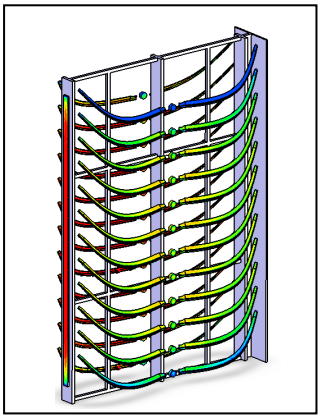
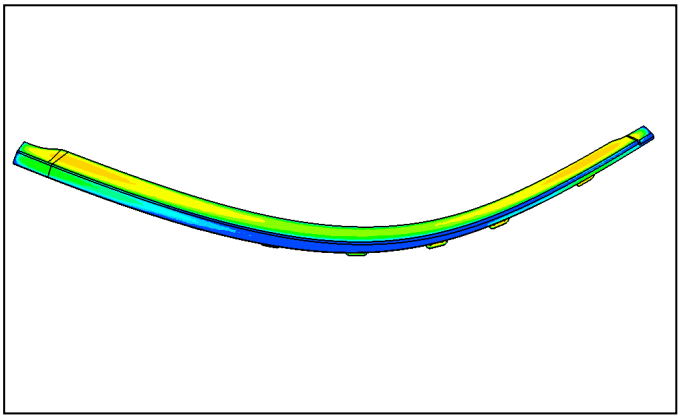
APPLICATION CASE

Optimization of the decorative Cr plating process for a rack of plastic parts

Automotive Solutions applied with Electrochemical Intelligence





The Need

A wide variety of Plating On Plastics (POP) applications are required by the automotive industry. In particular, ABS plastic car finishing parts range from door handles, to wing mirrors, to front grills. With automotive design innovations, the geometry of these parts is becoming increasingly more complex and parts are growing in size. Yet there is still a need to keep up production pace by placing as many parts on a rack, as the tank dimensions will allow.

Accurate assessment of the number of parts to be processed affects quotation accuracy and influences costs. Attaining the minimum (and maximum) thickness specification is vital. Recessed surface zones are the most difficult to plate but meeting the minimum thickness in these areas always results in excess deposit thickness on other areas of the part. With complex parts it becomes difficult to control production costs while remaining competitive.

"Trial and error" rack and tank design significantly increases time-to-market. These "wet runs" also involve important labour and consumables costs. The final yield attained after trial and error rack design often does not exceed 80 percent. Hence the need for faster and more accurate process engineering is a reality.

The Design Challenge

In general, decorative plating processes as on plastic parts, produce highly non-uniform deposit thickness distributions, especially the final chromium plating step. This is a problem when trying to assure minimal and maximal deposit thickness values. In order to plate parts meeting deposit thickness specifications, the rack configuration should ensure that the average current delivered to each part does not differ by more than 10% or 20% and that the deposit layer thickness on each part is well controlled to avoid excessive scrap. This calls for well designed racks with many configuration parameters considered: the arrangement, orientation and distance between parts on the rack; the use of insulating shields and/or current thieves to reduce edge effects and occasional use of auxiliary anode structures to better plate recessed areas.

An entire wet run, including the design and manufacturing of the rack, mounting parts, plating and measuring layer thickness distributions on some sample parts, can take a week or longer. Up to 10 trial runs can be expected to arrive at deposit thickness values that are within specifications.

With POP applications, electrical contacting is also very important. A proper choice of the number and position of the electrical contact points can avoid that parts deform after plating, and also rule out the risk for burning the deposit.

The Solution

Elsyca Advanced Engineering Services will dramatically speed up the rack design process. Using Elsyca PlatingMaster software, wet trials can be significantly reduced (from 10 to 2) or even eliminated, saving several weeks or even months of time.

Our engineers will actively drive this software tool for the "virtual" definition and manipulation of rack configurations; specifying electrode types, current sources and the computation of resulting layer thickness distribution. Visualisation of the end results includes a probe able to determine numerical deposit thickness values at specific points on the product surface.

With the software tool, defining rack configuration, visualising and computing the results take just a few hours. Modifying configuration parameters takes minutes thanks to the full integration of the software tool into a professional CAD environment. It also allows simulating different electrical contacting configurations for a single part, thereby accurately predicting the local heat production on the part and related burning risk.

In a few days Elsyca Advanced Engineering team can design and evaluate multiple rack-screen-robber-anode configurations and use this input to select the best one.

The Benefits

A dramatically faster and better rack design not only increases production capacity, but also severely reduces the scrap fraction, offering huge savings in consumables and manpower costs. Reducing wet run trials saves even more time and money and speeds up time-to market. The ability to provide accurate quotations increases customer confidence and wins more business.

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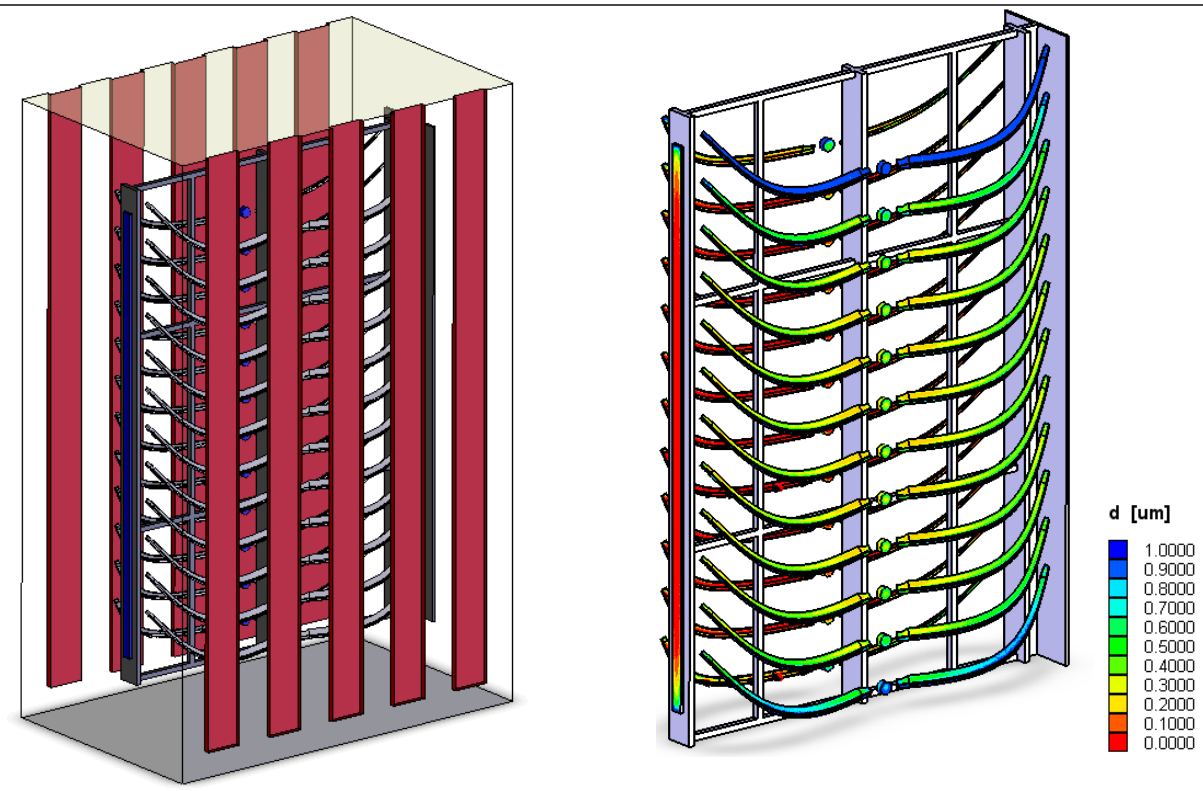
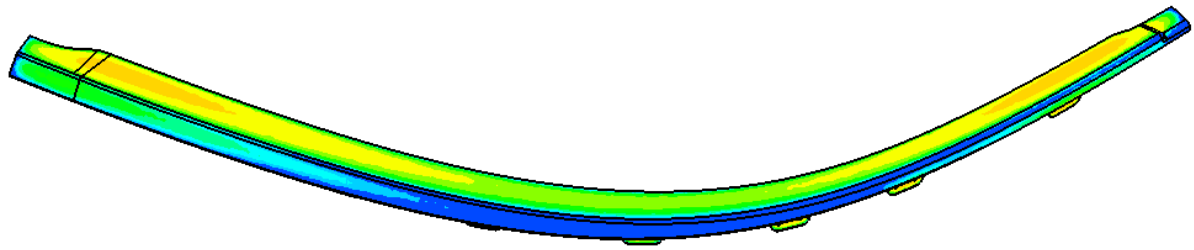


Left: CAD configuration of plating tank (partly) with rack of parts and current robbers
Right: simulated Cr deposit layer thickness



Simulated Cr deposit layer thickness on a single part

Note: Elsyca Advanced Engineering Services team can simulate all steps involved in the POP plating process (acid copper, semi-bright and bright nickel, hexavalent chromium). The database includes characteristics for each of these electrolytes, with all relevant electrode materials being present.

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