

CO₂-intensified tanning - from first ideas to industrial application

Eckhard Weidner^{1,2}, Philipp Widmer³, Manfred Renner², Helmut Geihlsler²

¹ Ruhr University Bochum, ² Fraunhofer UMSICHT, Oberhausen, Germany,

³ ECO2, Taverne, Switzerland

Eckhard.weidner@umsicht.fraunhofer.de; pwidmer@eco2.ch

Derived from an inquiry from industry for defatting leather via extraction with supercritical CO₂ first ideas on tanning leather in the presence of pressurized CO₂ were generated and tested in lab-scale in the early 1990s. Shortening of the tanning time and a considerable reduction of wastewater were key elements of a first patent, which was commercially not successful due to high investment costs. To unravel the physico-chemical principles a larger research program started around 2004. It was found that pressurized CO₂ modifies the pH-value of the tanning solution in a way to rapidly form complexes of chromium sulfate which then react with collagen in hides. Pressure could be reduced below 100 bar and a tanning process free of chromium-polluted wastewater was demonstrated in small pilot scale (20 l bin). The next technology readiness level (TRL) was reached in a tanning bin with 1700 l, allowing to tan up to ten beef hides. Excellent leather quality could be reached at pressures between 30 and 60 bar.



Key elements of the R&D-procedure at different technology readiness levels will be highlighted in a tandem lecture (industry-academia) and an advanced concept for CO₂-intensified industrial tanning will be visualized. With the new process 2 – 3 classical tanning bins are substituted by 1 bin operated at moderately elevated pressure. Resulting from high efficiency, operating costs are considerably reduced (less chromium, no wastewater containing chromium, less salt) with a return on investment of less than 2 years.

Prokein M, Renner M, Weidner E, Heinen T, Low-chromium- and low-sulphate emission leather tanning intensified by compressed carbon dioxide, Clean Technologies and Environmental Policy, 10/2017, 19(4) DOI10.1007/s10098-017-1442-x