Hull Maintenance of Steel Fishing Boats

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Metallic structures such as stainless steel, mild steel, galvanised iron, aluminium etc. are liable for rapid deterioration due to ravages of and marine corrosion. The problem of their protection is severe, concerning all the maritime nations of the world, that millions and millions of rupees are being spent annually for repairs, renewals, maintenance and preventive research. This phenomena of deterioration of materials in sea water is known for ages and attempts to minimise and prevent the catastrophe is still going on in the countless laboratories of the world.

Presently the fishing fleet in India comprises of different sizes of steel trawlers. Steel exposed to marine conditions often undergoes general and pitting corrosion. Hence great caution should be taken in predicting its performance.

Protection of steel trawlers (below water line)

Proper and periodical check of the hull below waterline is very essential for steel trawlers for obtaining long and trouble free service life. Monsoon period is the ideal time for attending the maintenance work as the fishing is irregular. Major repairs can be done during this period. The suggested schedule for hull maintenance while the vessel is on dry dock is as follows

Surface preparation

Steel surfaces have to be thoroughly cleaned before any surface painting is attempted. Removal of rust, mild scale, salt, oil, grease, dirt and loose paint if any from the surface is an essential factor for deciding the length of the paint system applied. A properly treated surface physically provides a grip as well as a

chemical bond depending upon the nature of the paint that is applied. Steel surfaces are usually cleaned by manual chipping scrapping and wire brushing. This leaves some patches of rust at certain places. This leaves the surface to Sa 2 specification which is sufficient for small boats.

Blast cleaning of the hull is to be followed for large steel fishing vessels. This technique basically consists of bombarding the surface with high velocity abrasives such as sand, metallic abrasives like chilled iron grit, carborandum grits and malleable iron grit or shots. This removes rust, mild scale, old, paints, etc. Occasionally the surface of the steel also gets abraded. The choice of abrasive depends upon the final finish required. This result in a finish corresponding to Sa 2.5 according to Swedish SIS 055900-1967. This finish is sufficient for the application of modern coating systems such as vinyl and epoxy paints. In case of new steel plates complete removal of mild scale is essential, this can be done by acid pickling or sand blasting. Acid pickling can be carried out only before fabrication, whereas sand blasting can be done either before or after fabrication.

Priming

Metal spraying or surface painting after grit blasting and thorough cleaning is a well established means of providing long term protection to steel inspite of initial high cost of surface preparation and subsequent blasting. The essential requirements of priming paint for steel to be immersed in sea water are that the medium must resist saponification and the paint should be a good electrical insulator.

Anticorrosive Paint (Buffer Coats)

Anticorrosive paint is applied only after all the surface preparations and priming are done but before applying the antifouling paint. Its main function is to insulate the bare metal as well as the subsequent antifouling paint from the underlying priming coats. Anticorrosive paint must be water resistant and quick drying. In

the present day, the anticorosive paints such as epoxy, chlorubber paint etc are used. Anticorrosive coating must be full dry before antifouling coating is applied. This high build paints may be used to have a film thickness of about 200 microns for severe working environment.

Antifouling paint

Fouling of ship bottom takes place mostly when ships are stationary. This can be prevented by the application of suitable antifouling paint. Antifouling paints contain chemical compounds which are poisonous to the larval setting of the fouling organisms. The conventional well known compound is that of copper. Several organic and inorganic poisons have been tried and are still being tried. The principle of operation of antifouling compositions is that the poisonous compound incorporated in the binder leaches out, when in contact with seawater, thereby preventing fouling, since the fouling forms do not settle on toxic surfaces. The efficiency of any antifouling paint depends on the leaching rate which must be above the minimum level, right from the beginning and it must continue for a long period. One or two coats of antifouling paint may be necessary on the hull below water line before launching. Different grades of antifouling paints such as tropical, super tropical and high toxin grade are available in the market.

Steel trawlers above waterline

The hull surface above water line is exposed to marine atmospheric corrosion. The hull in the waterline area is the more severe zone for corrosion than the fully immersed or completely exposed zone. This "boot-topping area" is subject to alternate wetting and drying besides the constant splashing of seawater. Protective coating tend to fail first in the area. A specialised painting schedule is necessary to protect this area, which is normally differ from corrosion and erosion. For this a tough, chemical resistance and excellent adhesion of epoxy system of paints make them ideal for use.

Recommended painting of steel fishing boat

1. Conventional system

New boats prior to launch -out side shell keel to 6" above waterline

1st coat: antisaline metallic primer	-	38 microns
2nd coat: antisaline metallic primer	-	38 "
3rd coat: antisaline metallic primer	-	38 "
4th coat: antifouling paint	-	50 "

High built anticorrosive paints may be used to have film thickness of about 200 microns for severe working environment Rudder and stern area

Rudder and stern area

1st coat high build bituminous paint	-	38 microns
2nd coat high build bituminous paint	-	38 microns
3rd coat high build bituminous paint	-	38 microns
		114 microns

2. Bottom painting with high performance coating system

1st coat of anticorrosive paint with chlorinated rubber base or epoxy base 50 microns
2nd coat of anticorrosive paint with chlorinated rubber base or epoxy base 100 microns
3rd coat of anticorrosive paint with chlorinated rubber base or epoxy base 100 microns
4th coat of anticorrosive paint with chlorinated rubber base or epoxy base 50 microns

Deck machinery and fittings

In all modern mechanised fishing boats, the day today operations on board is made easy and facilitated by the installation of necessary standard equipments such as trawl winches, gurdies, bollards, cowels, anchors, trawl gallows, etc. Mostly they are made up of mild steel fabrications and occasionally of cast iron. Such of these structures exposed to rain and shine as well as continued salt spray tend to disintegrate due to marine atmosphere corrosion. Gradually they tend to loose

their mechanical properties such below the safety limits. They have to be kept fully protected and free from the deteriorating elements. Periodical cleaning and painting with suitable protective coats are very essential. The following procedures can be followed.

1. Surface cleaning by chipping or blasting
2. Application of primers - red lead or zinc chromate or any tough anticorrosive coatings. One or two coats to dry.

The cost should be the main consideration. No anticorrosive method is a panacea. Every system should be looked at from the scientific point of view. Today those who fail to take precautionary and preventive measures pay a heavy penalty. Premature failure as a result of improper selection, design and maintenance has escalated the cost of operation of fishing trawler.

Cathodic protection

The stern quarter of a fishing vessel is more susceptible to corrosion owing to the use of several dissimilar metals such as steel, bronze or any other metallic propeller, stainless steel shaft, mild steel rudder etc. This constitutes galvanic corrosion of metals. This type of corrosion can be prevented by using cathodic protection principle. Cathodic protection is on electrochemical method of corrosion control for stopping or reducing corrosion. The system is so called because the structure to be protected is made a cathode in a controlled electrical circuit. Today it has emerged as one of the most important and economical method employed for the protection of ships hull, internal protection of corgoballast compartment of oil tankers, offshore structure, jetties, navigational aids, off-shore pipe lines, harbour structures, heat exchangers, pipe line running underground, oil installations, distribution line of natural gas, industrial storage plants and in breweries and dairies.

The relation between potential, corrosion and cathodic protection of steel

High corrosion	-	0.42V to 0.52V	VS	SCE
Moderate corrosion	-	0.52V to 0.62V	VS	SCE
Some protection	-	0.62V to 0.72V	VS	SCE
Zone of cathodic protection	-	0.72V to 0.82V	VS	SCE
Over protection	-	0.82V to 0.92V	VS	SCE

From the above information, it will be seen that the structure will be cathodically protected when the structure is kept between - 720 mV and -820 mV with reference to saturated calomel electrode.