BIP Auto Magazine article

Coventya published an exciting article in BIP Auto Magazine about the Trivalent Decorative Chrome deposits in the automotive Industry.

Bright and attractive, decorative chrome on grills, bumpers, logos and trim have a long and positive association with the automobile. The success of decorative chrome is a direct result of its deceptively beautiful finish which often belies its durability. With only a very thin film (0.1 – 0.8 μm), chrome provides excellent corrosion and abrasion resistance as well as resistance to tarnishing.

Chrome deposits are not stand alone finishes and are usually applied as part of a layer system. Typically plated over a bright nickel or in some cases, multiple layers of nickel, decorative chrome can be applied on top of steel, aluminium, copper alloy, zinc die cast and most notably, a variety of plastic materials.

In addition to the automotive industry, decorative chrome deposits are widely used on sanitary fittings such as shower heads and water faucets as well as consumer items such as fragrance packaging, home appliances and personal items like belt buckles and luggage.

Although the electroplated chrome deposit is completely non toxic and safe for consumers, the hexavalent chrome chemicals used to create the deposit are very dangerous. Hexavalent (Cr^{VI}) chromium compounds are very toxic and are classified as CMR compounds; (carcinogenic, mutagenic, repro-toxic). On April 17, 2013 the **European Chemicals Agency** (ECHA) published an updated version of the **Annex XIV** that includes chromium trioxide and other Cr^{VI} compounds. Cr^{VI} is now subject to authorization under **REACH** legislation and the date where its use is banned (the “Sunset date”) for chromium trioxide has been set as September 21, 2017. The latest date to apply for an authorization (which allows continued use for rare instances) is March 21, 2016. After the “Sunset date” it will be impossible to use chromium trioxide without authorization.

The **COVENTYA Group** has long considered new environmental regulations as opportunities to elevate technology rather than difficult business barriers to overcome. Several years ago, when the possibility of restrictive measures on Cr^{VI} first appeared on the horizon, the **COVENTYA Group** launched an extensive R&D project to develop a commercially viable, Cr^{VI} free chrome process for decorative applications.

In 2005 the **COVENTYA Group** was pleased to introduce an environmentally friendly decorative chrome process based upon trivalent chromium (Cr^{III}.). Since its release, **TRISTAR 300** has been widely accepted as an innovative yet reliable alternative to Cr^{VI} chromium based electrolytes for decorative applications.

The following chart illustrates the differences between a process based on Cr^{VI} and Cr^{III} technology, **COVENTYA TRISTAR 300**.

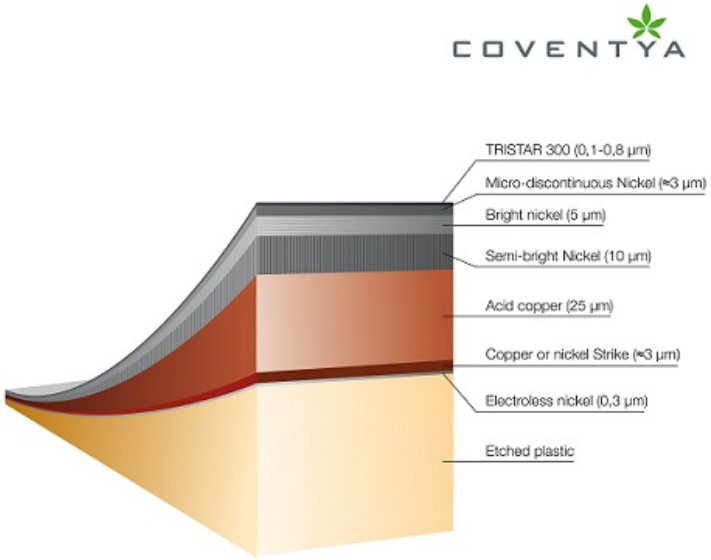
Parameter	**Hexavalent Chromium (Cr^{VI})** **Chrome 200**	**Trivalent Chromium (Cr^{III})** **TRISTAR 300**
Chrome (g/L)	200 g/L	20 g/L
Temperature (°C)	25°-35°C	30°-35°C
Cathode current density (A/dm²)	6-12 A/dm²	8-12 A/dm²
pH	< 1	2.5 – 3.0
Deposition speed (μm/min.)	0.03 - 0.05	0.07 - 0.12
Anodes	Insoluble Pb/Sn or Pb/Sb	Insoluble graphite
Filtration	Not necessary	Necessary
Agitation	Not necessary	Air
Color (cielab)	L : 85 a* : -1 b* : -1.1	L : 78 a* : 0.02 b* : 0.8

As mentioned in the chart, chrome deposits, including **TRISTAR 300** deposits, are applied on top of and in combination with multiple layers of nickel. By developing favourable galvanic interactions through the use of semi-bright, bright and microporous or microcracked nickel deposits **TRISTAR 300**, is able to pass the “Russian mud” test which simulates the exposed exterior plated parts to $CaCl_2$ instead of NaCl as winter de-icing salts. This environment has proven to be very difficult for hexavalent chrome deposits which currently cannot fulfil all of the specifications of the automotive industry.

Often it is difficult to pass corrosion tests, especially on parts with wide current density distribution due to complex geometry. **TRISTAR 300** not only passes the Russian Mud test but also passes 48 hours of CASS test (Copper Accelerated Acetic Acid Salt Spray) without any chrome VI based post-passivation and even after a thermal cycle according to the PSA standard B154140.

The COVENTYA Group is dedicated to develop new products and will soon introduce a very exciting layer system that has the potential to push the corrosion protection even further.

The image below depicts the typical layering sequence required for **TRISTAR 300** on a plastic substrate.



There are some in the industry that feel decorative chrome electroplating is facing extinction and the best course of action is a complete shift away from plating altogether. This approach appears nearly impossible as the likelihood of finding a coating that delivers both the beauty and durability of chrome is very small.

The **COVENTYA Group**, on the other hand, understands the foothold this technology holds and the prominent place it has in our world. Our customers and valued OEM partners rely heavily upon this technology and before simply watching it fade away on the sunset date we would work hard to extend the horizon for many more years.

Based upon the market feedback of our **TRISTAR 300** system, it has become clear that our efforts have resulted in a viable, and eco-responsible deposit that can withstand a corrosive world and look great doing it.

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