Innovative Membrane Technologies for Water Purification

International Workshop on Science, Technology, Innovation and Management for Water Sustainability (STIM-WS)

at

CSIR-NISTADS

by

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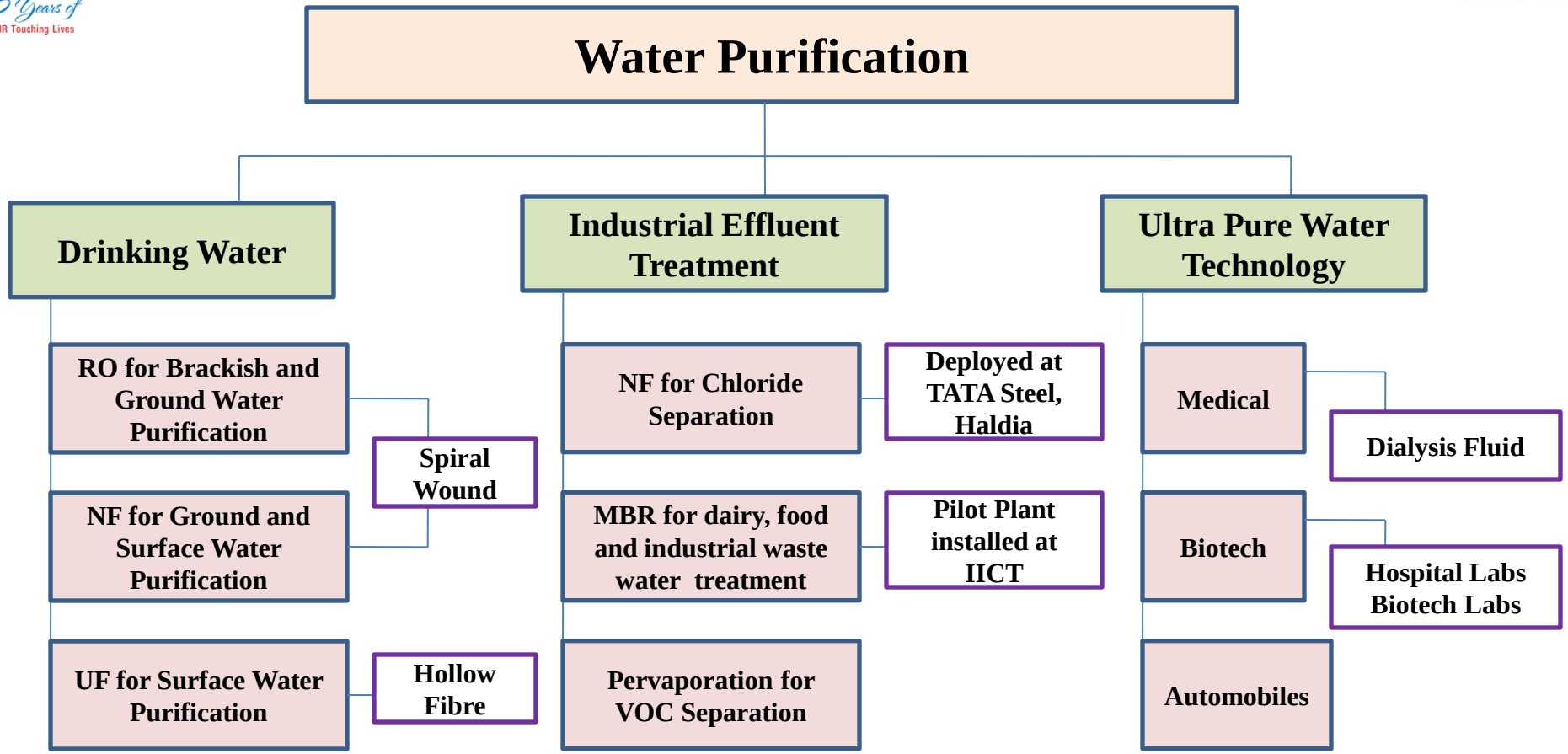
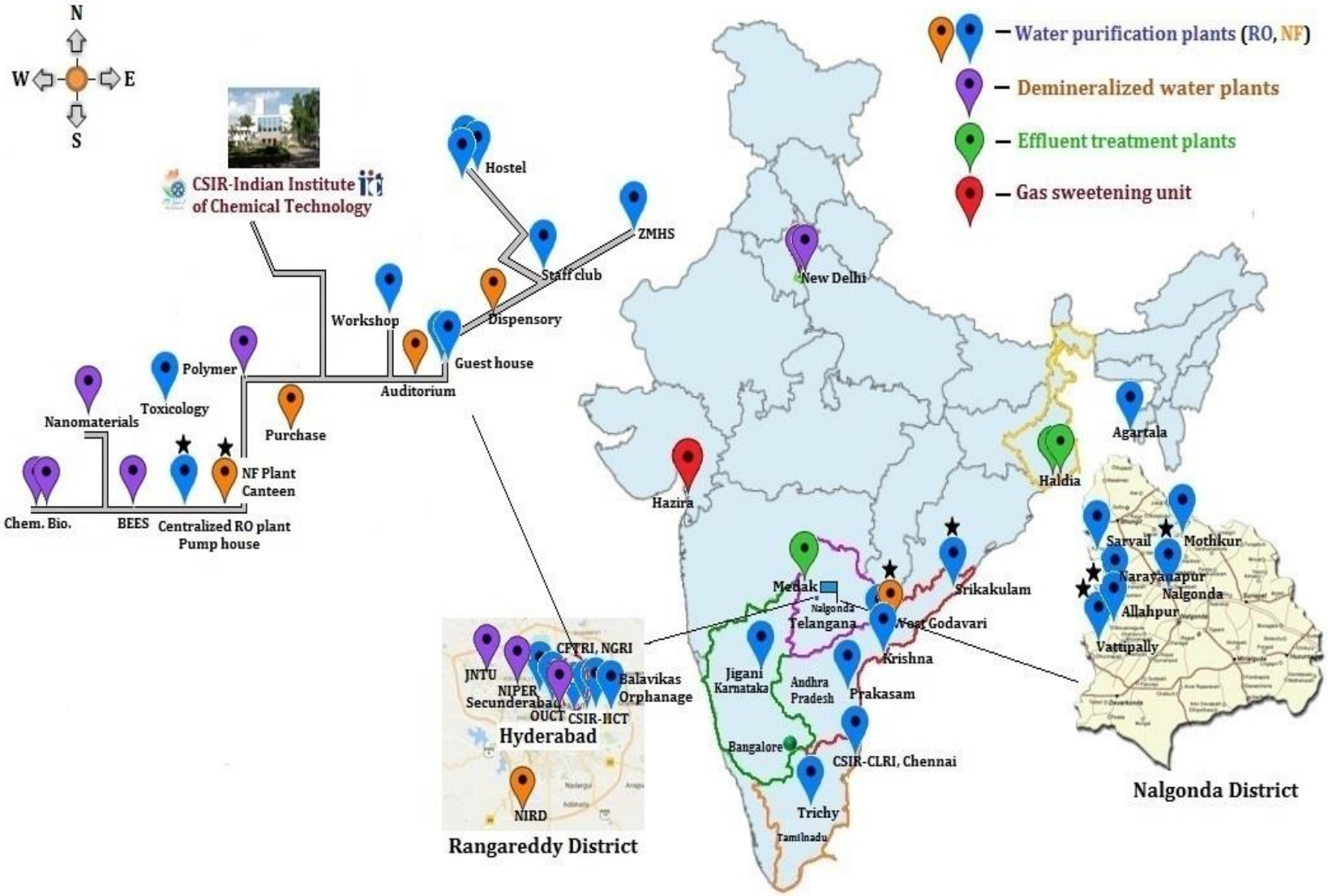
Our Vision


Water Purification
Drinking Water
Industrial Effluent Treatment
Ultra Pure Water Technology
RO for Brackish and Ground Water Purification
Spiral Wound
NF for Ground and Surface Water Purification
UF for Surface Water Purification
Hollow Fibre
NF for Chloride Separation
Deployed at TATA Steel, Haldia
MBR for dairy, food and industrial waste water treatment
Pilot Plant installed at IICT
Pervaporation for VOC Separation
Medical
Dialysis Fluid
Biotech
Hospital Labs Biotech Labs
Automobiles

OVERVIEW

- **RO for treatment of high TDS (700-1500 ppm) water**
- **NF for treatment of moderate TDS (300-600 ppm) water**
- **Cascaded RO unit for Demineralised water (0-2 ppm)**
- **NF plant for processing steel industrial effluent, 5000 L/h**
- **MBR of 500 L/h capacity for waste water treatment**
- **Spinneret device for production of haemodialysis hollow fibres**

CSIR-IICT's Deployments

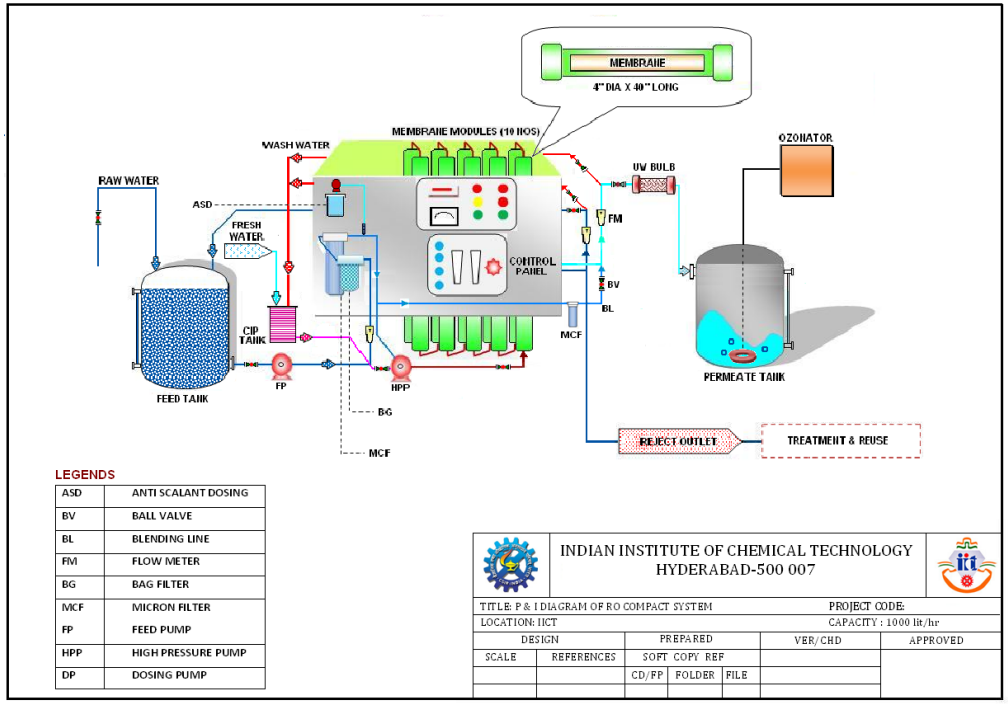


Pilot Plant at Mogallu village, West Godavari Dt.

Salient Features

- Indigenous RO/NF Membranes based on Hydrophilized Polyamide
- 40 Installations, Compact System Design, Easily Portable to Remote Villages
- TDS Reduction: 330 ppm to 57 ppm (NF), 830 to 90 ppm (RO)
- 6 Log Bacteria Reduction, Complete Turbidity Removal
- 1200 L/h Capex: Rs 5 Lacs ; Opex 3 - 5 Paise / L ; 00 LPH Rs 25000/-

Nanofiltration Technology for Water Purification



Schematic of NF plant Installed at Hyd Industrial Exhibition

- **1000 LPH capacity**
- **Indigenous Nanofiltration technology**
- **Served healthy water to 1.5 Lakh people**

Safe Water for Nalgonda Villages

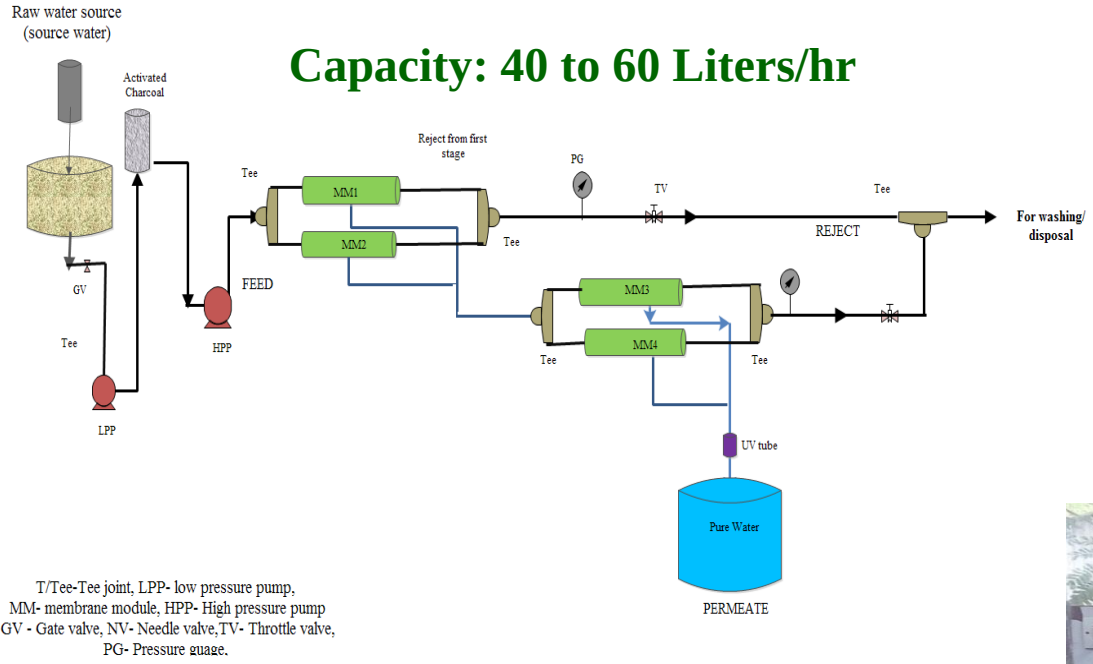
250 LPH Nanofiltration Plant installed at Jigani, Bangalore

Distribution of Water at Hyderabad Industrial Exhibition

Free Water Camp at NGRI Metro Station, Uppal Rd. , Hyderabad

Ultrapure (DM) Water for Medical & Biotech Applications

Capacity: 40 to 60 Liters/hr



T/Tee-Tee joint, LPP- low pressure pump,
MM- membrane module, HPP- High pressure pump
GV - Gate valve, NV- Needle valve,TV- Throttle valve,
PG- Pressure guage.

Advantages

- **Low cost (Rs. 40,000 only) & Highly Compact**
- **Multinational MilliQ or Sartorius cost Rs. 5 Lakhs**
- **Cost of Water Production: Paise 5 / Lit**
- **3 times higher capacity (50 L/h Versus 15 L/h)**
- **5 Successful Installations in IICT + NIPER + OU**
- **No maintenance (Millipore 1 lakh/Yr)**
- **Next Installation in CCMB, Gandhi Hospital**

Applications

- **Medical & Biotechnology**
- **Oligosynthesis (Cell Biology)**
- **Automobile Industry**

Features

- **Cascaded Membrane Assembly**
- **Polyether urea membrane**
- **0–2 ppm water TDS quality**

Hollow Fiber Membranes for Haemodialysis & Water Purification

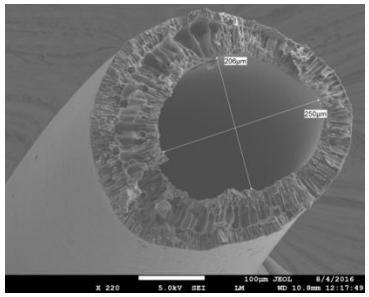
Photograph of Low Cost Indigenous Spinneret

Design of Novel Spinneret for Ultrafine Hollow Fibers

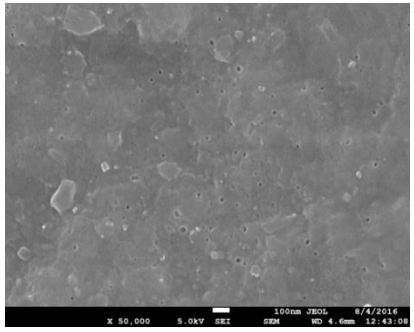
Manual Spinning Machine

(a) Haemodialysis
(450 µm OD, 250 ID)

(b) Water Purification
(1500 OD, 1000 µm ID)



End Cap



Potting with Epoxy

Membrane Module

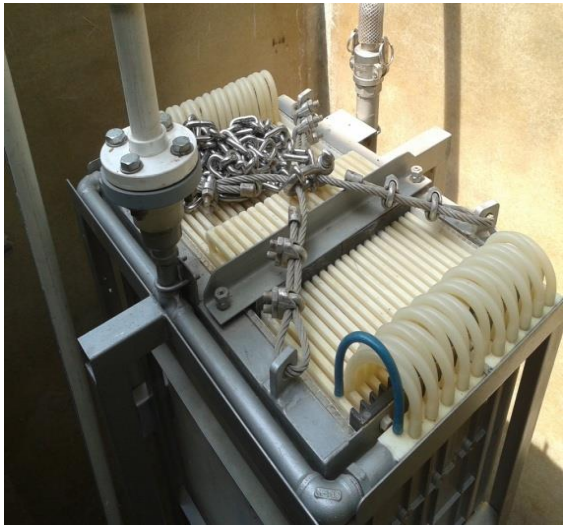
Activated Carbon Grafted Hollow Fiber, Composition: 15% PES+ 0.3% Activated Carbon in NMP

Industrial Effluent Treatment

Nanofiltration Pilot Plant of 5000 L/h Capacity for Separation of Chloride from TATA Steel Industrial Effluent

Effluent Source	Steel Quenching Tower
Location	Haldia Metcoke, W.B.
TDS Rejection	80%
Chloride Rejection	70% (2300 to < 800 ppm)
Water Recovery	75%

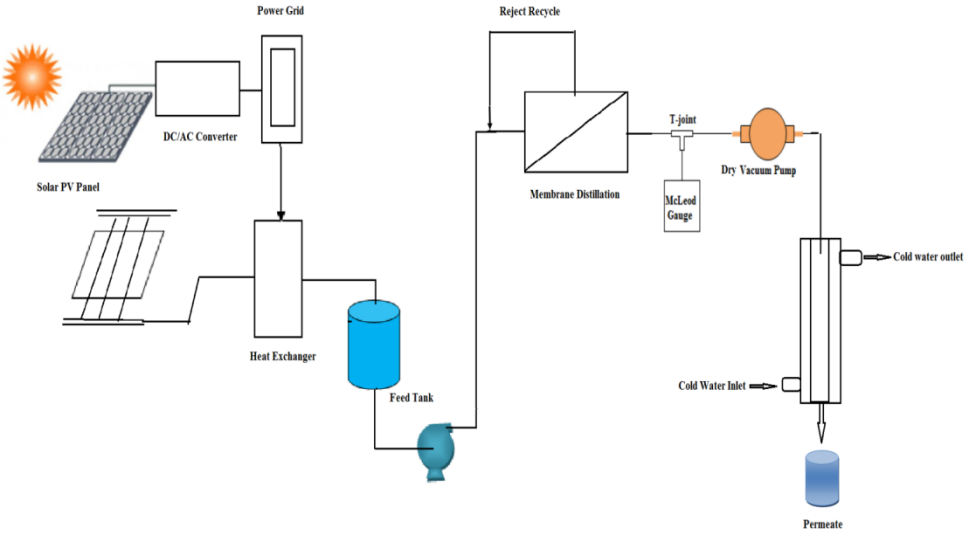
Membrane bioreactor (MBR) plant of 500 L/h capacity



- **Treatment of dairy, pharmaceutical and food industrial effluents.**
- **The process was able to reduce chemical oxygen demand (COD) to a large extent thereby meeting the safe discharge norms of wastewater into environment**
- **Recycling of major portion of the water.**
- **Aerobic MBR pilot system of 500 L/h capacity has been installed at IICT premises for treatment of pharmaceutical and food industry effluents.**

Future Plan of Work

- Installation UF-RO hybrid Plant at Srikakulam to remove pesticides, phenol, nephrotoxic metals (Hg, Cd, Pb) and excess hardness from ground water
- Proliferation of hollow fiber membranes for surface water purification & UF-NF or UF-RO integrated plants
- Solar driven membrane distillation for desalination of seawater



Solar Powered Membrane Distillation for Seawater

UF + RO Pilot Plant Dispatched to Srikakulam

THANK YOU