



IUE 3 – Total Dissolved Solids in Tannery Effluent

2018 updated document

At present most raw hides and skins are preserved through a salting process, using 30% to 50% of common salt on the weight of raw hide/skin.

Total dissolved solids (TDS or neutral electrolyte) has become a major problem in many countries. For example, some have set up regulations to limit the concentration of salts in effluents after waste water treatment; such as South Africa (1350 mg/l of TDS), Italy (1200 mg/l of chloride, 1000 mg/l of sulfate), India (2100 mg/l of TDS, 1000 mg/l of chloride, 1000 mg/l of sulfate). These limits apply for effluent from all industries, not just the leather industry.

In many cases these limits are difficult to achieve:

- TDS concentration is not reduced by conventional waste water treatments.
- Natural drying as a preservation method is limited to warm countries, where salting and energy are more expensive.
- Fresh processing of hides and skins needs a source of raw material that is constant in quality and quantity.
- Chilling hides or skins is feasible in many countries.
- Other preservative chemicals are suitable for short term preservation, but are not yet adapted for the long term.
- Some sodium chloride is necessary for pickling procedures before tanning.
- During leather production, various inorganic chemicals are added (for example, delimiting may be conducted with ammonium chloride, chrome tanning salt typically contains 50% sodium sulfate, dyes may be diluted with electrolyte). These chemicals are routinely used and their replacement may not be simple.

Consideration must be given not only to the TDS concentration in the mixed effluent, but also to reducing the total TDS per kg of hides/skins processed.

Trimming and, where possible, pre-fleshing are recommended to reduce the amount of salt added for preservation.

Beside alternative preservation methods, there are a few established technologies to reduce TDS:

- Mechanical or manual removal of salt from hides and skins before soaking
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- Organic acids compounds or CO₂ deliming instead of ammonium salts.
- Direct recycling of the pickling float.
- Direct recycling of tanning floats.
- Recycling of supernatant from chrome recovery.
- Use of liquid dyes and syntans, etc.
- Use of short float with reduced load of chemicals

TDS up to 20,000 mg/l and chlorides up to 10,000 mg/l do not substantially decrease the efficiency of biological treatment of tannery effluents.

High levels of TDS and sodium chloride are typically present in tannery effluent. The TDS concentration can reach 7,000 mg/l and in some cases more than 15,000 mg/l. The less water is used for leather production, the higher the TDS concentration.

Waste water treatment eliminates most of the suspended solids, large quantities of dissolved organic chemicals and ammoniacal nitrogen, but it has hardly any effect on TDS.

Current technologies under investigation to separate TDS in treated effluent are:

- Evaporation. This is used in some countries, achieved mostly by natural evaporation in lagoons, so the water cannot be reused. It requires a large area, taking into account typical average evaporation rates of not more than 5 mm per day in sunny conditions. This rate can be improved with technologies such as spraying. Multiple stages or vacuum flash evaporation cannot be considered economic.
- Reverse osmosis (RO). This technology is now being applied for tannery effluents to reduce TDS and recover quality water for re-use. It is a high-tech solution with relatively high investment and running costs. However it provides the possibility of recovering 70 - 80% of the initial float and TDS is reduced from the range of 8000 – 15000 mg/l to less than 500 mg/l. Proper tertiary treatment is necessary to achieve good results in RO treatment. The disposal of the remaining 20 - 30% of the initial float, containing high concentration of TDS (25 - 50 g/l), must be taken into account.

In either case, the TDS content is not actually treated or disposed of; it is merely separated from the rest of the effluent. The current disposal of waste neutral electrolyte remains a significant challenge for the global leather industry, particularly for those tanneries located in land-locked areas. The only sustainable solution is to eliminate it from preservation and processing as much as possible.