contact substrates, leading to corrosion damages. Highly corrosive properties of seawater refer to its high salt content, high amount of solved minerals, chemical properties, dissolved gases such as carbon dioxide affecting pH value of the water, electrical conductivity, bacterial activity such as SRB (Sulfate Reducing Bacteria), etc.; However, there are main factors that result in the pernicious effects of corrosion on seawater-exposed infrastructures:

1. Chloride Concentration (Salinity)

Salt concentration of seawater makes it an ideal conductive electrolyte, dramatically increasing the rate of the electrochemical corrosion. Moreover, the protective passive films on metallic substrates could be demolished by chlorides in seawater and add to the destruction.

2. Oxygen

By deteriorating the protective hydrogen films, oxygen makes metal substrates vulnerable to corrosion attacks.

3. Temperature

With increasing effect on the initiation and concentration of polarization, corrosivity is notably increased in areas with higher temperature.

4. pH Value

Decreased pH values indicating the increased acidity of seawater is among insidious corrosion-induced effects.

Destructive damages and the harm to the service life of the equipment and operational services subjected to seawater may occur through various mechanisms of corrosion, leading to initiation and expansion of deterioration in industrial facilities:

- Uniform Corrosion
- Localized Corrosion
- Pitting Corrosion
- Crevice Corrosion
- Galvanic Corrosion

Seawater Corrosion Protection

Curbing corrosion in seawater services is crucial for obtaining a durable service life and avoiding catastrophic consequences, as particular corrosive features of seawater cause corrosion-derived damages, decrease the functionality of the industrial operations; and may lead to significant loss in production, contaminated products, major structural failures and severe environmental issues.

Delineating specific measures to be put in place for corrosion protection could effectively control corrosion rate, ensuring the long-term performance of engaged industrial components.

There could be several solutions implemented for corrosion protection in seawater services; meanwhile, synergic effects of corrosion prevention methods bring on extra protective benefits:

- ✓ **Material Selection**

Proper Choice of Material is a preliminary step to minimize the ruinous effects of seawater on structures for a safe operation of equipment. When selecting the right material, corrosion resistance and strong mechanical characteristics are among the technical concerns.

- ✓ **Cathodic Protection**

Coupling metal with the to-be-protected metal substrates, creates an electrochemical cell in which the connected metal plays its role as a sacrificial anode, saving the metallic substrates i.e. cathodes from adverse corrosive processes.

- ✓ **Chemical Treatment of Seawater**

Treating seawater with the application of specific chemical additives and oxygen removal are among methods employed to ameliorate the damaging corrosion consequences.

- ✓ **Surface Treatment**

Creation of a protective barrier on the metal/nonmetal substrates prevents corrosive agents from direct contact with surfaces, and would dramatically hinder corrosion initiation and slow down the progressive rate of corrosion considerably.

Protective layers produced by metal plating techniques, various protective linings, surface modifications by cladding procedures, organic and/or inorganic coatings are of instances of surface treatments for corrosion protection purposes.

Solid Heavy Duty Glass Flake

Utilization of advanced polymer technology in the production process of Epochem flake 5020 has achieved an impermeable coating specifically suited for aqueous environments; in addition, due to the considerable quantity of specialized glass flakes tightly overlapping each other in the coating, the permeation resistance of Epochem flake 5020 against gas and/or liquid media is much higher compared to other types of the coatings

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Providing an impervious barrier layer, Epochem flake 5020 is an efficient solution in corrosion protection of any substrate exposed to wastewater and fast flowing seawater at both ambient and elevated temperatures.

With a smooth and glossy finish, Epochem flake 5020 is very well capable to be applied onto damp/wet steel and concrete surfaces.

In addition to the primary protection against seawater services, Epochem flake 5020 boosts the protective advantages by added benefits of resistance to turbulent flow and cavitation.

As mineral scaling and bio-fouling exacerbate corrosion, Epochem flake 5020 with anti-fouling properties ensures a continual operation in seawater services by decelerating the settling and growth of marine organisms, and preventing Microbiologically Influenced Corrosion (MIC) and the occurrence risk of pitting or crevice corrosion under the fouling.

With solvent free chemical composition, the anticorrosion glass flake coating of Epochem flake 5020 also demonstrates a particulate impact and abrasion resistance to improve efficiency of key industrial equipment such as centrifugal pumps.

Characteristics

- 100% Solid content
- Excellent resistance to seawater and mildly corrosive acid/alkaline media
- Self-priming
- Single or multiple coat application with tenacious bonding to wet steel and concrete substrates
- Excellent anti-fouling properties
- Elongation to break: Over 5 times higher than vinyl ester glass flake
- Outstanding cavitation resistance
- High abrasion resistant
- Impact resistance: 10 times higher than brittle and prone-to-cracking vinyl ester glass flake coatings

Application Areas

- Pipes in seawater services
- Subsea structures
- Seawater intake valves
- Cooling water pipes/spools/valves
- Splash zone surfaces
- Piles
- Buried flow lines
- Seawater pumps and transfer vessels
- Girth welds and bow thrust channels
- Drainage culverts
- Freshwater generation plants
- Desalination plants
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Typical Chemical Resistance (Full Immersion)

- Sulfuric acid 30%
- Hydrochloric acid 20%
- Glacial acetic 20%
- Phosphoric acid 50%
- Nitric Acid 10%
- Sodium Hypochlorite 15% and MEK, Toluene, Xylene, Acetone, Ammonia