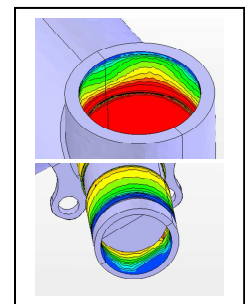
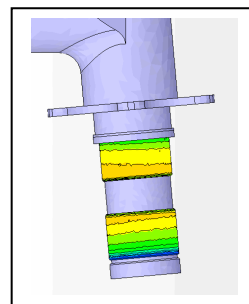
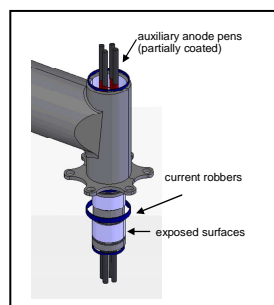
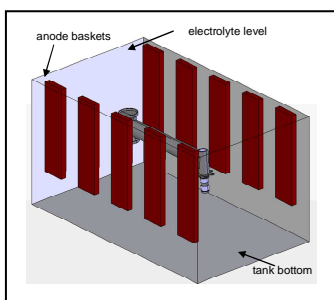


Reducing costs and lead time for electroplating landing gear components

Aerospace Solutions applied with Electrochemical Intelligence



The Need

Over the last decade the aircraft manufacturing industry has experienced radical change with the evolvement of increasingly complex supply chains spanning continents. Although this approach serves well in exploiting the particular strengths of various countries and their expertise it does raise further issues in terms of delivery. The slightest delay at one supplier can have a huge knock-on effect across the globe and impact substantially on the OEM's final aircraft delivery deadlines. Consequently, there is a need for all suppliers to look closely at their lead times and how they themselves are affected by other suppliers in the chain.

Another issue with such a global strategy is that all suppliers, large and small, are now more commercially exposed. OEMs are continually demanding a downward pressure on prices, competition is more fierce and lower cost economies not only compete on price but are clearly following initiatives to acquire technology. It is essential that as a manufacturer you continually improve and adapt your processes to ensure quality, and timely delivery at acceptable cost.

The Challenge

Landing gear components are nickel and hard chrome plated to provide long-term resistance to wear and corrosion. It is well known that hard Cr plating processes produce non-uniform deposit thickness distributions which often require time consuming mechanical grinding. This is very expensive and unnecessarily consumes labour, raw materials and diamond grinding tools.

The manufacture and refurbishment of landing gear components is characterised by numerous processing steps. Functional electroplating steps are followed by frequent intermediate de-embrittlement heat treatments of the part in dedicated furnaces, which can typically take up to 18 hours – further increasing lead times.

The Solution

The task for the project was to closely examine all of the processing steps, accounting for design, test and build of tooling systems and all labour required for manipulation and masking of components.

The objective of the audit was to define and evaluate the cost reductions, quality and productivity improvements that can be made by deploying an Elsyca '*electrochemical intelligence*' strategy. The outcome of the audit showed how an improved tooling system design, incorporating auxiliary anodes, shields and current robbers would result in shorter electroplating times, while strongly reducing rework such as grinding. A first rough estimate of the minimal savings was proposed. This formed the basis of a business case that focussed everyone's attention on the real cash savings.

During this audit, all required data for the Return On Investment (ROI) analysis was gathered. At the same time, all current ground rules and good practices during electroplating and rework were captured in close collaboration with the client. These rules were then incorporated into the project framework, that is, the design and optimization of the auxiliary tooling. The remainder of the project then focussed on quantifying the ROI.

From the results of the audit, Elsyca proposed and developed a strategy for a *rationalized* process sequence, by combining all Ni plating steps into 1 single integrated process step and all Cr plating steps into 1 single integrated process step. An additional goal was to meet minimal thickness specifications at any point while keeping excess plating thickness as low as possible.

With the 3D CAD information and the characterised chemistry, Elsyca *PlatingMaster* was used as a *virtual plating plant* in order to propose, design and test auxiliary tooling systems. The simulation results were used to guide the process design until the thickness distribution fell within the specifications.

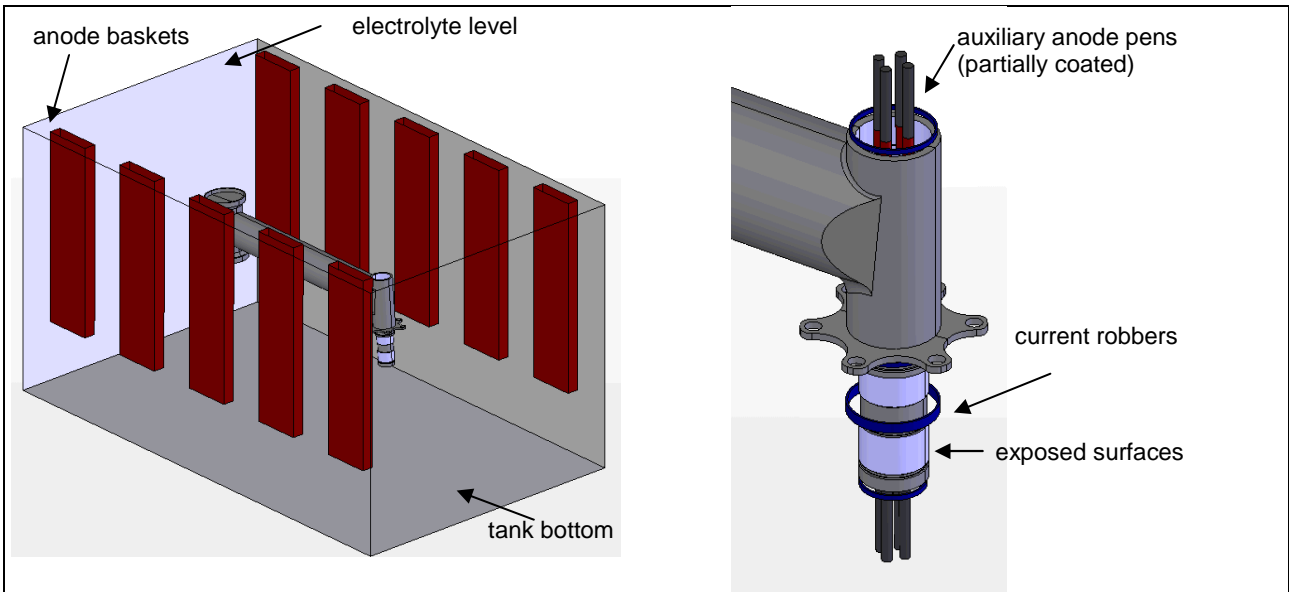
The next stage was the manufacture and assembly of the new auxiliary tooling, followed by a production trial to validate the ROI.

The Benefits

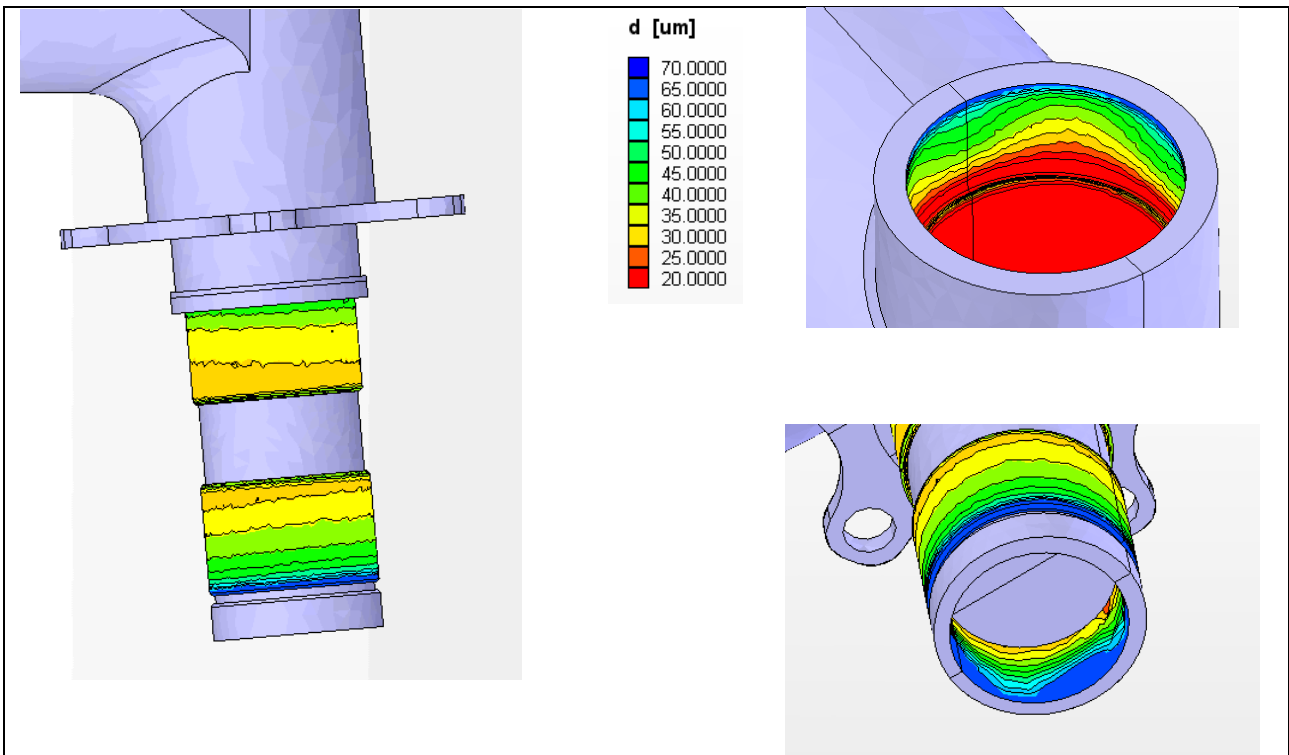
The benefits were immediate and measurable. A redesign of the complete plating process, removing several plating operations and related de-embrittlement steps, combined with dedicated and optimised auxiliary tooling structure translated into significant savings in lead times, manpower and material. The following results were obtained:

- 3 Ni and 1 Cr plating steps plus associated labour were completely removed
- Lead times were reduced by approximately 3 days by removing de-embrittlement steps
- Grinding work for plating excesses were reduced due to a more uniform layer thickness distribution deposited from the outset
- Lead times reduced by 3 weeks (for some racked parts) due to the drastic reduction in plant trials to achieve optimisation

Total savings of 500 k€/year in a plating job where 100 different types of parts are plated/year.



Left: CAD configuration of plating tank with landing gear part (trailing arm), partially masked
 Right: CAD configuration of optimised auxiliary structure



Left: simulated Ni deposit layer thickness on outer surface of trailing arm
 Right: simulated Ni deposit layer thickness on inner surface of trailing arm