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## Aluminium Alloy as Sheathing Material for the Wooden Hulls of Fishing Boats

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**Trials with indigenous aluminium-magnesium alloy as a substitute for copper in sheathing wooden hulls of mechanized fishing boats have given promising results. Costing only a little over one third as copper, the alloy sheathing has been giving satisfactory service for over 18 months since the boat was commissioned for regular sea-fishing operations off Cochin.**

**W**OODEN hulls of fishing boats, which have to be constantly in contact with sea water are subject to attack by various marine wood boring organisms. Various protective measures have been tested and tried to reduce the damage arising from this attack<sup>1</sup>. In the first place, good quality timbers inherently resistant to decay and damage are selected for boat-building purposes; or when less durable species of timbers are employed as is the case with all indigenous fishing crafts, suitable wood preservatives are applied. In the case of modern, mechanized wooden fishing boats which are dry-docked for hull inspection only once in a year, the hull below water-line is protected with copper sheathing of the desired quality and thickness. In addition to being highly resistant to marine corrosion, copper and copper-based alloys, by virtue of the toxic nature of their surface, repel marine fouling and wood boring organisms. In practice, copper sheathing of wooden hull has been found to afford maximum protection under normal working conditions. But the

extremely limited indigenous resources of copper and import restrictions have made supply of copper sheets very stringent, and of late, the prices have been spiralling. Hence, search for alternative sheathing materials has become imperative. Trials carried out in this direction at the Central Institute of Fisheries Technology, Cochin, are reported in this paper.

Since aluminium alloys are very useful in marine applications where weight saving is of importance, the studies were started with one such alloy. An aluminium-magnesium alloy with the composition, Al, 97; Mg, 2; Cu, 0.20; Fe, 0.20; Mn, 0.10; Si, 0.20; Zn, 0.10; and Cr, 0.20 per cent was chosen in view of its relatively good strength, corrosion resistance and cheapness—60 per cent cheaper and 35 per cent lighter than copper.

### **Preliminary trials and observations**

Panels cut from rolled sheets of the alloy  $\frac{1}{4}$  to  $\frac{1}{2}$  hard and of thicknesses 22 SWG (0.028 in.), 23 SWG (0.024 in.) and 24

SWG (0.022 in.) were sheathed over different wooden test blocks, using galvanized iron and aluminium fastenings, and subjected to a series of immersion tests at the Institute's test site for different periods of exposure ranging from 3 to 15 months under varying hydrographical conditions such as water temp., 26-32°C.; salinity, 0.4-34.0 parts per thousand; dissolved oxygen, 2.7-8.0 ml./litre; and pH, 7-8. These tests showed that in the absence of direct or indirect contact with nobler metals, there was no sign of corrosion or mechanical breakdown of the sheathing even after 462 days of continuous immersion. Also, the entry of wood boring organisms into the bare wood was effectively prevented. However unlike as in copper plates, there was free settlement of marine fouling organisms on unpainted panels; this could be kept under control by adopting suitable painting schedules. The paint thus applied on this alloy for antifouling purposes lasted longer than on steel, with the usual surface preparation. Among the fastenings tried for securing the panels to test blocks, aluminium wood screws were the most compatible.

### Service trials

A small non-mechanized row boat was taken up in the first instance, and its hull was sheathed with the alloy, using aluminium wood screws. No painting was done on the alloy sheathing; instead the sheathing



Fig. 1 — Final stages of sheathing

was scraped and cleaned at intervals of 2 months (when the boat was beached for servicing) to remove marine fouling forms. During the eight months the boat has been in regular service in the Port of Cochin, the hull was free from damage by marine borers. Encouraged by this, a 30 ft long mechanized fishing boat, constructed at the Institute, was completely sheathed, i.e. below the water-line (Fig. 1) with the alloy, using aluminium screws. The sheathing was given 2 coats of zinc chromate primer after light initial sanding of the surface. It was finished with 2 top coats of cold plastic antifouling paint just 12 hr before the launching of the boat. At the stern quarter where dissimilar metals such as the aluminium alloy of the hull, copper-based alloys of the propeller and its shaft, and the steel or cast iron rudder fittings are in close proximity, which may cause galvanic corrosion of the aluminium, zinc anodes were installed close to the propeller and rudder for cathodic protection of the aluminium sheathing.

The sheathing, after eighteen months in service since the boat was commissioned for sea-fishing in November 1963, is still in perfect condition, and free from any breakdowns due to corrosion. It has been protecting the wooden hull as efficiently as copper sheathing. This has clearly proved that Indian-made aluminium alloy plates can effectively substitute imported copper, thus saving considerable foreign exchange. The cost of covering 350 sq. ft of the wooden hull of a 30 ft mechanized fishing boat is only Rs 1000 for the indigenous aluminium alloy as against Rs 2600 for imported copper.

*Recommendations* — However, in using aluminium alloys for sheathing of wooden hull, the following precautionary steps will have to be strictly observed to ensure satisfactory performance:

- (i) Only Al-Mg alloy with a minimum of 2 per cent Mg and of either  $\frac{1}{4}$  or  $\frac{1}{2}$  hard type and 22/23 SWG should be used. Aluminium wood screws alone should be employed for fastening and not copper or iron. To avoid breakdown of the screw heads,

pre-drilling of the sheet and wooden plank is desirable.

- (ii) A good coat of coal tar should be given on the hull below water-line after necessary sandering of the wooden surface.
- (iii) A layer of tar-felt paper should be fixed on the coal tar coating between the wooden hull and the aluminium sheathing.
- (iv) All fastening holes on the wooden hull planking should be carefully closed with a seaming compound (white putty).
- (v) Two coats of a good quality commercial antifouling paint should be applied over the aluminium sheathing. Prior to the application, the surface should be duly prepared for proper adhesion either by light surface sandering or by application of etching primers, e.g. zinc chromate, 2 coats.

Paints containing copper should not be applied on aluminium without adequate barrier coats.

- (vi) If bimetallic contacts are suspected through sea water, Zn anodes (electrolytic Zn, 99-95 per cent) should be installed for cathodic protection.

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#### Reference

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## Science and Technology in the Formation and Production of Chloroquine

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**The various steps in the production of the antimalarial drug chloroquine are discussed with reference to the need for a close control of process variables. Details regarding chemicals and equipment needed for the process are given.**

IT is well known that there is a considerable time lag between the synthesis of a chemical in the laboratory and production on commercial scale. This is due to the several hurdles incidental to the translation of laboratory scale experiments into large scale operation, tackling of which calls for the combined efforts

of scientists, technologists and engineers. The production of chloroquine is a case in point. Though India was among the first countries to synthesize this compound<sup>1</sup> on its own, production in large quantities and that at an economic price had been a formidable problem. But the concerted efforts made in the Bengal Immunity