TANNERY MODERNISATION - PHASE II: TAN MOD II: FOR INDIAN LEATHER SECTOR

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LERIG 2016

CSIR-CENTRAL LEATHER RESEARCH INSTITUTE

MODERNISATION

- Development
- Concepts
- Adv. /Futuristic Technology – LERIG 2016
- Refinement
- Replacement
- Environmental Benefit
- Societal Benefit

Conventional Leather Processing

- For a given substrate,

$$f\,(C, M, T, D_P, pH, A)$$

- Concentration of chemicals

  ➡ **Pollution load**

✓ Mechanical agitation

✓ Temperature

  ➡ **Without Damage**

✓ Process Control

  ➡ **pH, Water / Chemical Addition**

✓ Process Intensification

Outline:
Tannery Modernisation – I

Objectives

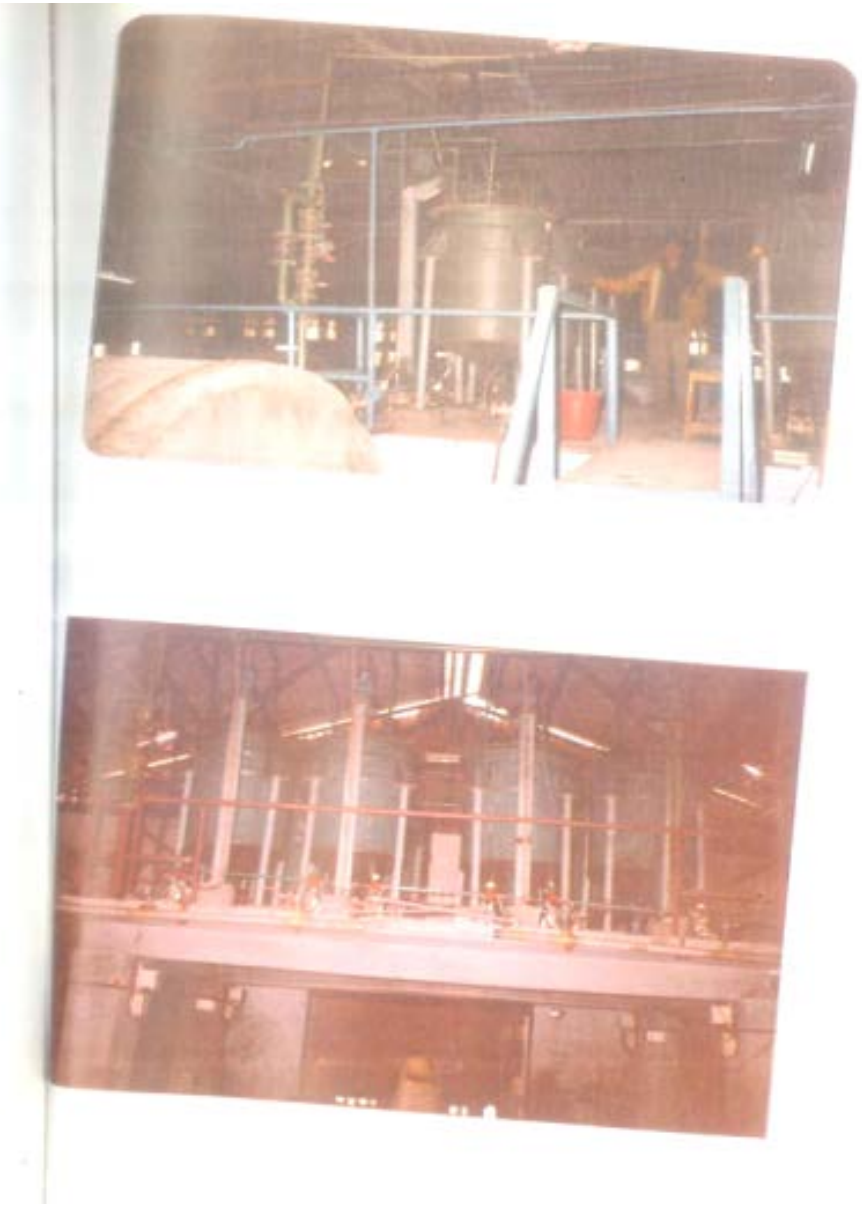
- Technology driven development framework for leather sector: Shift from traditional base
  - Up-gradation of technology
  - Promote the cleaner technologies
- Demonstration units for process control and cleaner tannery wet operations in a tannery
- Demonstration on the viable cleaner technologies in a number of commercial tanneries

Tannery Modernisation – I: Outcome

- New concepts in leather processing
- Equipment lay-outing
- Process control
- Replacement of obsolete machinery with newer versions
- Effluent treatment (Primary treatment & CETPs)
- Up-gradation of human skills

~100 Large and Medium Scale Units spread across the Nation were directly benefited

TAN MOD I
Controls for
Chemical Addition



TAN MOD I Controls for Chemical Addition

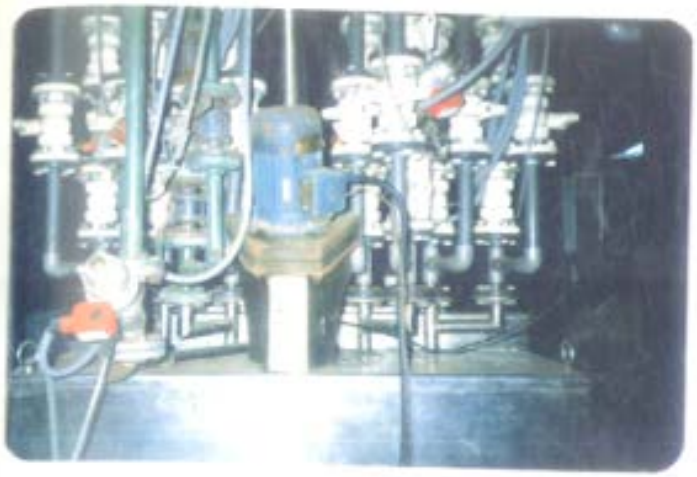
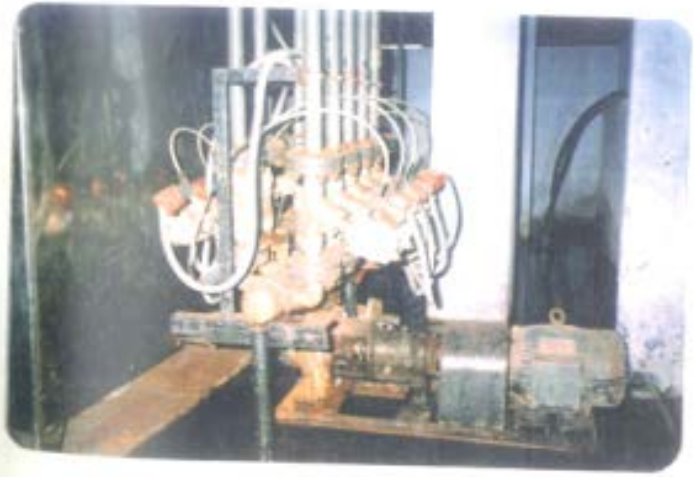


Fig. 5.5.12 : View of load cell and associated control valves



Control Valves

TAN MOD I
Hot water Generation unit

Benefits Accrued – TAN MOD I

"Modernization of wet operations in large scale tanneries is not a distant dream but a reality."

Following benefits were accrued during the Phase I programme:

- Quality Consistency (~100%)
- Waste minimization (15-30%)
- Productivity enhancement (20%)
- Value addition for leather
- Environmental benefits

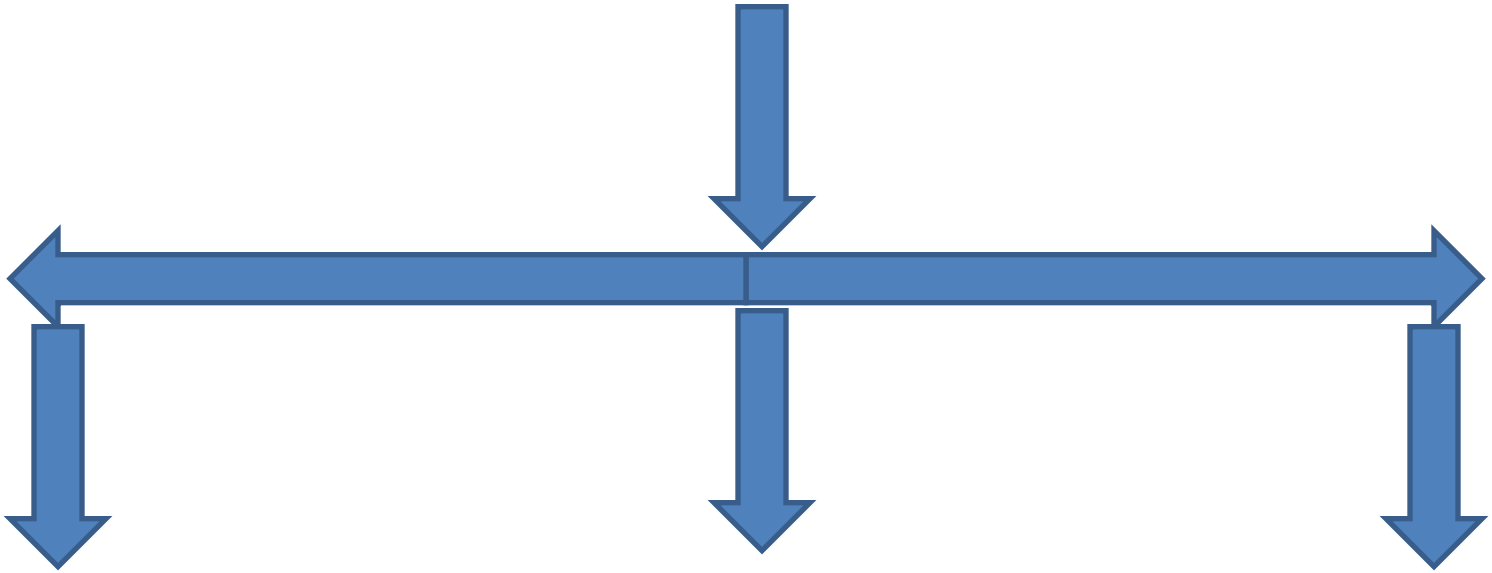
What are all the Un-Filled Gaps in TAN MOD I ?

- Wide Coverage also to Micro, Small and Medium sectors
- Wider coverage in entire country
- Skill development and Training with regard to tannery modernization tools at worker level
- Realizing: Mechanization is only a part of Modernization and not the only goal
- Incorporating Environmental, Safety and Hygiene concepts at a tannery level

Tannery Modernisation II: Objectives

- Process Optimization
- Improve Process Efficiency
- Better Design & Process Control
- Better Material Handling systems (lay out)
- Machinery up-gradation
- Energy audit: Use of non-conventional resources
- Primary treatment systems
- Environmental, Health and Safety
- Waste Minimization: Bye-product Utilization

TANNERY MODERNISATION II (TAN-MOD2)



BASIC AUGMENTATION/ STUDIES

LEATHER PROCESS PACKAGES

ENGINEERING PACKAGES

Inputs from relevant CSIR-CLRI Departments

Basic Augmentation for Leather (BASICS)

- **Basic Studies**
  - **Quality of chemicals**

  e.g. Purity of commercial grade lime: 60-95%

  For each 1000 kg of skin/hide: 35 kg lime usage or lime sludge could be reduced by using **High Calcium Grade Quicklime (>95%)**
- **Quantity & Quality of chemicals audit**
- **Quality/ Quantity of water**
  - **Hardness impairs quality of leather; TDS ↑**
- **Process vessels: Drums, Paddles or Pits**
- **Leather machinery**

Engineering for Leather Process (ENGLEAP)

- System for Recycle of spent liquors
  - Soak, Lime, Pickle, Chrome liquor recycling (RECYCLE)
- pH control, Water addition, Chemical addition modules (CONTROL)
- Process Intensification Tools: Near zero discharge of chemicals
- Energy audit & Non-conventional energy for leather
- Tannery Odor control
- Leather machinery up-gradation (LEAMAC)
- Tannery Lay-out up-gradation
- Scheduling and Sequencing
- Environmental, Health and Safety for Leather (EHSL)
- R&D and Testing centre

Engineering Packages

The entire process control operation is designed with following five modules:

a) Water addition module

b) Chemical preparation and dosing system

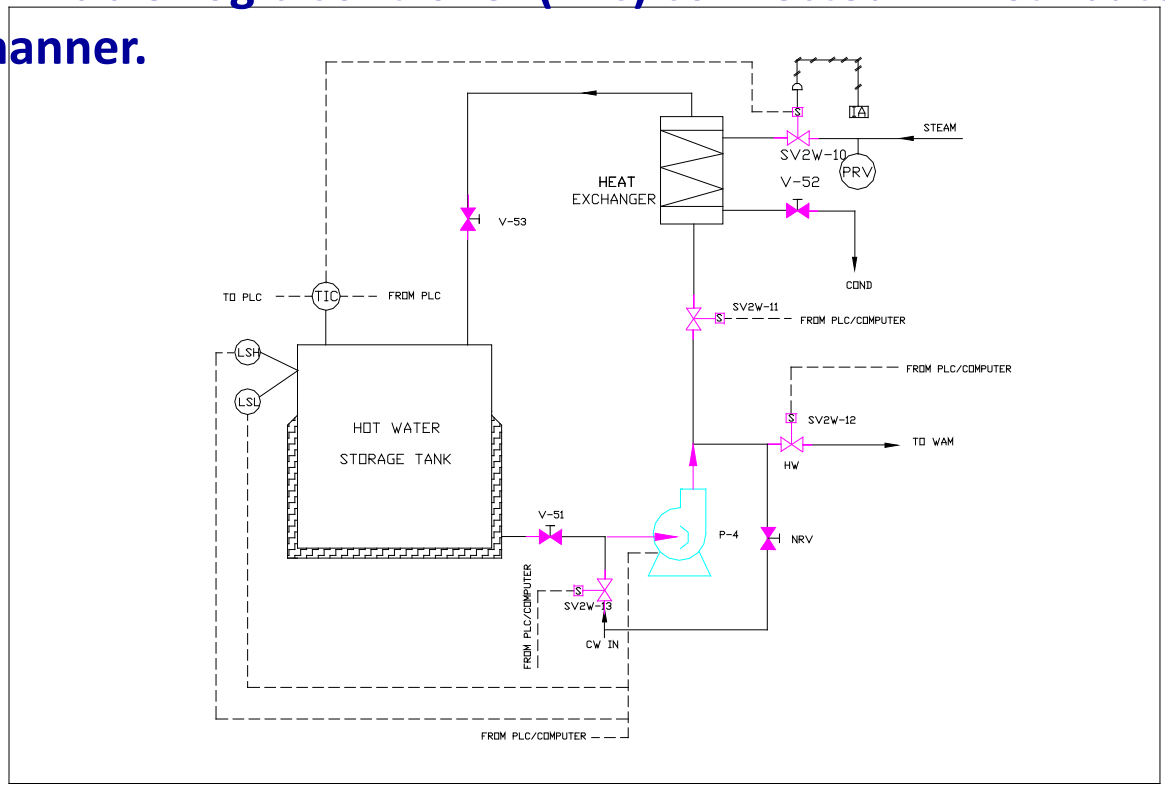
c) pH control and float recycle system

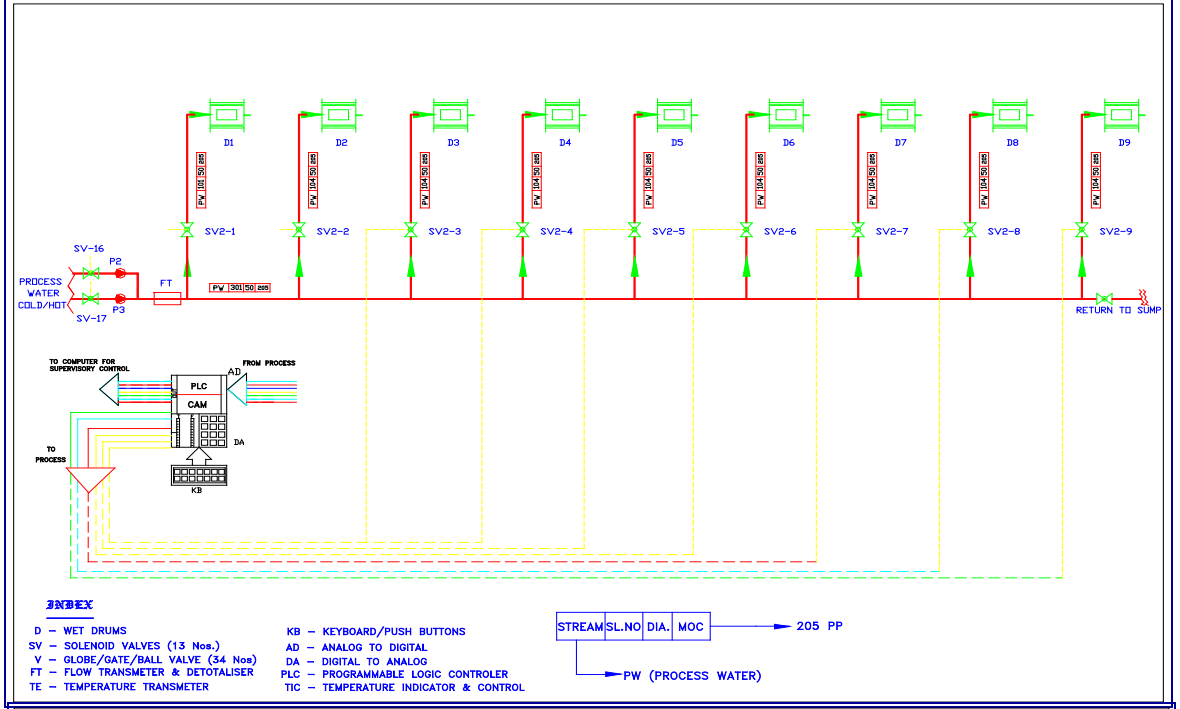
d) Drum rotation module

e) Odor reduction module

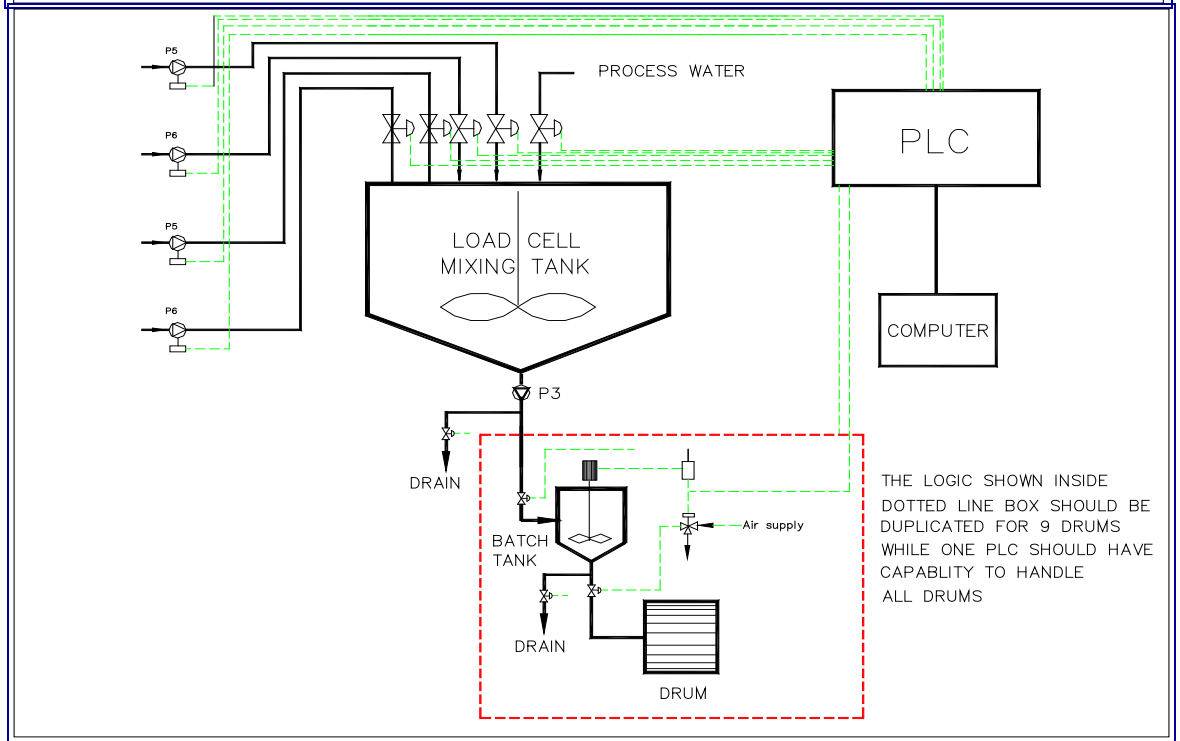
The proposed system is an integrated process computer with necessary field instrument and Programmable Logic Controller (PLC) connected in Distributed Control System (DCS) manner.

PLC Control System





Chemical Dosing Module



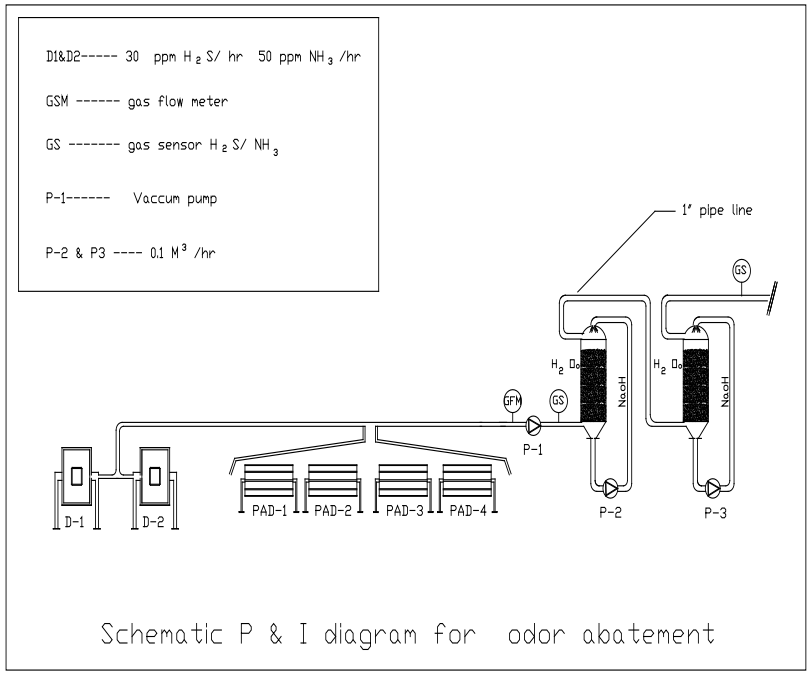
pH Monitoring Module

Odor Control System

R&D work at CLRI

Sources & Effects

- NH_3, H_2S, VOC, gases from degradation of putrescible materials in hides / skins
- These gases must be removed in order to maintain occupational safety, cleaner technology.



Schematic P & I diagram for odor abatement

VOC – 50 ppm
NH_3 – 30 ppm
H_2S - 20 ppm

Different **methods of removal** of NH_3 and H_2S
a) Addition of Chemical Reagents
b) Passing Compressed Air
c) Ozone Oxidation
d) Passing air in counter current to liquor in a packed (activated carbon) bed
e) Biochemical and Biological methods

Odor Abatement by Bio-Filter

Materials storage facility

- Cold storage facility for preservation of raw skins/hides
- Wet-blue storage systems with automated water sprinklers
- Finished leather storage system with Temperature and Humidity controls
- Hazardous chemicals storage and Dispensing facility (e.g. Acids etc.)
- Leather specialty chemicals storage facility (Dyes, Syntans, Dyes etc.)

Non-conventional Energy Options

- Solar energy operated air heating for leather drying
- Solar energy operated hot water supply for leather processing

Materials Handling facility

- Trolley for Raw skins/hides movement
- Electric Fork lift attached transport vehicles for Raw skins/Limed pelts/wet-blue/dyed leather/finished leather etc.
- Bulk chemicals transport

Leather Process Packages* (LEAPRO)

- New eco-friendly pre-tanning technologies
  - Salt-less preservation
  - Enzymatic processes
- Novel eco-friendly / High-exhaust tanning process technologies
  - E.g. CLRI salt free tanning process
- New eco-friendly, High-exhaust post-tanning process technologies, REACH compliance
- New finishing packages
- Novel leather process recipes for value addition

*Inputs from Tannery Division

Environmental, Health and Safety (EHS)

- Cleanliness and Hygiene
- Occupational Health & Safety (OHS)
- Safety audit
- Personal protection equipments
- Inter-locking systems & Trips
- Alarms
- Emergency management systems

Recommendation of RC, CSIR-CLRI

- Life Science and Genetic Engineering Intervention for Leather
- Clean Technologies
- Process intensification tools i.e. Machinery/Equipment
- Odor control
- Emission control
- Dust control
  - Equipments required for the above packages
- Robust process control systems
- TDS packages (TDS Control / reduction of salt)
- Regenerated leather
- Collagen package
- REACH package
- Package for Product sector
- Bye-product utilization package
  - High-value

Suggested Technologies for TAN MOD II

Components	Features	Approximate cost
Lay-out and Design Engineering facilities	**To avoid time delay** in transportation of transit / intermediate products from machine to machine relocation of units/processes and modification of (existing) lay-out of the industry is needed. Calculation and preparation of optimum layout facilities are available. Tentative cost for a module of 1 acre area tannery	Generic for scales
Water addition system	Hot water can be prepared by (i) mixing normal water with steam (ii) heating normal water by non-conventional energy. The sequence of addition of water to different drums can be controlled through PLC with supervisory system. Tentative cost for a module of 3000 Kgs/day capacity	Rs 5 Lakhs

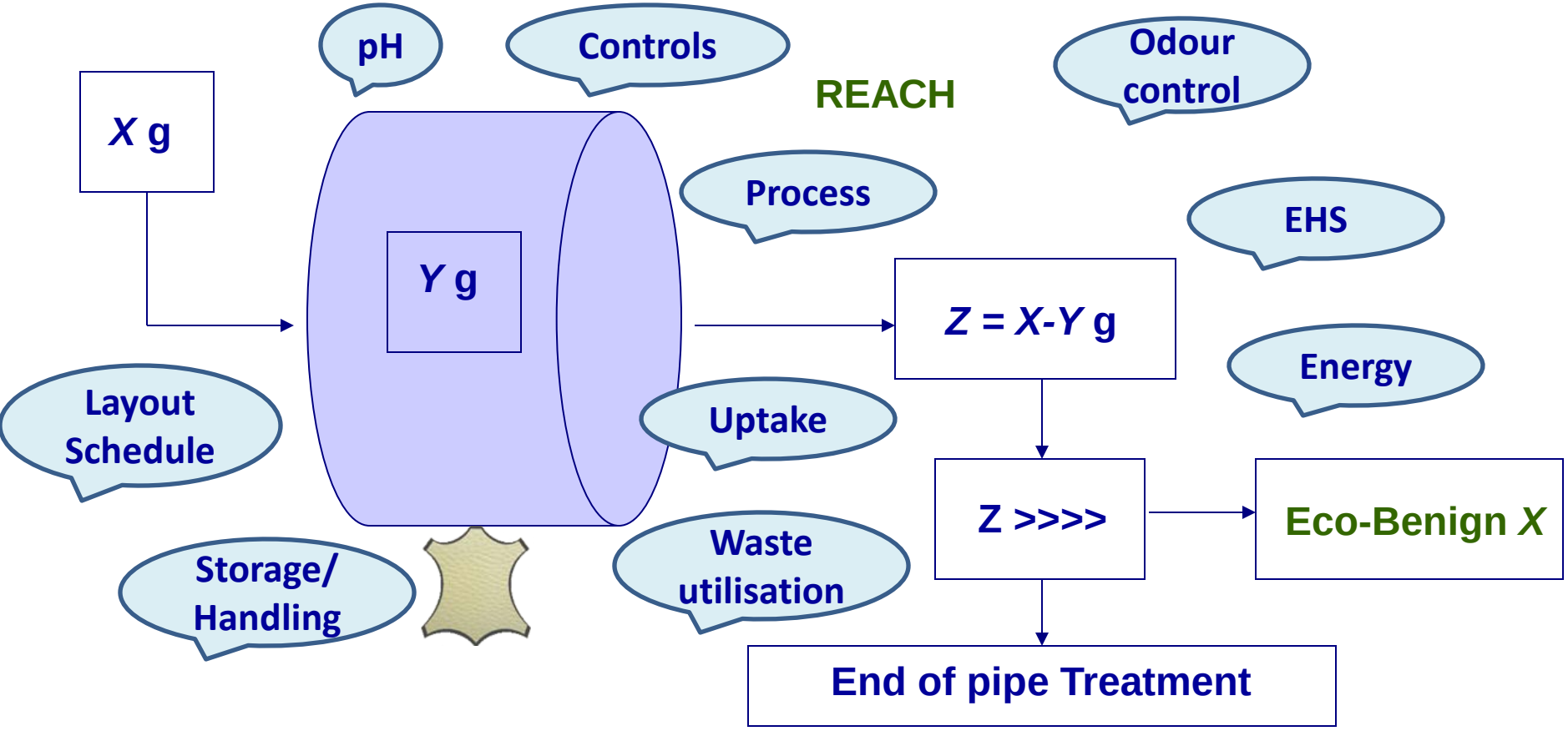
Components	Features	Approximate cost
Chemical Mixing and Dosing module	Chemicals can be dosed as per process sequence (flow / time control) using load cell, batch and bulk tanks and PLC with supervisory control. Tentative cost for a module of 3000 Kgs/day capacity	Rs 10 Lakhs
pH monitoring system	pH of process hides can be monitored (predicted on line) and flow of chemicals can be controlled using batch sequencing technique. Tentative cost for a module of 3000 Kgs/day capacity	Rs 5 Lakhs
Drum rotation module	Drum RPM can be controlled (8-16) or direction of rotation can be changed at any time using sequencing logic through PLC control strategy. Tentative cost for a module of 3000 Kgs/day capacity	Rs 5 Lakhs (Item 2, 3, 4, 5 together = Rs 12 lakhs)

Components	Features	Approximate cost
Odor abatement module	Odor in the drum / lime yard can be eliminated using environmental friendly techniques. Air pollution / health hazards can be minimized. This increases occupational safety	Rs 10 Lakhs
Quality / Quantity of chemicals Audit for each unit operations	In Quality / Quantity of chemicals Audit: Use of superior grades and optimum quantity of chemicals. Improves quality of leather and reduce pollution load.	
Scheduling & Sequencing	A user friendly (GUI) software based on management theory to schedule N number of Jobs to be passed through M number of machines (product sector of Leather houses). This uses optimization of processing (scheduling) time through linear programming concept. This will find the bottleneck areas and make a Gantt chart for sequencing of jobs/production	Rs. 8 Lakhs

Components	Features	Approximate cost
Recycling of Lime Liquor Pickle / Cr liquor	Used lime liquor →Filter →Add required lime & Na_2S → Ω →Paddle / Pit / Drum Spent lime liquor contains considerable amount of lime and Na_2S which shall be recycled for the next batch after suitable filtration and replenishing of chemicals required. Similar concept for Pickling (or) tanning Process shall be applied	
Temperature controlled Drums for Retanning, Dyeing , Fat liquoring	Drum float → Heated 60°C→ Recirculation to drum back. Exhaustion of chemicals used in Retanning, Dyeing and fatlqiuoring are significantly improved due to the use of temperature controlled process at 60°C. In view of more expensive syntans, dyes and fatlqiuors, improved exhaustion of these chemicals would not only reduce pollution load but also imoprove quality and give economic benefits for tanners	

Components	Features	Approximate cost
Material handling systems for each unit operations	Better Material handling systems for each unit operations shall be useful	
Raw material, Leather and Chemical storage systems	Chemicals Storage for leather processing and Better Material storage systems.	
Leather Process	Eco-friendly, High exhaust and REACH compliance	
Energy audit	Energy can be reused to increase energy efficiency and minimize wastage. Energy optimization will be done throughout the plant with the use of non-conventional energy sources such as solar	Rs. 8 Lakhs
Environmental, Health and Safety	Cleanliness and Hygiene; OHS	
Solid waste Utilization	Wealth from waste and Value added products	

TANNERY MODERNISATION II: ENVISAGED OUTCOMES



Reduce *X*; Maximize *Y* and use *X* through Ultrasound

TANNERY MODERNISATION II: ENVISAGED OUTCOMES

- Quality improvement
- Waste minimization
- Value addition for leather
- Productivity enhancement
- Energy efficiency
- Safe, Healthy Environment in Tannery

INCREASE IN UPTAKE OF CHEMICALS / HIGH EXHAUST (~100%) SYSTEMS, ALTERNATE ECO-BENIGN PROCESSING

सत्यमेव जयते

Report
of
The Working Group
on
Micro, Small & Medium Enterprises (MSMEs) Growth
for
12th Five Year Plan (2012-2017)

MSME
MICRO, SMALL & MEDIUM ENTERPRISES
OUR STRENGTH

Ministry of Micro, Small & Medium Enterprises
New Delhi

SCHEMES OF MINISTRY, MSME, GoI: XII PLAN

- Credit and Institutional Finance.
- Technology & Innovation.
- Skill Development & Training.
- Marketing & Procurement.
- Infrastructure.
- Khadi & Village Industries
- Coir Sector.
- Institutional Structure.
- Emerging Technologies.
- Special Areas & groups.
- Unorganized Sector.

*Source and Inputs from MSME, GoI, Chennai centre

MSME-XII PLAN: TECHNOLOGY SCHEMES

- Following interventions are proposed to provide support to the start-ups in the Hi tech and Emerging Sectors–
- Modular industrial estates/laboratories near premier technical institutions **(like CLRI)** with the required **Plug & Play facilities**
- Linkage to angel/venture capital for sourcing the initial capital requirement.

***Source and Inputs from MSME, GoI, Chennai centre**

Plug and Play facility model for MSME leather Clusters

- Advanced **sample leather processing drums** with controls
- **Modern Leather Processing Machines** such as Splitting, Shaving, Setting etc.
- **Auto-Spray Machine** for finishing
- Fini Flex machine
- **Area measuring machine**
- Leather/ Leather Products **Testing centers**

Highlights of schemes for MSME in Leather sector

- Skill development and training
- Clean Technology (Carbon credit system)
- Motivating units go for ISO, BIS certification
- Modern packaging technology
- Bar Coding
- Energy audit and use of Energy efficient technology
- Quality testing and Quality assurance
- Modern marketing practices
- Development of IT infrastructure

***Source and Inputs from MSME, GoI, Chennai centre**

Way Forward and Follow-up action

- Meeting with all the Stake holders
- Covering all the Clusters and Regions
- Scale of operations MSME and Large
- Suggestions and Feed back
- Different Packages
- Detailed Project Report (DPR)
  - Clusters
  - Individual Tanneries
- Contact E-mail: bpdclri@gmail.com

Thank you