

# **IMPROVED CLEANER LEATHER PRODUCTION AND CLOSED-LOOP PROCESSING OF SALINE AND CHROME STREAMS**

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# **GLOBAL LEATHER PROCESS & NEED FOR CLEANER PRODUCTION**

## **GLOBAL LEATHER PROCESS : 17 MILLION TONS / YEAR**

**China – 20%, Italy – 15%, Brazil – 12%, India – 5% - others Turkey – Vietnam – Pakistan – Bangladesh - Argentina – Spain, East European countries, New Zealand, etc.**

- Wastewater discharge : 600 to 650 million m<sup>3</sup>/year
- Salt usage & discharge : 7 to 8 million tons/year
- Chrome discharge : 0.3 to 0.4 million tons/year
- **Tannery Solid Waste : 6 to 7 million tons/year**
- **Generation of Fleshing : 2 to 3 million tons/year**
- **Sludge Generation : 4 to 6 million tons/year**

# LEATHER PROCESS IN ASIAN TANNERIES

**8 → 9 million tons / year** (50 to 55% of World Leather Process)

Activity	Discharge by Conventional Method	Current Status on Cleaner production and Recycling
Water usage and wastewater discharge	400 million m <sup>3</sup> /year – partly addressed	Reduction in 20% water usage Recycling from effluent is only 5% Scope for recycling upto 60%
Salt Discharge (TDS)	4.5 million tons/year – partly addressed	Reduction by about 15% Scope for reduction upto 50%
Chromium Management	0.2 million tons/year	Waste discharge reduced by 50% Scope for recycle and reuse upto 90%
Tannery Solid waste	3.5 million tons/year - Major Challenge	1.5 million tons (about 40%) converted into products.
Generation of Fleshing	1.5 million tons/year	About 20% fleshing disposed in an organized way – Major challenge for small scale units processing skins.
Safe Sludge disposal	3.0 million tones/year – Major Challenge	Less than 10% sludge reused – Major challenge in safe disposal and reuse.

# **CLEANER PRODUCTION - SALT AND SALINITY ISSUES**

- ❖ Most of hides and skins are heavily salted (50-60% on hide weight) due to tropical atmospheric condition.
- ❖ Few (less than 20% of the required capacity) organized slaughter houses and cold storage facility.
- ❖ Hides & Skins sold in weight basis and vendors prefer to add more salt for commercial reasons and tanners also add further salt for long period of storage.
- ❖ Desalting is not yet fully practiced in small scale tanneries.
- ❖ Resulted in increase of salinity in effluent and difficulties in biological treatment.

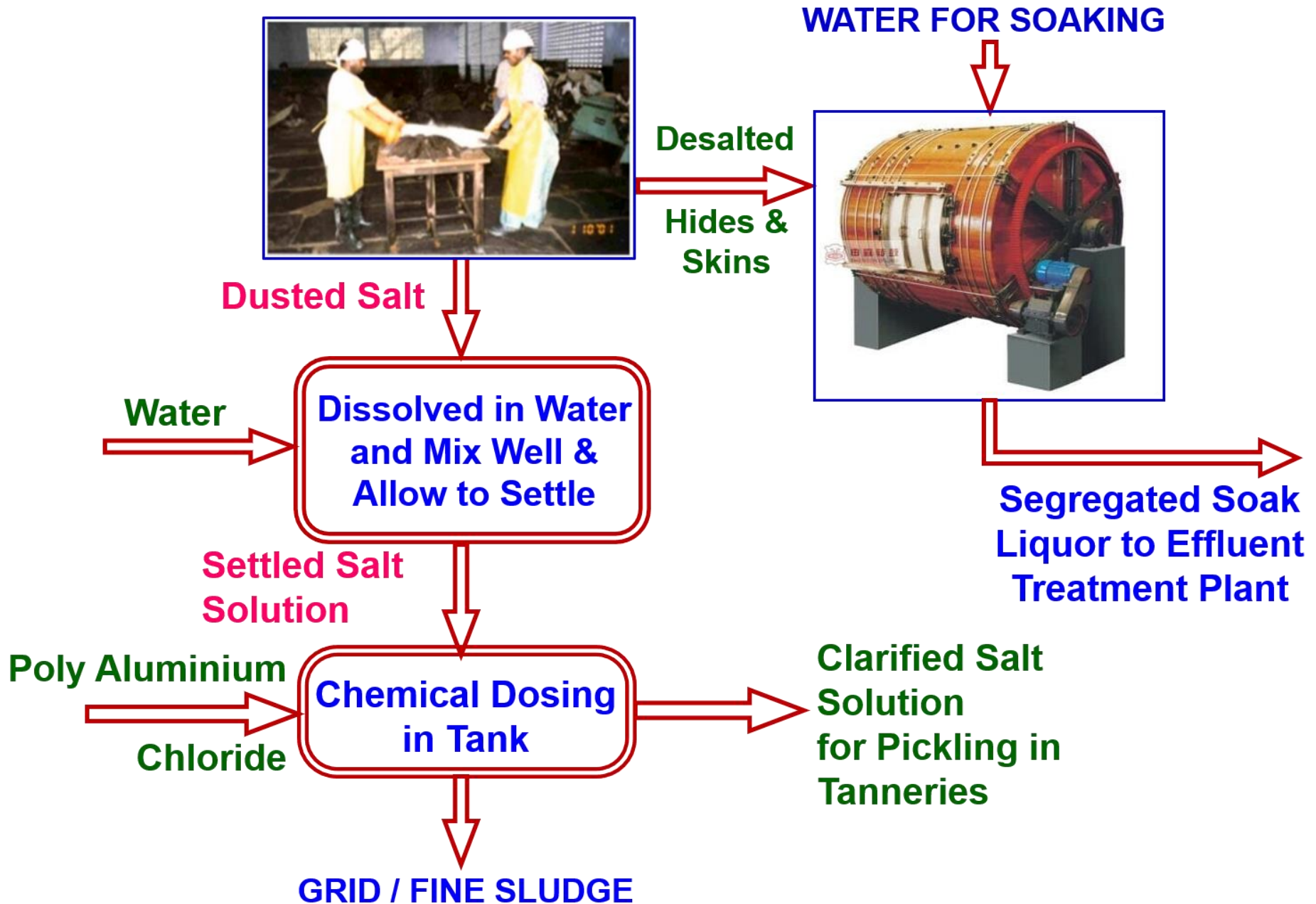
# **NEED FOR IMPROVED CHROME MANAGEMENT**

- ❖ More than 80% of tanneries in Asian countries adopt conventional chrome tanning using 7-8% BCS on pelt weight.
- ❖ 30% chromium is discharged in the spent chrome bath.
- ❖ Use of recovered chromium for main leather process is not popular particularly tanneries doing job works due to commercial and logistics reasons.
- ❖ Limitations in recovery of chromium from semi-chrome tanning process due to the presence of residual fat liquor in conventional chrome recovery system using MgO as alkali.
- ❖ Development of improved centralized chrome recovery system and recovery of chromium in the form of cake or powder has become necessary in India.

# **CHALLENGES FOR SUSTAINABLE SOLID AND SLUDGE MANAGEMENT**

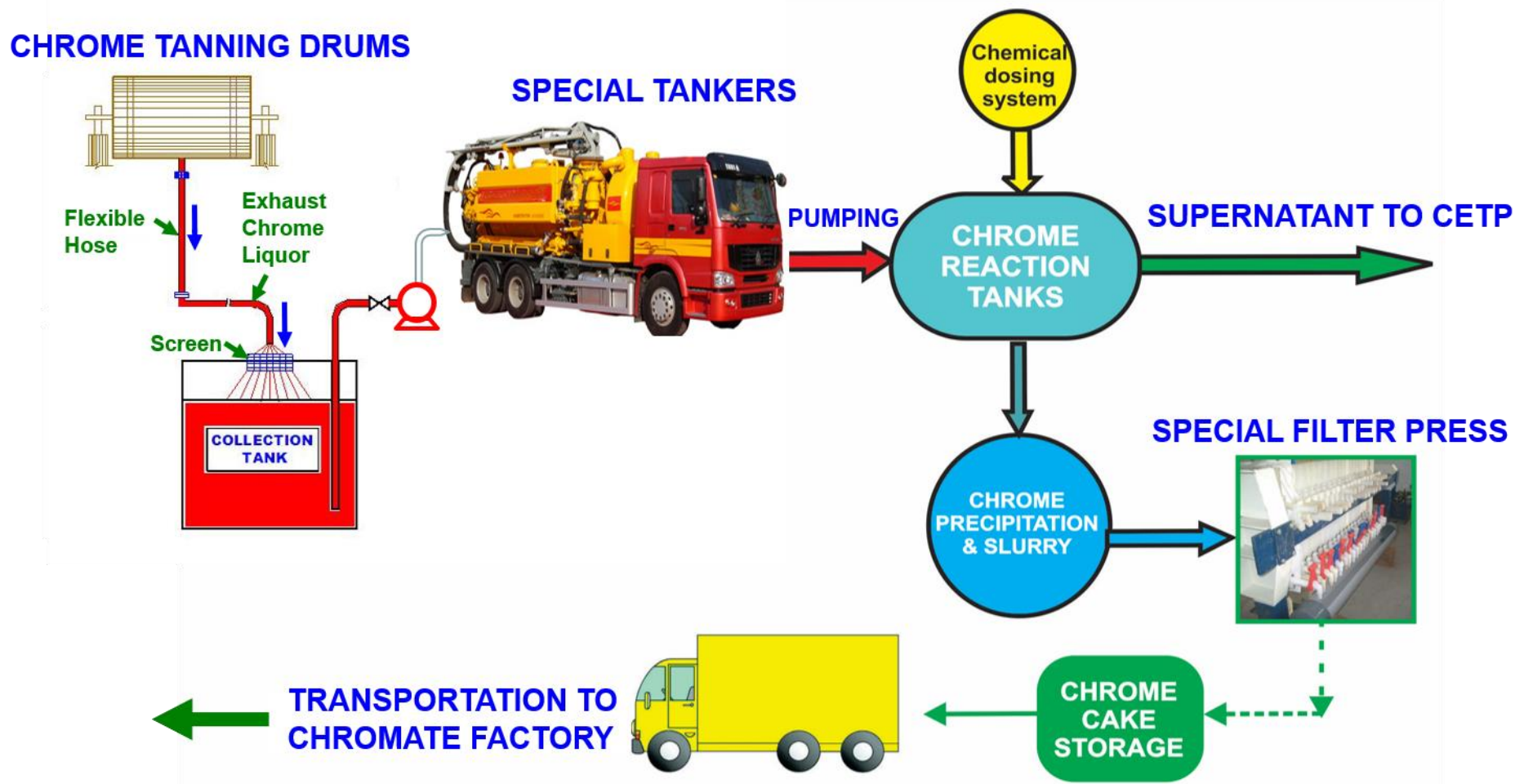
- ❖ Only large size fleshing from hides are taken for glue and gelatin manufacture. Fleshing from skins are thrown as waste / disposed in an unauthorized way.
- ❖ Most tanneries use poor quality chemicals in large amount in liming as well as in Effluent Treatment Plants (ETPs) results in high BOD, COD & Sludge generation to the tune of 8-10 tons per MLD of effluent.
- ❖ Disposal of the hazardous category sludge into centralized secured landfill requires further treatment and becoming difficult. Disposal cost is >150 USD per ton.
- ❖ Need to reduce chemical usage and convert physiochemical into biological treatment system.

# DESALTING USING DODECA SYSTEM





# IMPROVED COMMON CHROME RECOVERY SYSTEM (CCRS) – SEGREGATION OF CHROME BATH AND TRANSPORTATION WITH GPS





# CCRS WITH RECOVERY OF CHROMIUM IN THE FORM OF CAKE

APPROVED & SUPPORTED BY MINISTRY OF ENVIRONMENT & FORESTS

①

CHEMICAL  
FEED TANK  
(Sodium  
Hydroxide)



②

MAIN  
REACTOR



③

CHROME  
SLURRY  
THICKENER

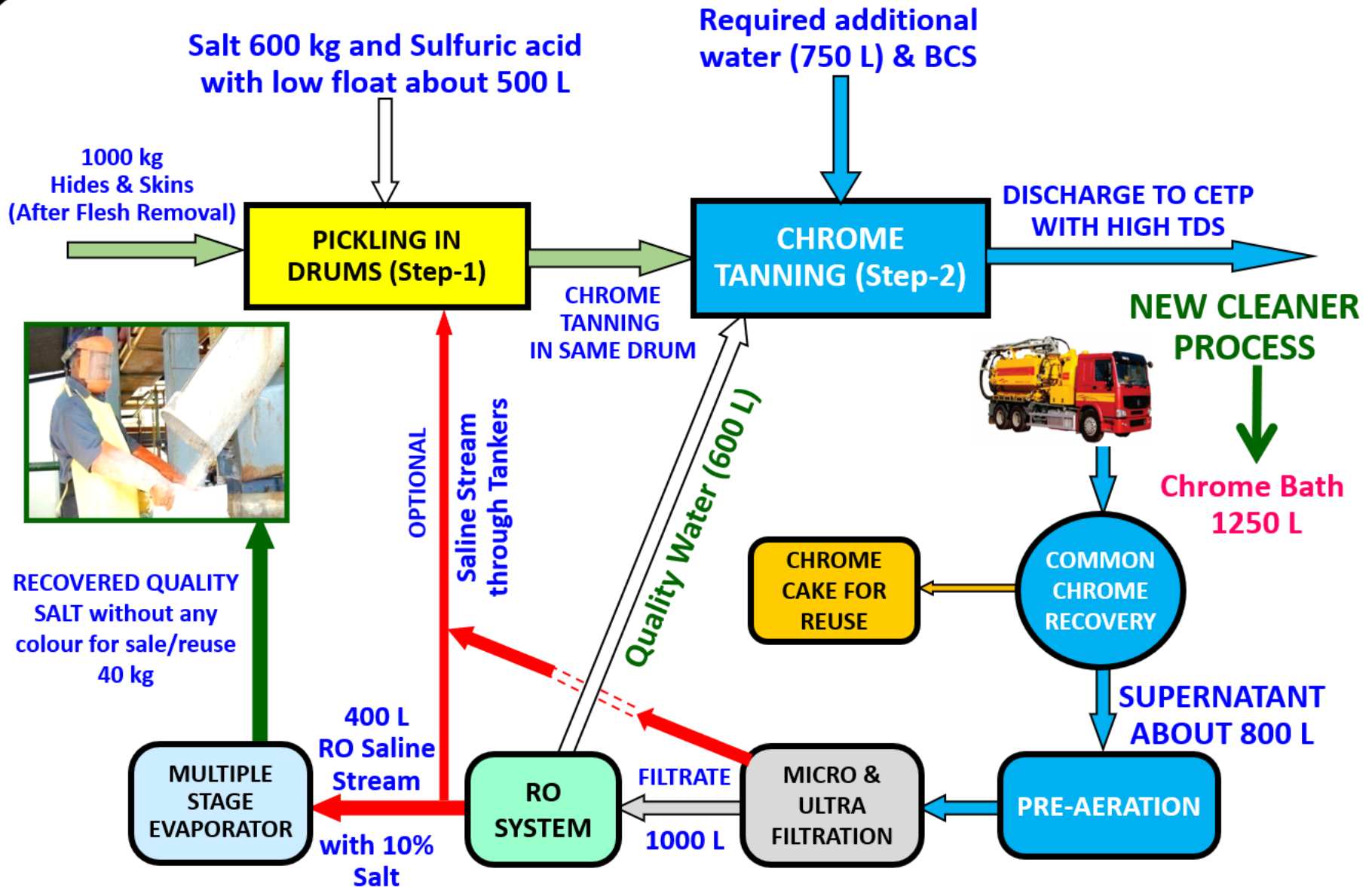


④

DEWATERING  
SYSTEM FOR  
CHROMIUM  
CAKE  
GENERATION



# CIRCULAR ECONOMY - CHROME STREAM TREATMENT, RECOVERY & REUSE

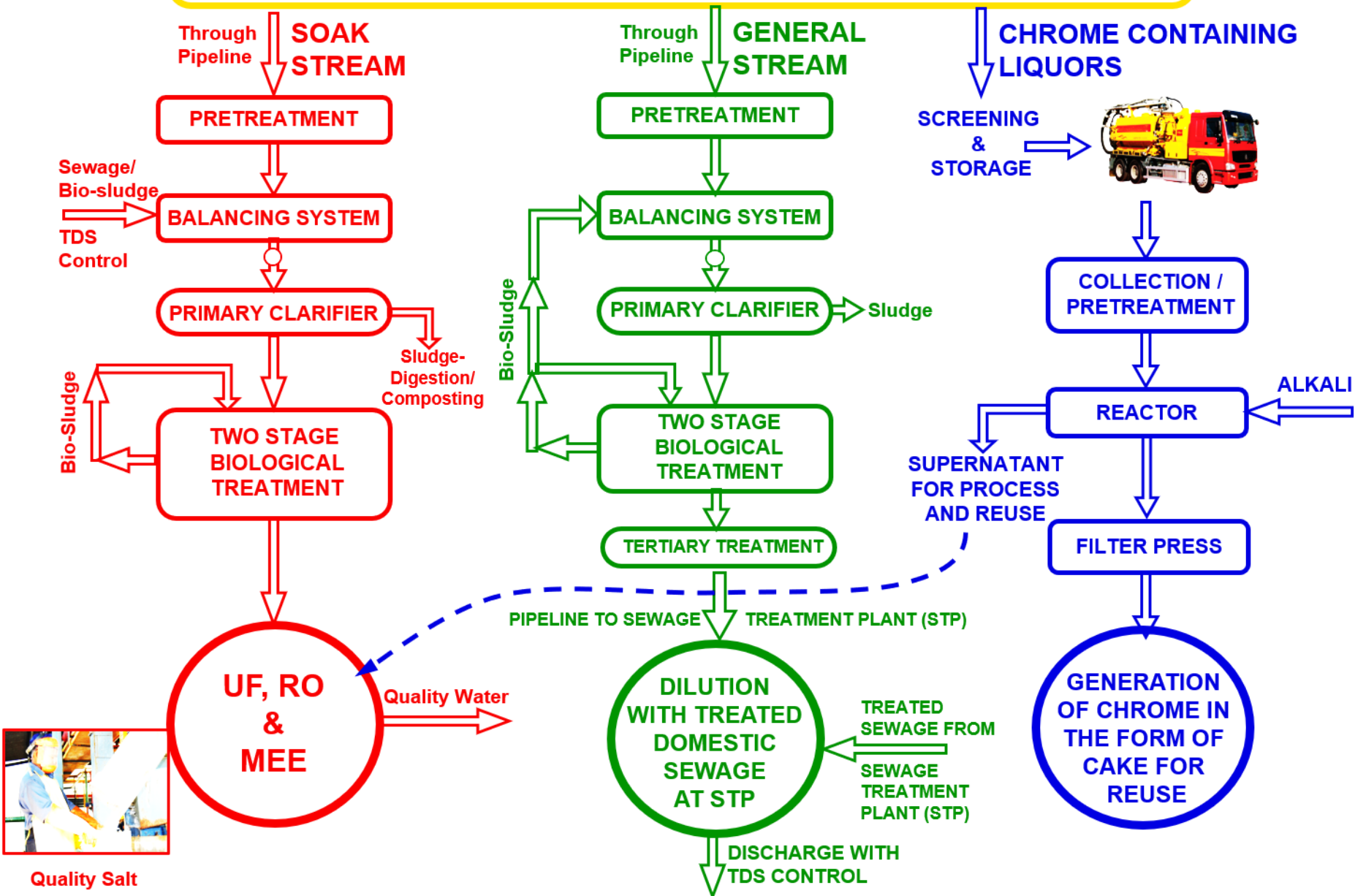


**Circular Economy : Recovery of Chromium is 98%; Recovery of Water 90%; Recovery of Salt 80%**

# **CIRCULAR ECONOMY - BENEFITS OF IMPROVED CHROME RECOVERY SYSTEM**

- ❖ Recovery process time is reduced from 20 hrs per batch to less than 8 hrs per batch (Operational efficiency increased by 200%).
- ❖ Better chrome management with 90-95% major reduction of chromium discharge to the environment.
- ❖ In addition to recovery of chromium, 90% quality water & 80% salt from supernatant are also recovered for reuse.
- ❖ Quality chromium (BCS) is recovered in form of powder.
- ❖ In India, it has become mandatory to adopt Improved Common Chrome Recovery System in all tannery clusters under ZLD concept – Targeted (2026) to recover 15000 tons of BCS worth 100 million USD per year.

# SEGREGATION & SEPARATE TREATMENT OF SOAK, SPENT CHROME BATHS & COMPOSITE STREAM





# **MANAGEMENT OF TOTAL DISSOLVED SOLIDS - SEGREGATION OF SOAK SALINE STREAM & SEPARATE TREATMENT**



**QUALITY SALT GENERATION FROM  
SEGREGATED SOAK SALINE STREAM**

**MULTIPLE STAGE EVAPORATOR FOR  
SALINE STREAMS**



**Recovery of water for reuse and RO saline reject for evaporation  
and salt recovery**

# **SECURE STORAGE SYSTEM FOR TANNERY CETP SLUDGE INTEGRATED WITH CETP – STAGES OF CONSTRUCTION**



## **MERITS:**

- Improved SLF system with RCC & HDPE liner.
- Occupies less land area.
- No separate treatment for leachate - Existing CETP is used.
- Better control and monitoring system.
- Comparatively low O&M cost on sludge disposal.

## **EARTH WORK EXCAVATION**



# **DECENTRALISED SECURE LAND FILL SYSTEM**

## **CAPACITIES 20000 - 150000 m<sup>3</sup>**



**Disposal Cost is less than 40 US Dollar / Ton compared to 200–300 USD in Europe, South American countries**

### **MERITS:**

- Scope for further conversion of sludge into products & issue of consistent quality and large quantity will be resolved.**



# **RENEWABLE SOLAR / WIND ENERGY**

**To compensate energy consumption in effluent treatment plants, renewable energy from solar plants are being generated in India.**



**Installation of Solar Energy Plants @ 1.0 MW system per 1.0 MLD capacity treatment system.**

# CONCLUSION & RECOMMENDATION

- ❖ By adopting improved cleaner process, the reduction in pollutional loads Sulphide - 80%; Chromium discharge - 90%; Salt (Sodium chloride) - 50%, etc.
- ❖ By segregation and separate treatment of saline stream & adoption of total biological treatment resulted in : Recovery of 2 tons of quality salt from every 10 tons of leather processed, reduction in sludge generation by 50%.
- ❖ Non-conventional energy generation compensate upto 70% of energy requirement of the effluent treatment plants.
- ❖ Challenging areas for continued R&D; Sustainable management of Total Dissolved Solids, Solid waste from tanneries and Sludge from effluent treatment plants.

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**THANK YOU**

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*Peacock - National Bird of India*



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