



Observations: the suppression of swelling in acid-pickle using alternative salts to common salt

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Preliminary investigations have taken place into the possibility of replacing common salt for the suppression of swelling in the pickling process with alternative salts. The objective of this investigation is to minimise the sodium chloride content in tannery wastewaters, so that secondary uses such as land irrigation may become possible.

Using a conventional beamhouse process, cattle hide was prepared for the pickling stage. Pieces 10cm x 10cm were cut and placed into containers for consequent pickling. A control using sodium chloride (NaCl) was run as a comparative standard. Other pickling salts used included magnesium sulfate (MgSO_4), potassium chloride (KCl), ammonium sulfate ($(\text{NH}_4)_2\text{SO}_4$), potassium phosphate (K_3PO_4) and sodium sulfate (Na_2SO_4).

In the first trials the salt concentration was based on the standard Baumé value, 6°. This included a negative control containing no pickle salt to give an indication of the hardness and the degree of swelling that an unprotected pelt would experience. Acid was added at 7.5g/l sulfuric acid and 10g/l and diluted 1:10. The pickle solution was shaken for two hours and the changes measured.

Swelling was recorded as the change in mass over time and as the change in thickness. To ensure the thickness was measured in the same place a mark indicating where the measurement was to take place, was placed on the pelt. As thickness proved to be an unreliable indicator, only the weight observations on the swelling behaviour of delimed/bated pelt were monitored. These findings are presented as *Panel 1*.

This shows that all of the salts used within this investigation can sufficiently protect the pickled pelt from the harmful effects

of acid swelling. Nevertheless, there were differences in pelt hardness, and although they did not increase weight they felt similar to the negative control. Notable examples of this included the ammonium and magnesium salt.

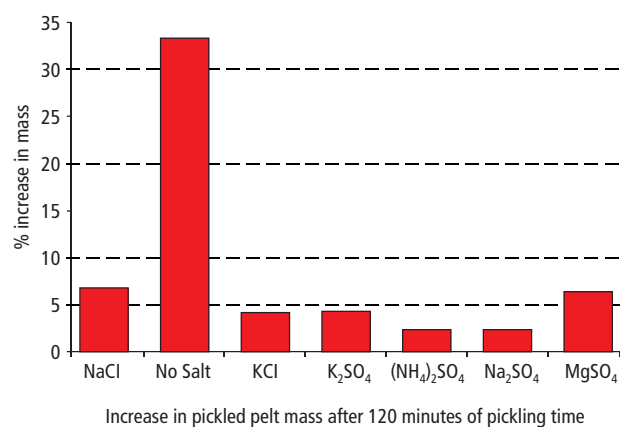
In the next experiment the concentration of the salts was adjusted to 50g/l. This was considered to be the optimum concentration to protect the pelt from an ionic strength perspective. These findings can be compared with the findings given in *Panel 1* where the salt concentration (g/l) required to achieve a specific density (6°Be) differed according to the composition of each salt.

This illustrates that in this situation MgSO_4 , KCl and K_2SO_4 reduced the swelling more than the NaCl control. However, the MgSO_4 pelt was glassy and similar in feel to the corresponding sample in the first investigation. There is, however, a broad level of similarity in the outcome from the two different investigations.

In practice, it is often hard to predict the amount of water in the drum, and tanners also tend to be cautious. For this reason the salt and acid concentration in common use can be highly variable. Nevertheless, the salt concentrations used in these preliminary investigations can be directly related to conditions found in manufacture.

These investigations show that acid swelling in pickle can be suppressed by salts other than sodium chloride. Optimisation studies regarding the equivalent concentrations to match values obtained by common salt need to be performed, but there are indications that alternatives to common salt can be used to suppress swelling within acid-pickle systems.

Panel 1: The swelling of pelt in the pickling process using various salts. Concentration 6°Be



Panel 2: The swelling of pelt in the pickling process using various salts. Concentration 50g/l

