

Surface Preparation - Aluminium

Very thorough surface preparation of Aluminium is essential if the coating scheme applied is to perform well. Aluminium, although when used in the marine industry is alloyed with magnesium, is a reactive metal, whose surface will react with atmospheric oxygen to form an almost invisible oxide layer. This occurs almost instantly on cutting or abrading and in damp marine environments a portion of the oxide will, in the passage of time, convert to the lighter and more visible hydroxide.

Furthermore, aluminium is prone to corrosion in a marine environment, particularly in confined spaces such as crevices and behind poorly adherent paint films. Therefore good surface protection is of paramount importance.

Aluminium can suffer serious galvanic corrosion unless care is taken in the choice of underwater fittings, propellers etc. In this respect, the use of cuprous oxide or metallic flake containing antifouling should be avoided. Reference should be made to the section on Antifouling application.

Degreasing

Before any other preparation commences, the aluminium surface must be thoroughly degreased to remove flushing oils and other surface contamination.

Solvent wiping using clean cloths can effectively degrease small areas, but these must be changed frequently to avoid re-distributing contaminants. Large areas should be degreased with a detergent such as Super Cleaner (YMA620) applied undiluted by cloth, allowed to "work" for 15-20 minutes before removal with copious quantities of fresh water. Some areas may require repeated application, and vigorous cloth rubbing to remove all contamination. Alternatively a solvent may be used such as Degreaser (ITA080).

Once degreased, the surface must not be touched by hand until painted, in order to avoid grease spots and consequent paint detachment.

Grit Blasting

Grit Blasting is the preferred method of preparation, as it provides an ideal profile for good paint adhesion and removes surface corrosion.

Ideally aluminium oxide grit should be used, and a suitable grade chosen to achieve a surface profile of 50-75 microns (2-3 mils). Aluminium oxide abrasives can normally be re-used without detriment to the surface profile. Other suitable inert abrasives do exist and advice should be sought from the suppliers of blasting aggregate.

Sand is not ideal for grit blasting as, apart from being injurious to health, it is often not sharp enough to provide the necessary surface profile. *The use of copper slag abrasives (as often used on steel) **must be avoided**, as these will promote serious corrosion.*

Once blasted, all debris should be completely removed, followed by application of the Initial Primer or a Holding Primer, ideally within a 6 hour period.

Mechanical Abrasion

As an alternative mechanical method, aluminium may be prepared by abrasive disk to provide the necessary surface profile for good paint adhesion. Whilst this is not as effective as grit blasting, this method has been used successfully by many yards. A coarse abrasive disk (Aluminium Oxide) should be used (24-36 grit) to achieve a heavily scored surface profile of 50-75 microns (2-3 mils). After grinding, the surface should be vacuum cleaned, followed by application of the Initial Primer or a Holding Primer, within a 6-8 hour period.

Etch Primers

Etch or wash primers such as Interprime 539 achieve adhesion by chemical reaction with the substrate, and may be applied directly to a degreased surface, but for optimum performance the aluminium should be lightly abraded to offer some mechanical adhesion. If etch primer is applied to a ground or blasted surface, accurate control of film thickness is important. Over-application to any surface must be avoided as this will lead to failure through solvent absorption or splitting of the primer film. Temperature during application is also important, and a minimum substrate temperature of 10°C (50°F) must be maintained. Once applied, etch primers must be over-coated with a suitable primer of correct film thickness within the recommended over-coating period. They must not be used in potable water tanks.

Chemical ('Mil-Spec') Pre-treatments

Whilst often effective, these are complex and employ chemicals hazardous for large-scale use. They are also coming under increasing environmental pressure, and will not be considered further here, as their use is beyond the scope of this article.

Summary

Surface preparation invariably involves blasting to a surface profile of 50-75 microns (2-3 mils). Prior to blasting:

- The surface should be degreased and weld splatter removed.
- Weld seams and sharp edges should be ground down to prevent too thin coatings being applied.

The profile achieved will depend on the abrasive used, the air pressure and the blasting technique, Inadequate profile = Insufficient mechanical key.
Excessive profile = Uneven coverage of sharp peaks.

- All debris must be removed by vacuum cleaning prior to painting.
- Compare blast profile to the standard photograph for colour of steel.
- Measure Mean Apparent Amplitude (MAA) using the surface profile gauge making sure the aluminium is not shadowed, contaminated or containing embedded grit.



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