

## PART I

### GENERAL

# RELIABILITY AND NEED FOR STANDARDISATION OF ELECTRICAL SYSTEMS IN SMALL WOODEN FISHING VESSELS

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The working condition and atmosphere in a wooden fishing vessel are generally most injurious to the electrical systems. Therefore great care has to be taken in designing electrical systems for small crafts. This paper deals with the difficult operating conditions and standardisation of electrical systems as applicable to small fishing vessels.

#### INTRODUCTION

Since the introduction of mechanised fishing in India fishing industry has developed rapidly both in exploitation of resources and their utilization. It is a major foreign exchange earning industry in the country. At present there are nearly 10000 small mechanised fishing boats and nearly 100 large boats operating along the coasts of India.

With the mechanisation of fishing boats electrical equipment and the connected electrical fittings became necessary for these vessels. But the electrical equipment, machinery etc. available in the market

are not of the marine quality. Certain materials of construction such as galvanised iron, cast iron, mild steel etc. used in machinery meant for land use will not withstand the corrosive atmosphere inside a fishing boat. Also a high degree of reliability is essential for any machinery meant for marine use. They should have the ability to render uninterrupted service under rolling and pitching of the vessel.

Standards are already available for the electrical systems in big ships. The operating voltage is fixed either at 110 AC or at 220 AC taking into consideration the power requirements of the vessel.

In small fishing vessels the space available for the installation of electrical machinery is very much less and the atmosphere is such that the electrical leakage and short circuiting are bound to happen. No standards are available at present for the electrical equipment and accessories in fishing vessels. Further, skilled manpower for handling the electrical equipment in fishing boats is scarce. Therefore, great care has to be taken in drawing up proper standards for the electrical equipment and installations in fishing boats. This paper deals with some of the problems encountered in the design, installation and maintenance of electrical system for small fishing vessels and certain suggestions for standardisation of electrical equipment and accessories.

#### ELECTRICAL SYSTEM AND ITS VOLTAGE

Storage batteries render important service on marine crafts of all kinds by providing power for lights, radio telephone, navigation and safety equipment. The capacity of the battery relative to the total load and the method of operation depend upon the size and type of craft. In small fishing vessels, since the total load requirement is less, storage battery alone is sufficient. Higher voltage system cannot be provided with because of the highly conducting atmosphere and poor insulation which may lead to short circuiting. For such vessels 12 V DC is the most suitable voltage.

The electrical power requirements of bigger vessels of above 11 m. OAL will be more and it is not practicable to provide batteries of sufficient capacity to feed the total connected load. But the

essential services such as the navigational and communication equipment have to work on a storage battery as they need uninterrupted supply of electrical power even if the main or auxiliary engine of the vessel is at shut down. Therefore it is necessary to provide this type of fishing vessels with two systems of electrical installation. One has to be a direct current system to charge the battery, which can work at 24V taking the drive for the dynamo from the main propelling engine. The second can be an alternating current system working at a rated voltage of either 110V 50 cycles or 220V 50 cycles single phase as the appropriate alternating current equipment are already available in the market. The alternating current generator can be driven by an auxiliary engine installed in the boat.

The direct current circuit can feed the starting, navigational, communication and other electronic equipment required for the fishing boats. The alternating current system can supply power required for other lighting, heating, refrigeration and air conditioning and fishing accessories such as winch, gurdies and pumps.

#### ELECTRICAL WIRING

In fishing vessels, particularly small wooden fishing vessels, all the electrical equipment and installations have to work under highly corrosive, humid and oily atmosphere. Hitherto electrical wiring in marine fishing vessels were carried out with lead sheathed copper wire with rubber insulation. The rubber insulation gets decomposed and softened when it is exposed to the oily atmosphere prevailing in the vessel and the live copper condu-

ctor comes into contact with the outer lead sheathing leading to electrical leakage and consequent corrosion of the metals on the hull below water line such as propeller, hull sheathing etc. Inside the vessel the electrical leakage will lead to short circuiting and fire hazards.

To overcome these difficulties and to find out suitable wiring materials, investigations were carried out at the Central Institute of Fisheries Technology and it was found that polyvinyl chloride insulation for the electrical wires is able to withstand the conditions obtaining in fishing boats where the wiring is to be done in conduit PVC pipes. In case of open type wiring tinned copper or brass clips with brass nails can be used for holding the wires. Studies have also been carried out to find out the suitability of aluminium as conductor instead of copper. It has been found that aluminium wires, if properly used, can be a good substitute for copper. For aluminium wires the joints and connecting points should be covered with proper jointing paste to avoid oxidation and loose contact.

The switches and fuses available in the market at present have some of their parts made out of iron or very thin brass strips. In the highly corrosive atmosphere in the fishing vessels these metal parts cause a host of problems. Therefore proper standards have to be prepared for the switches, fuses, connectors etc. The metal contacts of the above accessories should be made out of tinned, thick brass plates. The screws should be made out of brass, stainless steel or PVC. The main body of the switches and fuse can be porcelain, bakelite or fibreglass.

When the main engine is working each and every part of the small fishing vessel will be vibrating. The low voltage bulbs available in the market are bionet cap which will make loose contact with the bulb holder points on vibration and will get fused quickly. To avoid this difficulty screw cap bulbs of appropriate voltage and wattage should be manufactured and fitted in the vessels.

#### MOTORS AND GENERATORS

Electrical industry in India is mainly concentrating in the manufacture of AC machines as their demand is high. For small fishing vessels low volt direct current motors and generators are required. The motors and generators to be manufactured for this purpose should be of totally enclosed type and should have fire resistant insulations.

#### ELECTRONIC EQUIPMENT AND INSTRUMENTS

The common electronic equipment and instruments used in small fishing vessels are fish finder, direction finder, radio telephone, radar etc. Of these only very few items are at present manufactured in India. While manufacturing, the power requirements and voltage at which they have to work should be fixed taking into consideration the source of power supply in fishing boats. These equipment should be of rigid type and should have good quality metal contacts. All structures should be made of brass, stainless steel, PVC, bakelite or fibre glass. For smaller fishing vessels self contained units with their own power source (battery) are ideal so that they need not depend on the power source of the vessel.