

EXAMINING THE POTENTIAL OF LOCAL CLADDING FOR CORROSION PROTECTION OF 2024-T351 AIRCRAFT ALUMINUM ALLOY

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Abstract

A local cladding pattern, able to provide sufficient protection against corrosion on aluminium alloy 2024, has been defined. The definition was based on the quantification of corrosion damage of the un-protected areas of the material by means of stress concentration factors. Starting from the experimental identification of the dimensions of local cladding sufficient to protect a certain area of unclad aluminum alloy against corrosion, a multi-spot pattern capable to protect a medium scale panel has been identified. To verify whether the derived local cladding is sufficient for protection against corrosion, tensile and fatigue tests on pre-corroded specimens were performed and compared with the respective properties of the full-clad and the un-clad material.

Keywords cladding; pattern; corrosion protection; mechanical properties

1. Introduction

One critical aspect for the ageing aircraft is that structural integrity can be affected by corrosion. As the time of an aircraft in service increases, there is a growing probability that corrosion will interact with other forms of damage, such as fatigue cracks or multiple-site damage. The ageing aircraft may have accumulated corrosion damage over the service life and its residual strength depends on possible degradation stemming from corrosion-induced embrittling mechanisms (Kamoutsi et al. 2006). Thus, corrosion should be a major consideration for evaluating the structural integrity of ageing aircraft components. Numerous research projects and international conferences have been organized to ponder on the problem of material degradation in older aircraft, e.g. (Petroyiannis et al. 2004; SICOM Project).

To prevent corrosion damage, current common practice for the aeronautical industry is the deposition of protective coatings on the surface of the material. Anodizing and sealing of the bare material, e.g. (ASM Handbook "Corrosion" 1987; ASM Specialty Handbook "Aluminum and Aluminum Alloys 1993; Sastri 1998;