**RECYCLING AND REUSE OF CHROMIUM SOLUTIONS**

<table>
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<tr>
<th>Process step</th>
<th>Beamhouse, Tanyard</th>
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<td>Description</td>
<td>Exhausted tanning floats are reused at either the pickling or tanning steps.</td>
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**Technical description**

There are two options for the recycling of exhausted tanning liquors.

1. Recycle the tanning liquors to the pickling process if tanning is executed in the pickle float, the exhausted tanning bath can only partly be recycled into the next batch of pickle liquor. For recycling into the pickling float the liquor is passed through a nylon screen and, after 24 hours, passed to a tank where it is mixed with the pickle acid. The hides are drummed in a brine solution, and then the pickle/chrome liquor is added. After the standard pickling time, the fresh chromium input is added.

2. Recycling the tanning liquors to the tanning process: If the liquors are recycled to tannage, hides are taken out of the drums at the end of the process, allowing about 60% of the float to be recovered. In the tanning operation, fresh chromium powder is added to the drained pickled pelts (which carry about 20% residual float) and then the recycled liquor is added. In both cases some changes to the tanning process might be necessary, such as reducing the amount of masking agents and salts added.

For both options a holding tank and a screening of the solutions are required. Recycling up to 10 times before discharge is possible. Chromium liquor builds up volume (instead of discharging to the environment). Process control and monitoring are necessary for calculating and adjusting float strength (salt content, pH, etc.) and for checking impurities.

**Achieved environmental benefits**

The efficiency of the recycling is dependent on the efficiency of the tanning process itself.

1. Recycling the tanning liquors to the pickling process. On average, 50% of the tanning float (but not the drainage water and the water from samming) can be recycled, which is equivalent to up to 20% of the fresh chromium input. Salt carried over in the spent tanning liquor allows for a reduction of 40% in the salt added to the brine solution. Chromium discharge in the effluent can be reduced by 50% (reduction of 40-50% from 5.9 to 2.8-3.5 kg Cr per tonne of raw hide in the waste water).

2. Recycling the tanning liquors to the tanning process. The fresh chromium input can be reduced by 25% for bovine hides and up to 50% for sheepskins. Chromium discharge in the effluents can be reduced by 60%.
### Environmental performance and operational data

No operational information provided.

### Cross media effects

No information provided.

### Technical considerations relevant to applicability

No chromium-free pretanning option is possible. When there is a common chromium recycling unit that works well and takes up all the chromium liquors produced, recycling of the liquors may not be viable. Quality losses may occur. The colour of the wet blue may change and subsequently may have an impact on the dyeing operations and the quality of the final product. Impurities (protein, grease) and surfactant, masking agents and other process chemicals may build up.

Careful monitoring and control are needed to limit this build-up to acceptable levels. The techniques are simple to apply, flexible, and applicable to most leather types. However, they have not been widely adopted in European tanneries due to fears about the resulting quality of the leather. In addition, there seems to be a preference to increase the exhaustion of the chrome-tanning process, rather than to recycle the exhausted liquor due to quality reasons.

Recycling the tanning liquors to the pickling process can be applied to processes where pickling and tanning are carried out in the same float. Where the exhaustion of the chrome tanning is in excess of 80%, direct recycling of the exhausted chromium liquor may not be economically feasible. The technique can be applied to both new and existing plants.

One limitation for the recycling and reuse of chromium solutions is that the volume that can be recycled is quite low since only main tanning floats can be recycled. However, chromium will also be discharged through washing baths and liquid expressed during the samming of the leather. This is one of the reasons why installations that previously used recycling of chromium solutions moved to chromium recovery through precipitation and subsequent reuse of re-dissolved chromium.

### Economics

Running and capital costs are low, although the introduction of the technique requires at least a holding tank and a screen. Economic feasibility will depend on the exhaustion rate of the chrome tannage and the quantity of the chromium liquors generated. In general, the lower the exhaustion rate and the higher the volume of the floats, the higher the economic feasibility is.

Furthermore, the final quality of the product will have a high impact on the sustainability of the technique.

### Driving force for implementation

The main driving force is the wish to reduce the chemical consumption and the discharge of chromium into the effluent. However, the use of the techniques has not been widespread in Europe due to quality reasons and the limited environmental effect compared to chromium recovery through precipitation and separation.
| Example plants | This option has been implemented in some tanneries in Australia and North America. This technique was used in Germany for the production of lower quality leather, but is no longer used. |
| Source         | JOINT RESEARCH CENTRE. Best Available Techniques Reference Document for the Tanning of Hides and Skin. 2013 |
| Key words      | Chromium, industrial effluents, process water, reuse of materials, water reuse |