

# Cr6+ Inhibition Way Forward for Sustainable Leather

By Tata International | Category: Implemented Innovations

Leather tanning requires basic Chromium Sulphate which contains Cr3+ (not harmful). Crafting operation of tanned skin to leather may convert Cr3+ to Cr6+ (harmful). Compliance limit for Cr6+ in finished product is below 3 ppm, sometimes unavoidable to maintain due to process limitations and even after use of commercially available inhibitors, resulting in complaints - e.g., complaint from Osco Industries, Vietnam. Root cause analysis was done and it was found that 2% of our finished leather crosses Cr6+ limit i.e., in the range of 3-10 ppm. A team from Tata International developed a unique chemical combination which acts as a reducing, stabilizing and chelating agent that eliminate Cr6+ formation completely in the finished product.



## The Context

Approximately, 2% of finished leather contains Cr6+ in the range 3 to 10 ppm which is carcinogenic and harmful. Customer limit of Cr6+ in finished leather is not more than 3 ppm, resulting in customer complaint and claim. One such complaint was received from OSCO, where the Vietnam customer received a claim of USD 4000. Customer specified requirement in specific products cannot be achieved without Basic Chromium Sulphate.

This triggered the need to use a strong reducing agent, which will not allow the conversion of Cr3+ to Cr6+. The team developed a combination, which is a reducing, stabilizing-cum-reducing agent (available in-house, based on patented technology) and a chelating agent.



## The Innovation

Leather processing uses Basic Chromium Sulphate (BCS) which contains Chromium in trivalent form (Cr3+). Cr3+ is not reported harmful for plant and human beings, hence 90% of global leather production uses BCS to achieve hydrothermal stability, grain tightness, light weight leather and skin preservation. Stringent test conditions are suggested by customers for Cr6+ detection i.e., 80° C temperature (less than 5% RH) and in the presence of Xenon UV lamp. The risk of customer complaint and claim is high when the finished leather crosses the Cr6+ limit. R&D team developed an innovative combination of reducing, chelating, and stabilizing-cum-reducing agent (available in-house, based on patented technology), thus completely inhibiting oxidation of Cr3+ to Cr6+. The innovative combination is water soluble, and hence can be used at wet end. The innovative combination was implemented in pilot and bulk recipes after successful trials where Cr6+ was not detected. Absence of Cr6+ in finished leather has advantages of product safety for human application, and sustainable leather and product manufacturing.



## Overcoming Challenges

### Challenge #1

The team used all 3 products separately after literature, internet search and application trials. Results were found encouraging in all 3 cases but Cr6+ formation could not be eliminated completely. Trial pieces tested at NABL accredited laboratories, showed that in some cases Cr6+ was totally eliminated, but not 100%.

### Challenge #2

Some other reducing agent claimed in available patents / papers like Butylated Hydroxy Toluene (BHT) and Butylated Hydroxy Anisole (BAT) was also tried for Cr6+ inhibition but BHT / BAT is insoluble in water and are banned chemicals for application. They were hence not used.

## Impact of the Innovation

increase in revenue by  
**₹3 lakhs**