

# THE DRIVE OFF ROAD NEWSLETTER



TOPIC

**THE FIRST REACH COMPLIANT  
PLATING ON PLASTIC FACILITY IN EUROPE!**

# IT IS NOT ONLY ABOUT REACH!



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## 1 INTRODUCTION

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The Global Metal Finishing Industry has been aware of hazards of working with CrVI, not only for environmental reasons but also for the health of people who work closely with the suspect technologies. Due to REACH initiatives as well as progressive companies desire to become green, there is an urgent challenge for specialty chemical suppliers to eliminate this dangerous substance. COVENTYA is one such company.

A number of years ago, COVENTYA initiated a long term R&D project focused on the removal of CrVI products used in the metallization of plastic parts for OEM automotive applications.

- The first project involved the development of innovative Trivalent Chromium processes resulting in a broad product range of TRISTAR technologies. These technologies have been available in the industry for over five years with remarkable success replacing CrVI by CrIII for decorative finishing.
- The second project is the development of a Chrome Free Etching technology that resulted in a new range of products called SILKEN BOND.

SYNCOTECH, former Wafa Spain, is a company located in Barcelona (Spain) dedicated, among other business, to the plating of plastic parts with a commitment to workplace safety and environmental sustainability. Over the last five years, SYNCOTECH has industrialized, with great results, the COVENTYA range of TRISTAR processes replacing CrVI by CrIII in the back end of its decorative finishing process.

In 2017, as a result of the success obtained with decorative trivalent chromium, SYNCOTECH and COVENTYA collaborated on a project for the industrialization of Chrome Free Etching technology (SILKEN BOND).

Today we can confirm that the project is a great success and is the first REACH compliant plating line for plastic in Europe that is free of Cr VI.

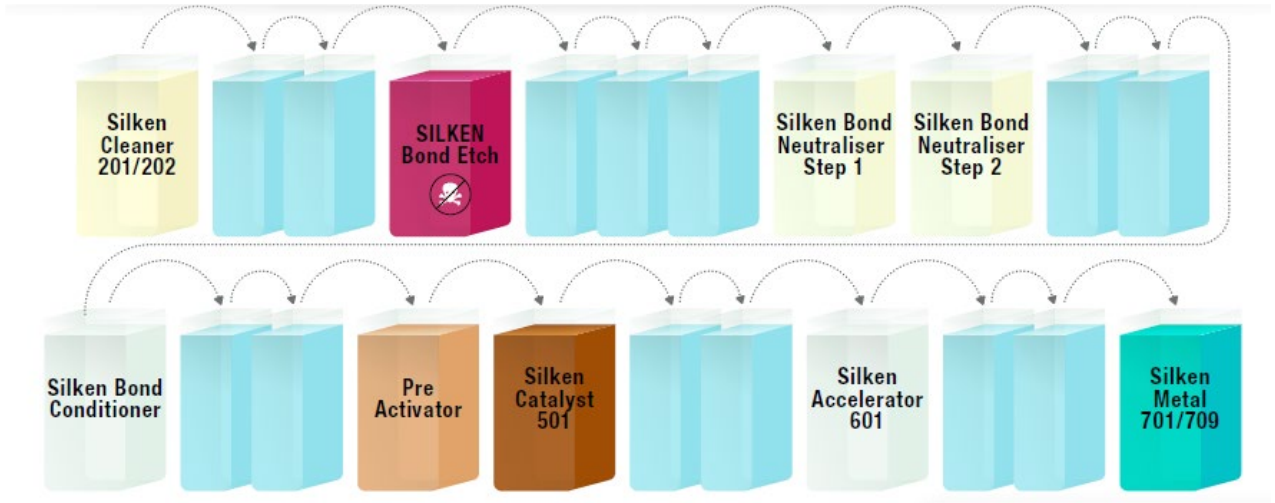
During the one year partnership, there has been a focus on important targets to assure success. The Chrome Free Etch technology had to have a long life and provide stable performance as well as operating parameters such as time and temperature comparable to conventional chromic acid based etch.

In addition, it was critical that SILKEN BOND was successful on both ABS and ABS/PC with the low concentration chemistry advantage of the SILKEN BOND process. Finally, the process had to be easy to maintain and simple to analyze the process components.

Two main issues common with Chrome Free Etch technologies have been overcome during the one year partnership. First, the development of an additive step, which prevents the metallization of the racks and second, the successful implementation of an oxidation cell into the SILKEN BOND ETCH chemistry which enables a stable and a long life etch process.

As a follow-up to the success at SYNCOTECH, an update to the status of the SILKEN BOND process is provided.

## 2 PROCESS SEQUENCE



Picture 1: The COVENTYA process developed at SYNCOTECH can be integrated with a reasonable effort in an existing plating line.

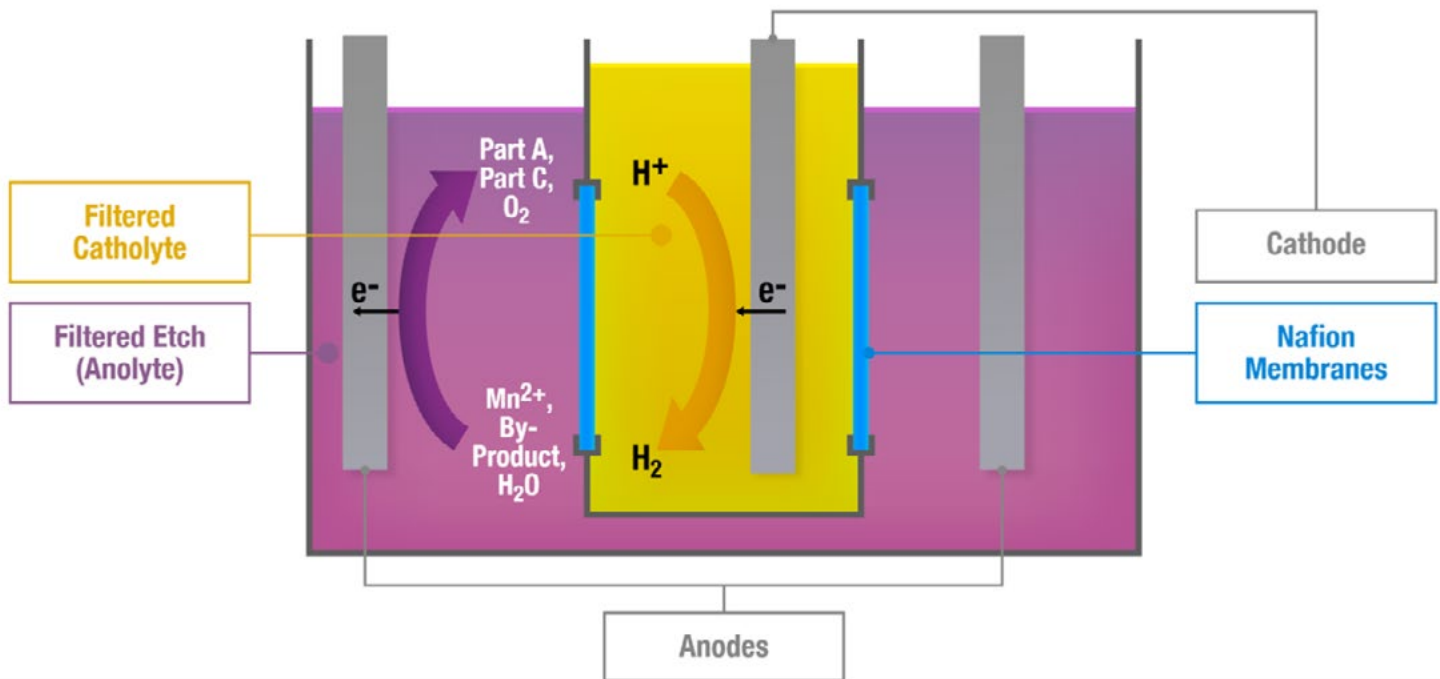
With the SILKEN Bond process there are 22 total steps including 9 process and 13 rinsing steps. As for conventional chromic acid prep, there are 19 total steps with 7 process and 12 rinsing steps.

Additional development to incorporate the SILKEN BOND conditioner into the SILKEN Bond neutraliser steps will decrease the total process steps making for easy integration into existing plating line layouts.

## OXIDATION CELL

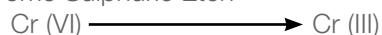
As already described, the SILKEN BOND process requires the use of an oxidation cell in the SILKEN BOND ETCH, which generates a stable process and a long life system. The usage of an oxidation cell offers many advantages for the SILKEN BOND process. The technology operates with a very low concentration of permanganate, 0.3 g/l, nearly 10 times less than competitive technologies.

The following is a schematic of the oxidation cell that illustrates the basic concept and reactions controlled to make the technology stable over long periods.



During etching, the butadiene will be oxidized out of the plastic surface. With conventional etchants and SILKEN BOND there are breakdown products associated with both processes.

1. Chrome Sulphuric Etch



**This reaction happens only during the etching of the plastic surface.**

The use of porous pot (oxamat) unit keeps the Cr (III) at controllable concentrations.

2. SILKEN BOND ETCH



**This reaction occurs constantly, even during idle production periods.**

The additive C stabilizes the system, but also creates a by product which is controlled by the oxidation unit. **The oxidation unit must run at all times.**

## 4 RACK PLATING

To date, the greatest challenge the SYNCOTECH and COVENTYA Spain team faced was to eliminate rack plating (metallization). In the conventional pre plate process, hexavalent chrome from the etch poisons the PVC rack coating and therefore the palladium absorption into the rack coating is prevented. In a Chrome Free Etch technology, this poisoning is not possible so alternative

ways to avoid rack plating potential is required. COVENTYA has developed a way to balance the system and thus, avoid this tendency and occurrence.

A newly developed additive in one of the process steps protects the rack coating and prevents rack metallization.



Picture 2: rack without newly developed additive



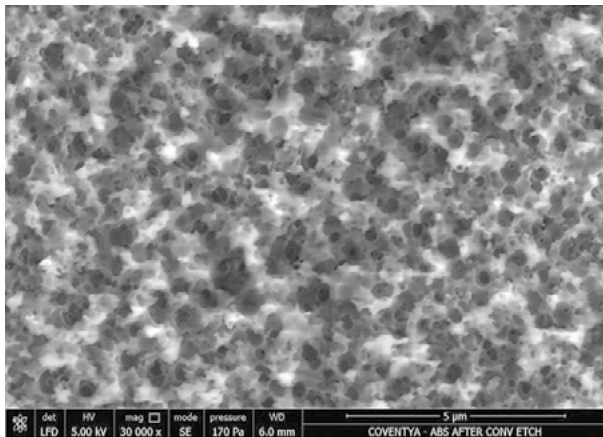
Picture 3: rack with newly developed additive SILKEN BOND PROTECT

## 5 ADHESION

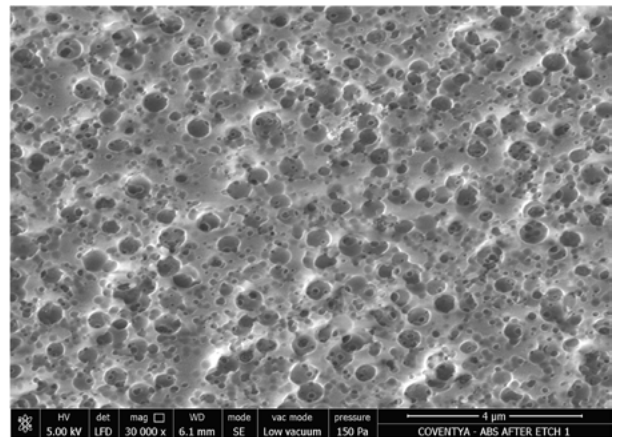
All automotive OEM's have traditionally implemented a thermal shock test and/or a peeling test value in their specifications for characterizing the effectiveness of the plating process. The traditional hexavalent chromium etch system has historically performed well in passing these tests. With the SILKEN BOND process, the surface demonstrates a smoother finish after the SILKEN BOND ETCH even though the adhesion values

obtained are on the same level when compared to a conventional pre plate process. The graphs below illustrate adhesion values of 14.6 – 17.2 N/cm for ABS and 7.2 – 8.0 N/cm for PC/ABS. The SILKEN BOND process has passed several thermal shock tests from different OEM's and industry segments. Below an SEM comparison of an ABS part with chrome sulphuric and etched with SILKEN BOND.



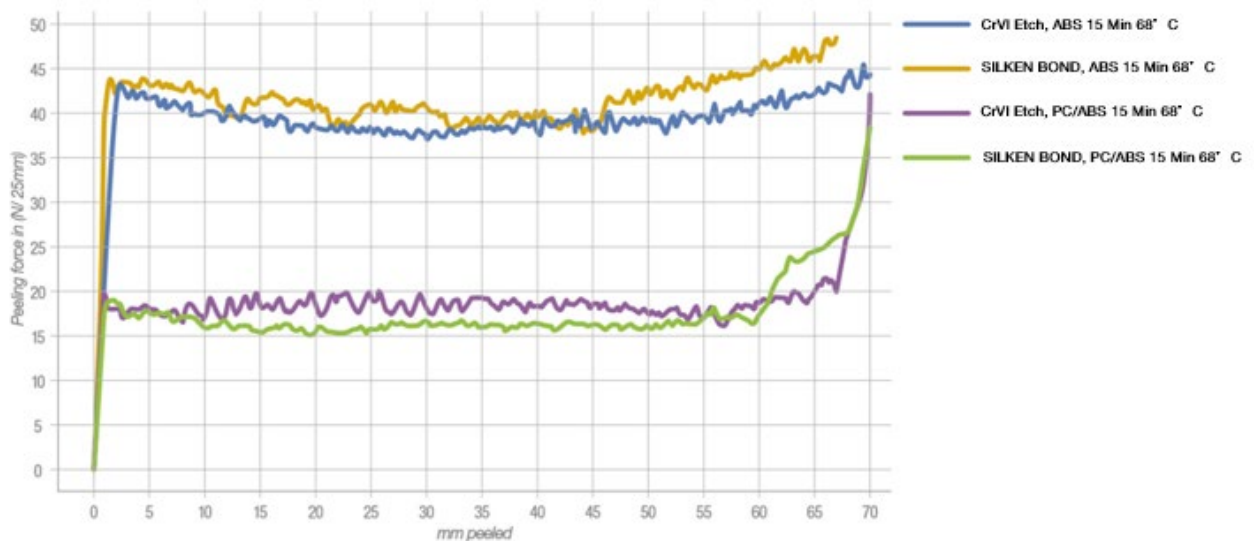


Picture 4: ABS, 9 min Cr/H2SO4 etch



Picture 5: ABS, 9 min SILKEN BOND

The comparison of peeling test values are summarized below. Peeling test at 90° followed ASTM B533-85 (2013). The peeling strength highlights the adhesion of the metallic layer in a plastic surface. Parts are 2.5 cm wide and measurements were performed in OEM labs



As a result of the SYNCOTECH and COVENTYA partnership, the SILKEN BOND process has successfully addressed the following targets:

- Function of the oxidation cell
- Elimination of rack plating
- Adhesion
- Understanding critical process steps to plate Bi-Injected parts
- Parameters for all necessary process steps
- Long life cycles of each process step
- Positive yield comparison

Due to this successful partnership,

- The SILKEN BOND process is ready for the next step.
- THE SILKEN BOND process is state of the art and can be integrated with minimal effort into existing plating lines.
- Adhesion values are similar to parts processed with conventional chrome sulphuric etch.
- The tendency for rack plating has been eliminated
- The process operates with the lowest amount of permanganate (0.3 g/l) compared to other chrome free etch technologies in the market today.

**The Future is Now** for the Plating on Plastic industry with respect to gaining a **REACH Compliant Process Line**. Pursuit of workplace safety and environmental sustainability has delivered very positive results for both companies. Our collective efforts have proven to the European Automotive Industry that with true leadership, innovation can overcome the obstacles our industry will face in the future. The first, high volume, CrVI free production line in Europe confirms the reality.

**It is not only about REACH!**



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