

# Finding a Replacement for Hard Chrome Plating

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## Major automotive, pumps and food processing equipment makers can't be wrong in choosing an alternative for hard chrome plating.

With more than 20% of the turnover coming from hard chrome replacement projects, **Expanite**, the Danish pioneer within surface hardening of stainless steel, is on its way to position itself as one of the most used alternatives for hard chrome plating.

Finding a replacement for hard chrome plating can be challenging, and with EU regulations lowering the limit value for hexavalent chromium, the industrial markets need to find alternatives. Hard chrome plating, in various forms, has been one of “the standards” to improve resistance towards wear and corrosion for stainless steel components. And as new solutions are required, Expanite’s hardening technologies have documented their effectiveness within the automotive, pumps, valves and food processing equipment markets.

### Sustainable Solutions, Diffusion vs. Coatings

Unlike a hard chrome coating, where the electrolyte used during processing may contain hexavalent chromium ions ( $\text{Cr}^{6+}$ ), which are hazardous to human health and environmentally harmful, the Expanite treatments involves only nitrogen and carbon atoms. This makes Expanite an environmentally friendly and sustainable process.

Expanite effectively removes the native oxide film covering stainless steels during the first steps of the gas process without adding any aggressive chemicals, and this allows controlled diffusion of carbon and nitrogen atoms in the underlying steel, thereafter.

### Nitrogen/Carbon Diffusion Replacing Hard Chrome Plating

“More than 20% of the parts we are processing today with the Expanite process are replacements for hard chrome plating,” says **Thomas Abel Sandholdt**, CEO at Expanite.

Whether it’s the valve parts of a fuel injector within automotive, a bushing for marine engines or the rotor for a large pump, they have all experienced the benefits of choosing a diffusion process with no risk of coatings cracking or inhomogeneous hardening zones. And along with that comes the compliance with the EU *Reach* program on reduction of  $\text{Cr}^{6+}$  as well as the fundamental decision to move towards more sustainable solutions.

Commenting about replacing hard chrome with Expanite, Sandholdt highlights opportunities in the automotive industry with valve components.

“Independently of each other, three major suppliers to the automotive industry approached Expanite,” says Sandholdt. “They all produce fuel injectors with valve components in ferritic stainless steel, which traditionally were hard chromed

plated. All three were facing issues such as wear, general quality problems and high cost. And they all found various solutions within the Expanite toolbox. The first of the three projects went into serial production in January 2020, while the two other projects are scheduled to begin serial production in 2021 and 2022.

“As we are often our customers’ biggest secret, many will not allow us to reveal that we actually have helped them change from hard chrome plating.”

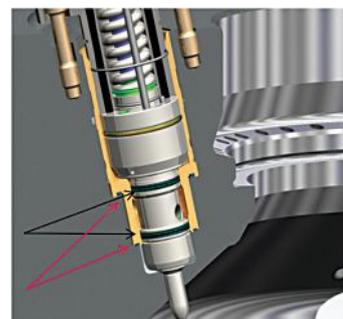
### Competitive Cost

From the first look, Expanite hardening technology might seem costly compared to hard chromium plating. However, Sandholdt says that he is convinced the price difference will equalize, once total life cycle cost and performance are taken into account.

According to Sandholdt, “The proof lies in the decisions made by so many of Expanite’s customers.”

www.expanite.com

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### Company Profile:

*Expanite was founded in 2010 by leading experts in materials and surface hardening technology. The company is headquartered in Hillerød, Denmark, near Copenhagen, and has treatment centers that are located in the USA, Germany, Korea and China.*



*Expanite’s surface hardening solutions are applicable to all stainless steel types and can be tailored into a customer’s own product line as part of a licensing agreement. [www.expanite.com](http://www.expanite.com)*

# Surface Hardening Specialist Helps Students Solve Wear Problems on Titanium Race Car Parts

Mia Grundtvig, MarCom Manager at Expanite A/S, Hillerød, Denmark, shares that Expanite has consulted and advised the students at the **Rennteam Uni Stuttgart** in identifying and solving some of their challenges with wear on the titanium parts in their racing car.

## Student Design Competition

The Rennteam Uni Stuttgart takes part in the Formula Student racing series, a competition for young engineers across Europe as well as involvement in other international competitions. Formula Student is an international design competition for students in which teams from around the world construct a single-seated formula vehicle and produce a ready-to-drive prototype, assuming a fictitious design assignment.

The young constructors of the Rennteam Uni Stuttgart are constantly striving to optimize the construction process including the use of materials, and spend almost all of their time in constructing and testing the cars to prepare for competitions.

## Challenging the Weight

To increase the racing vehicle's performance, which includes lowering the weight of the race car, the Rennteam students changed some of the car's parts to titanium. However, the students were then faced with problems related to parts wear due to low surface hardness.

The students decided to contact surface hardening specialist Expanite for possible solutions.

## The Successful Solution

The material experts at Expanite A/S proposed the surface hardening of the critical titanium parts including parts of the power train positioned between the differential and the drive shaft. This surface hardening was accomplished through the use of the company's ExpaniteHard-Ti process.

ExpaniteHard-Ti hardening technology makes the use of light-weight titanium parts possible, therefore resulting in increased efficiency and significant weight reduction for the Rennteam race car.

ExpaniteHard-Ti is a gas-based interstitial hardening process that leaves no coating on the surface and therefore nothing that can spall off.

The actual hardening zone can be tailored to have a case depth of from 10 to 50  $\mu\text{m}$ , and surfaces can be post-polished to a mirror finish.

Through application of the ExpaniteHard-Ti process, the surface hardness can be increased 8 to 10 times to approximately 1000 HV.

## Students Thankful for Support/Guidance

"We are thrilled and appreciative about the support that we have received from the Expanite expert team. With the guidance and recommendations obtained from Expanite A/S, we are convinced that through the utilization of the Expanite hardening technology, we will experience less or no wear on the titanium parts incorporated in our race cars," commented **Ignacio Gabilondo** from the Rennteam Uni Stuttgart.

Expanite is based upon research carried out since the year 2000 and was founded in 2010 by leading experts in materials and surface hardening. The company is headquartered in Hillerød near Copenhagen and has treatment centers in the USA, Germany, Korea and Chi-

na. Expanite A/S' solutions are flexible and can be tailored into a customer's own product line as part of a licensing agreement.

Rennteam Uni Stuttgart was originally established in 2005. The team is composed of highly motivated students from a broad range of fields taking part in the Formula Student racing series, which is a competition for young engineers, all across Europe, along with being involved in other international competitions.

Interested readers can find that additional technical information and specifications about ExpaniteHard-Ti hardening technology is available at the Expanite A/S website.

[www.expanite.com](http://www.expanite.com)

[www.rennteam-stuttgart.de](http://www.rennteam-stuttgart.de)

