On-site fishing vessel repairing and servicing at dry dock, Kakdwip fishing harbour under RKVY

– *a success story of marine sector*

Department of Fisheries, Aquaculture, Aquatic Resources and Fishing Harbours
Government of West Bengal

Title: **On-site fishing vessel repairing and servicing at dry dock, Kakdwip fishing harbour under RKVY** ï ***a success story of marine sector***

Category: Most significant success story in the field of Marine Fisheries.

Challenge:

The state of West Bengal has high potential for developing marine fishery as a lucrative industry on the basis of fish resources in exclusive economic zone of Bay of Bengal and competent human resource to man the sector. However the task is riddled with several inherent constraints. Infrastructural factors like Fishing harbor and dry dock for repairing and servicing of Fishing vessels are the major factors that are hampering the growth of this sector.

Initiative:

Initiatives were taken to fill the gap of infrastructural requirement for repairing and servicing of Fishing vessels with the following objectives:

1. Construction of Dry Dock at Kakdwip Fishing harbor.
2. Construction of slipways for lifting vessels.

Activities done to address the challenge:

1. The width is 25 metres and the depth of water at the toe is 1.5 metres.
2. The portion above water level is casted in situ and is more than 250 mm in thickness in Grade 35 concrete.
3. The submerged portion consist of precast units, also in Grade 35 concrete
4. The toe is protected with heavier stone armour and concrete-filled jute bags.
5. The timber skids, 100 mm x 100 mm in section, may then be bolted to the concrete.
6. Slope for a slipway; slopes maintained at 17 percent steep with Compound slopes, with the submerged part at 17 percent and the dry part at 9 percent.
7. The slipway is a large slope with two parallel beams running down 4 to 5 metres below water level, each carrying a heavy-duty steel rail.
8. A steel cradle, runs up and down the rails by means of a special winch.
9. The vessel to be slipped is floated over the cradle and secured. The cradle is then winched up the slope until it is clear of the water and then locked in the desired position.

Key result/insight/interesting facts:

The fishing vessels operated from this harbour is wooden or FRP type. The vessels are very much susceptible to marine corrosion. Corrosion is the destructive attack on a metal

by chemical or electrochemical reaction with its environment (Figure 1). Rusting applies to the corrosion of iron or iron-base alloys with formation of corrosion products consisting mainly of hydrous ferric oxides. Non-ferrous metals, therefore, corrode as well but do not rust.

Most corrosion can be considered as an electrochemical process which occurs in stages. Initial attack occurs at anodic areas on the surface, where ferrous ions go into solution. Electrons are released from the anode and move through the metallic structure to the adjacent cathodic sites on the surface where they combine with oxygen and water to form hydroxyl ions. These react with the ferrous ions from the anode to produce ferrous hydroxide which itself is further oxidized in air to produce hydrated ferric oxide: red rust.

Pitting corrosion occurs in some circumstances where the attack on the original anodic area is not stifled and continues deep into the metal, forming a corrosion pit. Pitting more often occurs with mild steels immersed in water or buried in soil rather than those exposed in air. Pitting can also occur on stainless steels in certain environments.

Crevice corrosion leads to crevices that can be formed by design-detailing, welding, surface debris, etc. Available oxygen in the crevice is quickly used by the corrosion process and, because of limited access, cannot be replaced. The entrance to the crevice becomes cathodic since it can satisfy the oxygen-demanding cathode reaction. The tip of the crevice becomes a localized anode and high corrosion rates occur at this point.

Bi-metallic corrosion occurs when two dissimilar metals are joined together in an electrolyte, like seawater, an electrical current passes between them and corrosion occurs on the anoxic metal. Some metals (e.g. nickel and copper) corrode preferentially themselves, thereby protecting the steel. The tendency of dissimilar metals to bimetallic corrosion is partly dependent upon their respective positions in the galvanic series (in descending order, the galvanic series for seawater lists magnesium ï zinc ï aluminium ï cadmium ï mild steel ï wrought iron ï cast iron ï stainless steel ï lead/tin solder). The further apart the two metals are in the series, the greater the tendency.

In the presence of seawater, cadmium, aluminium, zinc and magnesium all corrode preferentially to mild steel, with magnesium corroding the fastest and cadmium the slowest. Other aspects which influence bi-metallic corrosion are the nature of the electrolyte and the respective surface areas of the anodic and cathodic metals. Bimetallic corrosion is most serious for immersed or buried structures but should also be considered for steel in the atmosphere.

Stress-corrosion cracking occurs under the simultaneous influence of a static tensile stress (the metallic element is under load), which may be well below the yield strength of the

steel and a specific corrosive environment. This type of corrosion is not common with ferrous metals, though some stainless steels are susceptible in chloride environments and mild steels can exhibit stress-corrosion cracking in the presence of nitrates or in highly alkaline solutions.

Bacterial corrosion can occur in soils and water as a result of microbiological activity. The most commonly encountered is that arising from the presence of sulphatereducing bacteria. These reduce sulphates in the soil to sulphides and cause corrosion under anaerobic conditions (i.e. in the absence of oxygen). They are characterized by black corrosion products having the distinctive ñrotten-eggò smell of sulphide.

Bacterial corrosion is most commonly encountered in pipelines, sheet piles and other buried structures.

Anti-corrosion coatings for steel fall into two broad categories:

Åmetallic coatings, and

Åpaint coatings.

Paint Coatings

Paints are made by mixing and blending three main components:

- **Pigments:** finely ground inorganic or organic powders which provide colour opacity, film cohesion and sometimes corrosion inhibition;
- **Binders:** usually resins or oils but can be inorganic compounds such as soluble silicates. The binder is the film-forming component in the paint; and
- **Solvents:** used to dissolve the binder and to facilitate application of the paint.

Solvents are usually organic liquids or water.

Impact:

Kakdwip fishing port is located at Kakdwip in south twenty-four Parganas in the coastal district of West Bengal, India. It is an important full-fledged fishing port. Every coastal area and deep seas in this port from the fish trawler anchor. Approximately 200 Vessel arrives the harbour every day.

Earlier, on account of lack of dry dock, the vessels were forced to land in the river bank for repairing and servicing. Scrubbing, cleaning and machine repairing used to cause severe pollution due to waste paint and oil spillages, oil draining. The dry dock ensured reduced and efficient servicing and vessel repairing with minimum pollution.

Lessons learned:

i) Dry dock needs to be equipped with crane and winches.

ii) Covered area for scrubbing needs to constructed for checking air pollution due to suspended paint particles.

iii) Separate space for workshop for machine overhauling needs to be added.

Additional information:

i. The project was financially supported by Rastriya Krishi Vikash Yojana (RKVY) during 2014-15 with an financial outlay of Rs. 282.00 lakh.

ii. In 2014-15 an amount of Rs. 141.00 lakh & on 2015-16 an amount of Rs. 141.00 lakh were released for this project.