

Water mixing and measurement

If it isn't measured then it cannot be controlled

Introduction

In leather processing, water acts as a medium between the hides/skins and chemicals by (a) removing undesired materials from hides/skins and (b) facilitating the reaction between chemicals and hides/skins. Water consumption for tannery unit processes varies depending on the unit process, type of raw material, finished product, process vessels (drums/paddles), chemicals, availability of water, and legal restrictions.

In many tanneries (characterized by small- and medium-sized tanneries) the volume of water

used during the process is not measured but judged visually, though the chemicals and hides/skins are weighed. If the water is not measured, consumption is almost always higher than the volume actually required. The following table shows the average values, ranging from soaking to post-tanning in tanneries.

The running wash generally ranges from 30 to 120 minutes. Estimates indicate that water used during this wash is 12 to 15 m³/t of raw material, whereas the maximum water consumption in batch washing is only about 3 to 6 m³/t.

PROCESS STAGE	PROCESS VESSEL	FLOAT REQUIREMENT (AS PER RECIPE)	ACTUAL USAGE	EXCESS USE OVER SPECIFIED REQUIREMENT
Beamhouse	Paddles	150 to 200%	200 to 216%	+50 to +66%
Tanning	Drums	70 to 150%	120 to 200%	+50 to +130%
Post-tanning	Drums	100 to 150%	220 to 300%	+70 to +200%

Methods to measure water

WATER FLOW METERS: These meters are mechanical and based on the rotation of the turbine, which is rotated by the flow of water. Woltman type meters are preferred because of their longevity combined with the fact that the meters are dry and only the turbine runs in the wet chamber. A counter roller runs in the dry chamber and is magnetically coupled to the turbine. The counters are encapsulated, evacuated and protected against flooding. Water flow meters need a dirt box strainer to avoid frequent clogging.

ELECTROMAGNETIC FLOW METERS:

These meters operate based on Faraday's law of electromagnetic induction. When a magnetic field is applied to the metering tube, a potential difference proportional to the flow velocity perpendicular to the flux lines is generated. The potential difference is displayed as a flow. A solenoid valve controls the flow if a specific set volume is reached.

WATER METERS.



A comparison of various types of water flow measuring equipment is provided in the following table:

PARAMETER	WATER FLOW METER	ELECTROMAGNETIC FLOW METER	AUTOMATED WATER MIXING-CUM-ADDITION SYSTEM
Type	Mechanical	Electromagnetic	Electromagnetic, PLC controlled
Accuracy	Average	Very good	Very good
Possibility of manual error	Average	Average	Low
Ease of operation	Manual control is required	Easy	Very easy
Life	Less (strainers are required)	High	High
Investment (for a tannery with about 8 processing vessels)	Rs. 80,000	Rs. 300,000	Rs. 1,000,000 – 1,500,000

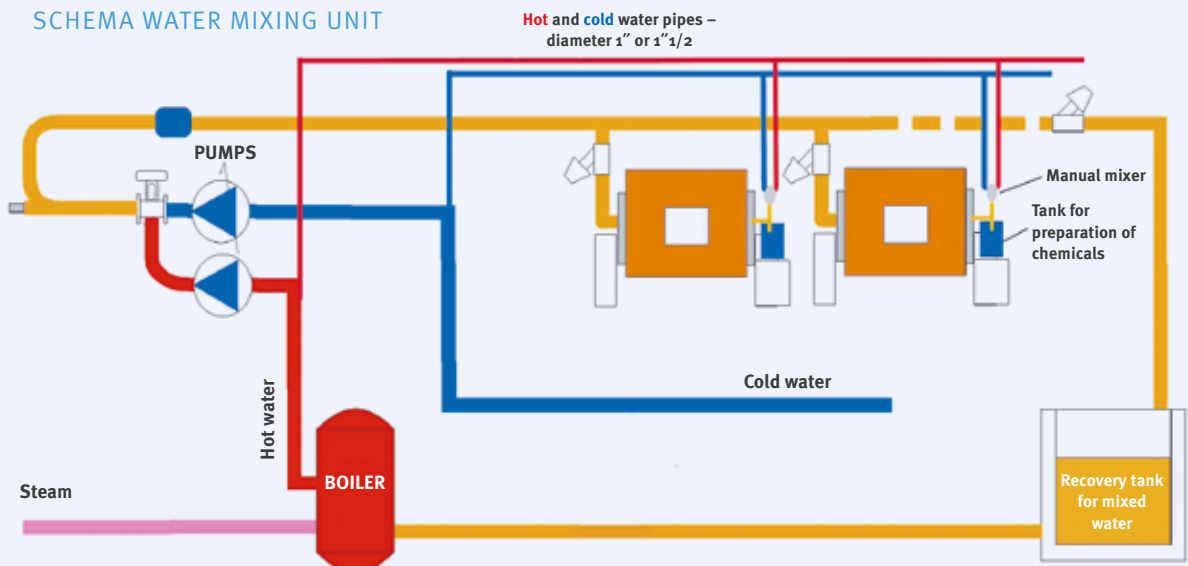
AUTOMATED WATER MIXING-CUM-ADDITION SYSTEMS:

Automatic water addition systems also work on the electromagnetic flow metering principle and a programmable logic controller (PLC) control. In addition, they operate hot and cold water pumps, thus making the water addition completely automatic. The valves in each process vessel are operated by a pneumatic control valve actuated by the PLC. In addition, the automatic water mixing-cum-addition systems provide water at a desired temperature. The waiting time is low as these systems have high flow rates, i.e., from 400 to 800 litres per minute, thus productivity is increased. The use of these automated water mixing systems resulted in 20 percent less water consumption.



AUTOMATED WATER MIXING-CUM-ADDITION SYSTEMS.

SCHEMA WATER MIXING UNIT



Methods to reduce water consumption

Water consumption can be reduced using the following methods:

- ❖ Use of drums for soaking/liming
- ❖ Recycling waste streams within the leather processing
 - › Counter current soaking;
 - › Recycling of lime liquor;
 - › Reuse of pelt wash liquors;
 - › Reuse of chrome liquors directly or by reusing the supernatant liquor from chrome recovery plants in pickling; and
 - › Combining rechroming and neutralization

When adopting a particular type of recycling, it is imperative to understand the process requirements and characteristics of waste streams. In addition, process control and monitoring are important until the process is standardized.

After adopting the most feasible methods for water measurement and recycling, it is possible to achieve between 20 to 22 m³/tonne of raw material from raw hides to finished leather. In terms of area of finished leather, it is possible to achieve 8 to 10 litres per square foot. However, there have been several cases in which the tanning industry has succeeded in consuming even lower amounts of water up to 12 m³/tonne of raw material.

Benefits of water measurement and conservation

While the measurement of water itself results in reduced water consumption, the following are the main advantages of adopting proper water management in tanneries:

- ❖ Reduced water consumption lowers the cost of effluent treatment, and improves the efficiency of treatment;

- ❖ Consistency in quality of leather made – batch to batch quality consistency;
- ❖ Reduction in quantity of chemicals, particularly post tanning chemicals; and
- ❖ Reduced exploitation of natural resource, i.e., ground water.



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