



Water management—driven by legislation

The concept of zero discharge for water

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In India there are more than 3,000 tanneries, with a total processing capacity of 700,000 tons of hides and skins per year. The water use is about 100,000m³/day, and it is possible to treat the resulting effluents to very high standards before discharge—with the exception of total dissolved solids (TDS).

The discharge of treated effluents to ground waters has resulted in a gradual rise in the TDS of water abstracted from bore wells. It is now common practice for tanners to purchase tanker loads of good quality water for use in retanning, dyeing, fatliquoring and finishing processes.

For discharge into inland surface water, treated effluents must meet the standards of BOD 30 mg/l, COD 250 mg/l, TDS 2100 mg/l, Chloride 1000 mg/l, Sulfides 2 mg/l, and Chromium 2 mg/l. However for marine discharge, the BOD level is set at 100 mg/l, with no limits for TDS and Chloride.

With typical TDS and Chloride values ranging between 9,000-18,000, and 5,000-8,000 respectively, there is a shift to relocating tanneries in clusters where marine discharge is possible. By the end of 2006, the Kolkata complex of 540 tanneries, supported by six effluent treatment plants capable of treating 30,000m³/day, will be fully operational, with discharge to the sea via a 30 km backwater channel.

Similarly, a major new complex for tanneries seeking relocation or expansion is due for completion by 2009. This is at

Nellore in the State of Andhra Pradesh, about 120 km north of Chennai, offering the advantages of marine discharge.

The Zero Discharge concept for water

Many tanneries cannot relocate without causing severe local job losses, and these face a new challenge. Following a recent High Court order, by March 2007 in the state of Tamil Nadu, industries such as Textile, Dye and Tanneries (*and CETPs*) have to adopt a Zero Discharge (ZD) Concept for the recovery of water. In the simplest terms this means that following full effluent treatment, all effluent must be subjected to:

- Extended tertiary treatment (*chemical, biological, and clarification*) that includes sand/activated carbon filtration
- Reverse osmosis (RO)
- Recycling of low salinity permeate within chemical process
- Evaporation of the saline stream concentrate and salt management

All of these systems have been investigated on pilot/demonstration scale, but the jump to full scale is immense.

Reverse Osmosis

For RO to be manageable, the suspended solids content of the feed must be minimal. This is feasible as filtration has been used on a large scale to remove both fine suspended solids and colloids. However, large scale filtration and RO are at the cutting edge of technology, and the practicalities of membrane care, maintenance and longevity under the massive volumes envisaged are yet to be experienced.

Management of water resources

It has been proven that it is possible to reuse effluent permeate from RO in the most sensitive parts of leather manufacture. The quality can be quite acceptable, and about 65% of the effluent can be recycled. This is very significant as the demand for fresh water can be reduced to approximately one-third.

Achieving Zero Discharge (ZD)

If the TDS of the concentrate rises to values greater than 30,000 mg/l, then the efficiency of RO is severely diminished. This leaves approximately one-third of the treated effluent as concentrate for evaporation, but until the recovery of TDS/Cl as dry solids is completed there can be no reduction in the total salinity/TDS load discharged from site.

To meet this objective several methods have been investigated. These include solar evaporation pans, and systems utilising sprinklers to increase evaporation by 300%. Other systems include forced air drafts through spray units, and these are hoped to provide an 800% increase in performance.

The concept of ZD is driving technical advance, but the time-scale is very tight. ☹

Panel 1:
Values following RO of fully treated tannery effluent

Parameter	Permeate Characteristics			Concentrate Characteristics		
	Min	Max	Average	Min	Max	Average
TDS	88	440	230	8000	28000	13000
Chloride (Cl ⁻)	17	190	82	1500	4300	2700
Sulfate (SO ₄ ⁺⁺)	BDL	8	2	1900	14000	6000
Sodium (Na ⁺)	15	120	60	1100	6000	2800
Calcium (Ca ⁺⁺)	BDL	11	3	8	950	360
Magnesium (Mg ⁺⁺)	BDL	1	1	6	290	86
Silica (SiO ₂)	BDL	3	1	6	100	33

All Values expressed mg/l. BDL - Below Detectable Limits

Panel 2: The concept of Zero Discharge

