Curing is the process carried out for the temporary preservation of the hides and skins, which are the basic raw materials for the leather industry. Hides and skins are subjected to bacterial damage if left untreated beyond sometime. Hence they have to be preserved till the commencement of leather processing in tanneries. The most commonly used curing methods globally are salt-based ones using huge amount of common salt (about 40-50%) for the preservation. Salt based curing methods are very effective in preserving the skins and hides for long storage periods. However, these methods generate a huge amount of pollution loads in the form of total dissolved solids (TDS) and chlorides during leather processing. Salt used in curing contributes more than 40 % to TDS and about 55 % to chlorides in the combined tannery effluent. The discharge limit for TDS is quite stringent in India and particularly in the state of Tamil Nadu, which accounts for more than 50% of the tanning activity in the country. Tamil Nadu Pollution Control Board had fixed a stringent discharge norm of 2100 mg/L for TDS, as the state is a water-starved one. Currently, the waste water from the soaking of salted skins and hides needs to be segregated and evaporated in specially constructed solar pans. The constraints are the space available for constructing the solar pans and the efficiency is poor due to prevailing climatic conditions. Moreover, there is also a problem associated with the safe disposal of the salt recovered from the solar pans. Thus the lasting solution to
the problem may rest on the development and adoption of alternative curing methods based on salt-free preservation methods. In the present investigation, an attempt has been made to conduct detailed studies on the rationalization and development of a chilling method of short term preservation suitable to Indian conditions.

The optimization of chilling temperature for the preservation of skins and hides has been carried out by studying the growth profile of the five of the most prolific skin bacteria found in India at different temperatures. The results indicate that 4°C might be the optimum chilling temperature for effective inhibition of the growth of skin bacterial isolates for a duration of 7 days. Use of biocides may be necessary to extend the duration of curing beyond 10 days. Laboratory scale optimization studies were done with goat skins and cow hides to study the effect of chilling temperatures on the curing efficacy and the quality of the leathers. Experiments were done in a cold temperature cabinet with a thermostat control. This study also reveals that 4°C may be the optimum temperature. The results of the study of chilling profile using a data logger indicate the need for a blast chiller to accelerate the rate of cooling such that the temperature of the hides can be brought down to the target temperature in less than 1 h to minimize the chance for bacterial damage. The optical microscopic studies with the chilled hides at different temperatures show that the fibre compaction increases with the decrease in temperature compared to salt cured skins and hides. It is evident from the pollution data for spent soak liquors that more than 80% reduction in TDS and about 98% reduction in chloride contents are possible by replacement of
salt curing method by the chilling method of preservation. The leathers produced had also the required qualities and strength properties to fulfill the trade requirements. Large scale experiments conducted with the mobile chiller designed and fabricated show that it is possible to chill the material to the optimized temperature of 4°C in less than 1 h as envisaged. The study of the degradation patterns of various skin components obtained following the bacterial count, contents of soluble nitrogen, tyrosine and hydroxyproline in the hide during the thawing process indicate that the safe duration of transportation of the chilled hides in insulated containers might be about 15 h. The temperature profile during the thawing process also confirmed this finding. The leathers produced from the chilled skins and hides were comparable in all the properties compared to the leathers from salted control counterparts as evidenced from the visual assessment, physical testing data and scanning electron microscopic studies. The fibre compaction and grain tightness were found to be better with the experimental leathers. This makes the chilling method an attractive option for the Indian cow hides which are generally loosely structured due to the fact that they are mostly from old or fallen animals. The large scale experiments also revealed that the TDS and chloride pollution loads in soaking and composite waste liquors could be reduced considerably by the adoption of the chilling method. Based on the study, a chilling system involving the design for the stationery blast chiller (collection center) with 5 tons/day capacity and cold storage of the chilled hides with a capacity to hold 2 days production (both at collection center and tannery) has been proposed. The detailed cost benefit analysis for the system has also been assessed. There is a possibility of considerable cost saving with
the adoption of the standardized chilling system in the Indian condition and the method is cost effective.

On the whole, the chilling system standardized in this investigation emerges as a technically and commercially viable short term preservation option for skins and hides in the Indian conditions to mitigate the TDS related pollution problems faced by the leather industry. Due to an unorganized raw material supply chain system prevailing in the Indian social context, the system might prove beneficial to such situations where the collection centers are within a transportation time of less than 15 h and the tanneries are directly sourcing the hides and skins from slaughter houses or primary collection centres.