

## Comparison of the Electrolytic, Ultrasounds and Chemical Cleaning in Corroded Naval Steel

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**Abstract** – Oxygen, salt and water are key factors affecting metal deterioration and leading to corrosion in a marine environment. Prolonged corrosion may compromise the use of the materials and this may have an important economic consequence, since the cost derived from its prevention may be much greater than the manufacture or acquisition cost itself. Moreover, acquisition of new pieces may be more expensive than the cost of the cleaning procedure and there may be also discontinued pieces. However, restoration is necessary to prolong the life cycle of different equipment or instruments.

This work compares qualitatively the advantages and disadvantages of three cleaning methods: electrolytic, ultrasonic cleaning and cleaning with commercial chemicals that are commonly used on boats. Materials employed were probes artificially corroded in the laboratory, as well as real parts of boats of the Spanish Naval Academy. Electrolytic cleaning was carried out by placing samples in a solution at 1% NaOH, with a graphite electrode and a current of 0,5 to 2,5 A. Ultrasound was applied at 37 kHz, time treatments varying between 10 min and 1 h 15 min, and 2,5 g of *Ultrasonic A* degreaser. Chemical cleaning was carried out with *Minea Ferronet*, a commercial solution, with a high deoxidation, degreasing and descaling power.

A summary of the results obtained can be observed in Illustrations 1-2. Electrolytic method showed high efficiency to clean metal probes, regardless of the initial corrosion. Promising results were obtained either with laboratory probes and real pieces, characterized of more complex geometries.

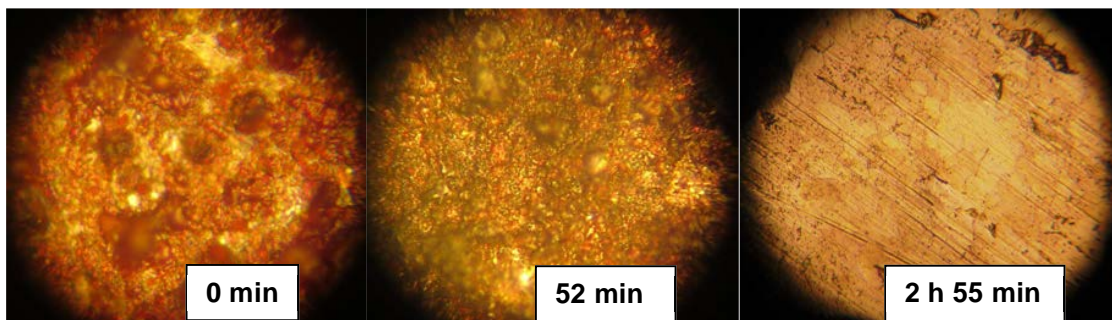


Illustration 1. Electrolytic cleaning significantly removed corrosion from the original probes (left) after 52 min and 2 h 55 min.



Illustration 2. Electrolytic cleaning was also applied to pieces of boats of the Spanish Naval Academy.

**Keywords** - Electrolysis, corrosion, metals, oxidation, restoration.