



CETP plant, Ranipet. ALL IMAGES: WTP

A complete solution

RICHARD DANIELS, TECHNICAL EDITOR, WORLD LEATHER

Water has become an increasingly precious resource in many parts of the world. As a result, large industrial users have come under intense pressure to either change their technologies so as to use less or, if that is not practicable, to recycle as much as possible. Despite the brickbats thrown at the leather industry over the years in regard to its environmental conduct, it is in fact right at the forefront of water recycling.

The Ranipet CETP (common effluent treatment plant) in India is a showcase example of what can be achieved. Commissioned in 1995, the plant originally provided full primary and secondary effluent treatment for 77 tanneries (now approaching 100), followed by discharge of the treated residue into surface waters. Twelve months ago, this policy was revised so that 95% is now returned to the tanneries as pure water for reuse.

Recovered water is currently transported back to the tanneries using a fleet of water tankers. This will shortly

be replaced by a 25 kilometre pipe line that is on the point of completion. The resulting closed water-loop will not only be more efficient but will also avoid problems of water provision or abstraction for a significant number of tanneries in the area, eliminate the discharge of saline treated effluent into surface waters and alleviate local concerns over increasing salinity in groundwater.

THREE STAGE PROCESS

The technology that has been developed to do this is based on a combination of reverse osmosis (RO) and evaporation/condensation. It operates in three stages.

1. The raw wastewater generated by each tannery is subjected to in-house pre-settling and screening before discharge and delivery to the CETP via underground pipelines. On receipt, the effluent is fine screened, settled and equalised. It is then subjected to chemical dosing using aluminium salts, lime and polyelectrolytes to remove any

chrome, suspended solids and part of the organic load. This stage is followed by activated sludge treatment using fine bubble diffusion aerators to degrade organic materials and sulfides. A tertiary treatment then completes this stage by chemically dosing the treated effluent and filtering it through sand.

2. After this sand filtration, the treated effluent is water softened by a lime-soda process using a reactivator clarifier and then further filtered using multigrade filters. This is followed by ultra filtration (UF) in a sequence of hollow fibre membranes for 30 minutes and is then backwashed for one to two minutes. The ultra-filtered effluent is then polished in an organic scavenging unit before desalination in two-stage RO units. At this point in the process, approximately 75% of the effluent has been recovered as high quality permeate from the RO operation and suitable for return to the tanneries for further use. This stage of the operation takes electrical power from the grid for 14 hours of



All treated effluent is returned to tanneries as high quality water.



After tertiary treatment, remaining suspended solids are removed by ultra filtration.



Wood and biomass steam generating plant.



Recovered dry salts await packaging.

the day and from the plant's own generators for the remaining 10.

3. There are many examples of air evaporation of the concentrate following RO treatment of effluents. However, when using this technique, although dry salts are recovered, the water content is lost through evaporation. The CETP process is different in that the remaining 25% of concentrate is force evaporated using a steam generating plant fuelled by 10-12 tons of firewood per day supported by biomass briquettes of dried solids from the activated sludge treatment process as required.

The steam generated is circulated under pressure through steam coils to evaporate the water from the concentrate. This takes place in a seven-stage stainless steel evaporator plant, where the evaporate is recovered as pure water using a condenser unit. This recovered water is added to the permeate from the RO operation for return to the tanneries. Any water losses are due to the normal surface evaporation associated with effluent

treatment; no liquids are discharged from the site.

The salt-laden solid residue from the evaporation plant comprising mainly sodium chloride, sulphate and persistent organic compounds is finally recovered via a centrifuge and stored in polypropylene bags. A huge storage facility is under construction to hold this salt long term while uses, such as hide and skin preservation, are investigated.

GLOBAL FIRST

Although this is the first plant in the world to operate in this manner, the technology used can be applied anywhere. While it totally solves the problem of saline discharges into surface waters and rivers for inland tannery clusters, it is expensive both in terms of capital, operational costs and energy consumption. The cost of conventional treatment at the plant (primary, secondary and conventional tertiary) was Rs 30-40 (\$0.6-0.75) per cubic metre; it has now risen to Rs 140-160 (\$2.6-3.0).

Nevertheless, the CETP plant is

paving the way forward by saving abstracted groundwater to the extent of 3,000 cubic metres per day and has eliminated the risks of contamination of both surface waters and the aquifers through salinity. It has also ensured the future viability of tanneries in the Ranipet cluster and the livelihood of some 15,000 direct employees. Funding for the project was provided by a 50% grant-in-aid from the Department of Industrial Promotion and Policy, Government of India, 15% from the Ministry of Industry and Commerce, Department of Industry, Government of Tamilnadu and 35% by the CETP (i.e. the tanners themselves). Total cost was Rs 440 million or approximately \$8 million in dollar terms.

This can truly be regarded as a 'world first' where a combination of clean technology on behalf of the tanners and considerable investment backed by both regional and central government has created an efficient water/tanning/effluent closed loop that is a benchmark in water recycling for the leather industry. ♻️