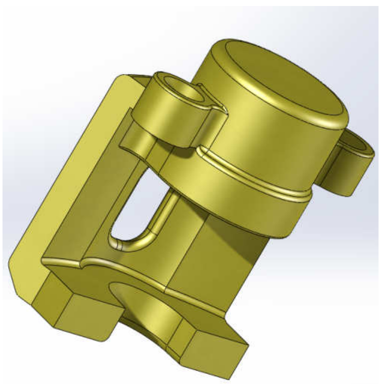
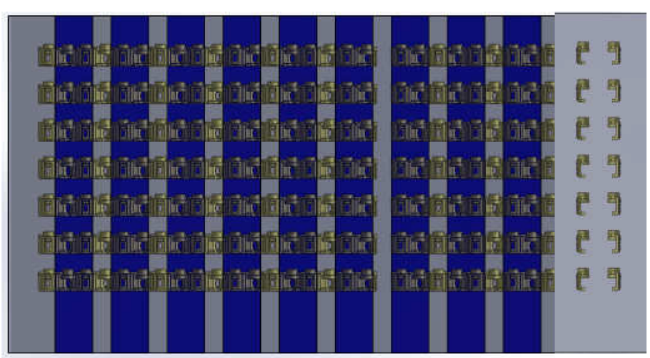
A plating feasibility analysis aims at replacing a physical test run during the development

The plating feasibility analysis aims at replacing a physical test run during the development of a new rack or tooling configuration.

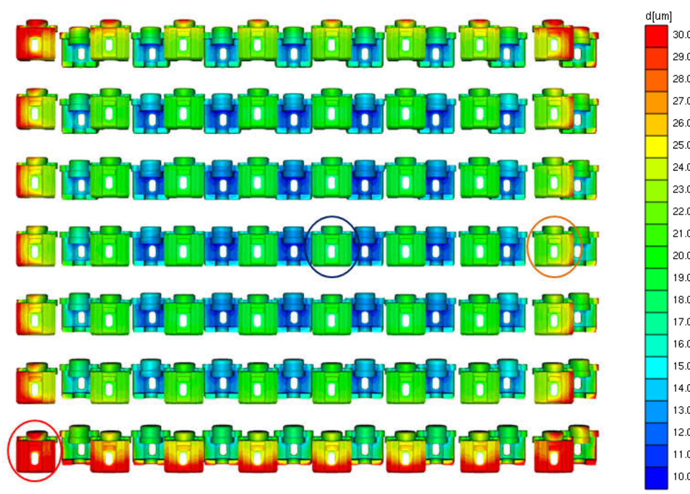
In this example, a break caliper is plated with an alkaline zinc/nickel bath (12-18% Ni). The zinc/nickel layer is a functional deposit (corrosion protection) and specified at 12 micron minimum for the entire surface of the part.



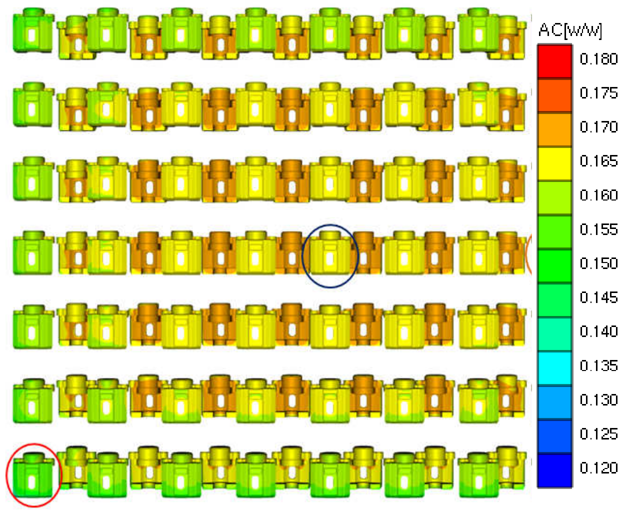
The rack configuration is defined by the costumer together with the infrastructure (plating tanks) and process parameters details (current and plating time). The CAD model of the rack (as defined by the costumer) is defined in the costumer specific plating tank together with any existing tooling.



Simulation results include current density and layer thickness color plots for the entire rack and additional statistical information for 3 selected parts. To better illustrate the spread in results across the rack, the parts across the rack that receive the lowest (= part A), highest (= part B) and average deposit weight (= part C) are identified.



The color plot clearly depicts the increased deposit thickness for the parts that are located at the edges of the rack, yet somewhat limited on the right hand side, where the 2nd rack is situated (not shown here). Although the 2nd rack is present the space between then is still large enough to create a noticeable edge effect at these positions too.

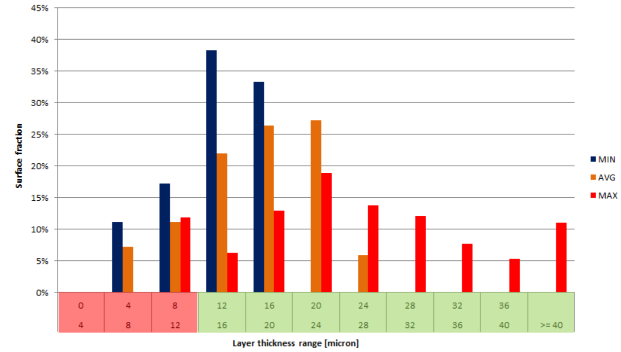


The same color plot is presented for the nickel content distribution. For this electrolyte, nickel content decreases with increasing current density, thus the parts around the edge of the rack show a lower nickel content than those in the centre of the rack.

	Deposit weight	Overplating factor
Part A (minimum deposit weight)	5.1 g	116 %
Part C (average deposit weight)	6.2 g	141%
Part B (maximum deposit weight)	9.1 g	207%

Deposit statistics show that part B takes up twice the required metal weight while part A does not consume much more than the required minimal metal weight for coating the part within specifications.

The distribution of the metal can be easily understood from the bar chart below. Although part A shows a small overplating factor, the distribution of the layer thickness shows that 28% of the surface is actually below specifications.

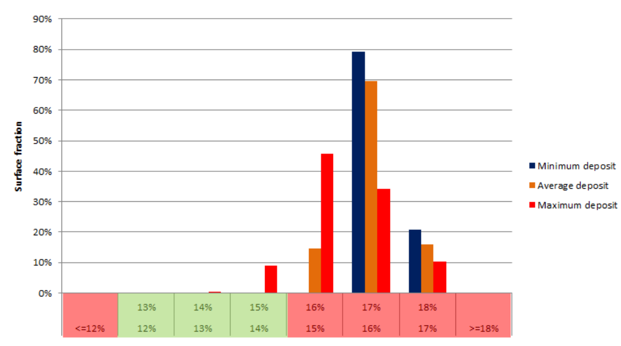


In the bar chart above the layer thickness is segmented in layer thickness ranges, in this case every 4 microns, and the corresponding surface fraction that falls within this interval is presented. The first blue bar indicates that around 11% of the surface (of the minimum deposit part) is between 4 and 8 microns in layer thickness.

The bars in blue correspond to the layer thickness of the part A, the orange bars represent part C and the red bars correspond to part B.

The minimum specification is shown in the bar chart horizontal axis as red and green bands. This chart clearly depicts that even the maximum deposit part still has over 10% of its surface below specifications.

Apart from minimum layer thickness also nickel content has a defined specification window. In this example the nickel content specification is 12 to 15%.



To better illustrate the usefulness of the bar charts, the bath type used in this example has an operating window from 12 to 18% in nickel and thus a large portion of the parts shows excessive nickel content. The nickel excess can be immediately identified in the bar chart.