

## Laser Paint Stripping on Large Zones on AA 2024 Based Substrates

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**Abstract :** Aircrafts are painted with several layers to guarantee their protection from external attacks. For aluminum AA 2024-T3 (metallic structural part of the plane), a protective primer is applied to ensure its corrosion protection. On top of this layer, the top coat is applied for aesthetic aspects. During the lifetime of an aircraft, top coat stripping has an essential role which should be operated as an average of every four years. However, since conventional stripping processes create hazardous disposals and need long hours of labor work, alternative methods have been investigated. Amongst them, laser stripping appears as one of the most promising techniques not only because of the reasons mentioned above but also its controllable and monitorable aspects. The application of a laser beam from the coated side provides stripping, but the depth of the process should be well controlled in order to prevent damage to a substrate and the anticorrosion primer. Apart from that, thermal effects should be taken into account on the painted layers. As an alternative, we worked on developing a process that includes the usage of shock wave propagation to create the stripping via mechanical effects with the application of the beam from the substrate side (back face) of the samples. Laser stripping was applied on thickness-specified samples with a thickness deviation of 10-20%. First, the stripping threshold is determined as a function of power density which is the first flight off of the top coats. After obtaining threshold values, the same power densities were applied to specimens to create large stripping zones with a spot overlap of 10-40%. Layer characteristics were determined on specimens in terms of physicochemical properties and thickness range both before and after laser stripping in order to validate the substrate material health and coating properties. The substrate health is monitored by measuring the roughness of the laser-impacted zones and free surface energy tests (both before and after laser stripping). Also, Hugoniot Elastic Limit (HEL) is determined from VISAR diagnostic on AA 2024-T3 substrates (for the back face surface deformations). In addition, the coating properties are investigated as a function of adhesion levels and anticorrosion properties (neutral salt spray test). The influence of polyurethane top-coat thickness is studied in order to verify the laser stripping process window for industrial aircraft applications.

**Keywords :** aircraft coatings, laser stripping, laser adhesion tests, epoxy, polyurethane

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