Metal Plating on PLASTIC SUBSTRATES

FISCHERSCOPE X-Ray XDLM positioning.

The following is just a handful of plating on plastics technologies available to meet customers' needs.

Measuring Cr/Ni/Cu Coatings on Plastic Substrates

Bathroom fittings are commonly finished with decorative chromium plating. But what appears to be a solid metal shower head, for example, is often just a multi-layered metal coating on top of a plastic substrate. To guarantee that the shower head not only look pretty when delivered, but even after many years of usage, the thickness of each individual layer must be controlled to ensure quality.

The typical composition of such shower heads is a chrome/nickel/copper coating system on top of a plastic substrate material. The decorative chromium outer layer is usually only 0.5 m thick (or less) and the nickel layer about 5-10 m. If the copper layer is between 20-25 m, making the overall coating thickness no more than 30 m, non-destructive measurement using the x-ray fluorescence (XRF) method for a true coating thickness reading.

X-ray fluorescence instruments with a proportional counter tube are perfectly suited for this application method. Even with small measurement spots, sufficiently high count rates can be obtained due to the large detector area, ensuring good repeatable precision. Because of the large, easily accessible measurement chamber, the robust instruments of the FISCHERSCOPE X-RAY XDL family are well suited for large specimens with complex shapes. To maximize the precision of the results, proper positioning of the object is essential, for example by choosing an intrinsically horizontal area or correctly aligning the sample. To assist in this crucial step, FISCHERSCOPE X-RAY measurement systems are equipped with a laser pointer positioning aid and high-magnification camera optics. Using the video image generated by the WinFTM software, the exact focusing of the measurement spot can be achieved.

Table 1

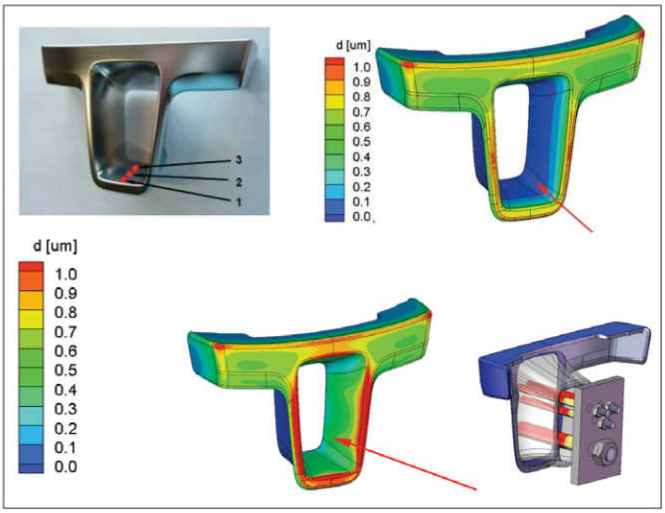
Measurement spot	1	2	3	4	5
Cr mean value	0.17	.017	.017	0.17	0.16
Standard Deviation	0.003	0.005	0.005	0.004	0.005
Ni mean value	7.24	7.40	7.10	7.29	7.21
Standard deviation	0.07	0.04	0.10	0.11	0.07
Cu mean value	21.40	21.90	22.10	20.10	20.60
Standard deviation	0.25	0.39	0.29	0.29	0.26

Typical results of an x-ray measurement, collected using a FISCHERSCOPE X-RAY XDLM with a measuring time of 30 seconds for four measurement cycles per spot.

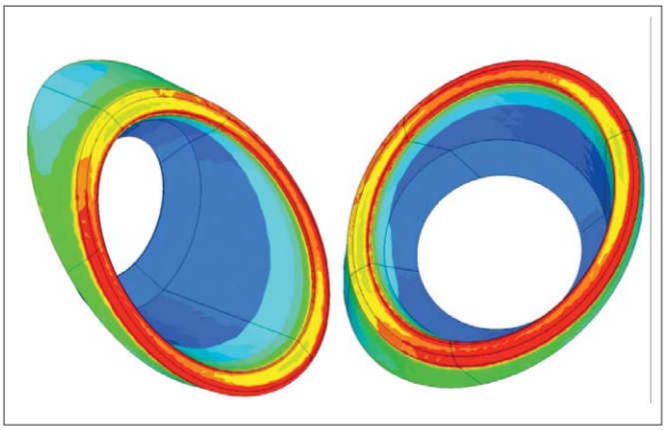
Upfront Plateability Assessment Reduces Production Risk

Just as Moldflow has become indispensable to the plastic injection molding industry, PlatingMaster simulations are becoming the norm for the plating on plastics (POP) industry. This move has been catalyzed by the US Automotive Industry's refocus on quality and manufacturing risk elimination. Without the need for any physical prototypes, it is possible for an OEM to input the math design data of a grille component, for example, and get an immediate view on areas that run a risk of being over plated (rough deposits, increased waste) or under plated (poor aesthetics an in-field corrosion risk).

The same technology can also be leveraged by plating service providers to design and optimize the rack, tooling and process, ensuring maximum yield within



Tests and simulations showed that the required chrome coverage would not be met.



Designer's upfront plateabilty analysis on the fog light bezel above, clearly shows problem with overplating on edges and no plating in the recesses – identifying this issue in the studio is much more effective, reducing total lead time and potential manufacturing cost overruns.

quality specifications.

Elsyca has available two products – PlatingMaster for detailed plating analysis and tooling design and also a 'lighter version' aimed at OEM studios for assessing impact of design on plating production. The company has a presentation available showing how TRW applied the predictive plating technology to redesign tooling and racking to ensure plating specifications were met in high volume production.

The following figures show that with appropriately designed auxiliary tooling, specifications would be achieved.

This technology is becoming firmly embraced by automotive OEMs, for example, GM's latest global standard for plated plastic parts, GMW14668, recommends "plating simulations where there is uncertainty of meeting minimum plating thicknesses due to part design features." For more difficult parts, such as License Plate Appliques (LPAs) there is, in fact, a requirement for plating analysis – 'Elsyca or equivalent approved'. Ford has also included plating simulation requirements in its Engineering Best Practices.

Product design determines success or failure. The challenge is to address the fine balance between aesthetics and the impact of design on manufacturing cost. Design characteristics, such as protruding edges or recessed areas, pose major challenges to the plating process. Elsyca's new Design Plateability Analysis tool will help the designer, by pin-pointing problem areas on the parts which will have problems with the layer thickness or quality of the deposit. The designer will be able to assess the impact of potential geometry changes on the plating process, while the product managers will be able to assess the impact of the design on the production cost.

NeoLink A Milestone in Direct Plating on Plastics

With Neolink, Atotech has reached a crucial milestone in direct plating on plastics. Much shorter and cost-effective than conventional plating systems for plastic materials, NeoLink ensures fast metal deposition on ABS and ABS/PC blends with no need for electroless Ni or Cu plating and Ni or Cu strike. Furthermore, the low palladium formulation (50 – 70 ppm) of NeoLink Activator allows for minimized drag-out costs.

Unlike conventional plating systems, usually removing tin and tin chloride after activation in the accelerator step in order to expose palladium, NeoLink replaces tin with copper. As a result, copper links to palladium, providing a high and stable electrical conductivity that allows for direct copper plating. Easily integrated in existing lines, NeoLink immediately

Cu/Ni/Cr plated parts after NeoLink pretreatment.

improves productivity and the reliability of the production.

NeoLink meets the most demanding requirements of the automotive, sanitary, fashion and white goods industries worldwide.

With annual sales of €65 million, Atotech is one of the world's leading manufacturers of processes and equipment for the printed circuit board, IC-substrate and semiconductor industries (Electronics), as well as the decorative and functional surface finishing industries (General Metal Finishing).

For determining the thickness of decorative Cr/Ni/Cu platings on plastic substrates with a maximum overall coating thickness of approximately 30 m, this article has provided a solution. To measure thicker coatings, instruments employing the (destructive) coulometric method are also available as an alternative.

Technology for creating simulations of the plating process before it is applied is becoming very cost effective for the plating on plastics industry.

For direct plating on plastics, research and development is ongoing for quicker, cost effective solutions.

Editor's note: Companies mentioned in this article can be reached at:
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