सत्यमेव जयते

जल शक्ति मंत्रालय
जल संसाधन, नदी विकास और गंगा संरक्षण विभाग
MINISTRY OF JAL SHAKTI
DEPARTMENT OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION

9th INDIA INTERNATIONAL WATER WEEK-2026

CLIMATE RESILIENT WATER MANAGEMENT

SEPTEMBER 22-26, 2026

IIWW

Innovative Sustainable ZLD Solution for 99% Clean Water and Resource Recovery from Wastewater

SED

Dr. RAJEEV NATH TIWARI

SPRAY ENGINEERING DEVICES LIMITED

VISION STATEMENT



Dedicated for Sustainable Environment Development to Unlock Perpetual Food and Energy Resources

ABOUT SPRAY ENGINEERING DEVICES

Year of Inception	**1992**
Nature of Business	Manufacturing, Designing, Process Engineering, Advisory, EPC, R&D
Type of Industry	Thermal Heat Recycling for Zero Carbon Emission in Sugar, Sugar Refinery, Wastewater, Jaggery, Biofuels, Ethanol & Distillery, Textiles, Dyeing, Pharmaceuticals
R & D Recognition	Department of Scientific & Industrial Research (DSIR), Government of India
IPRs	• Innovation Patents: 56+ • Design Patents: 60+ • Trademarks: 20+ • Copyrights: 15+
Global Presence	Projects overseas: 90+ India: 500+
Recognitions	**22+**
No. of Employees	**1550+**

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BUSINESS VERTICALS

SUGAR

Technologies & Products for Lowest Steam Demand in Sugar Plants

WATER

100% Water Recovery with ZLD & ZLI, Zero Emission of CO, CO_2.

BIOFUEL

Biomass to 2G Ethanol/ Biofuel with LanzaTech's Fermentation Technology

JAGGERY

Boiler less Sugarcane Processing for Jaggery Production, 100% Bagasse & 100% Water Saving, Zero Carbon Emission

PRODUCT CONCENTRATION

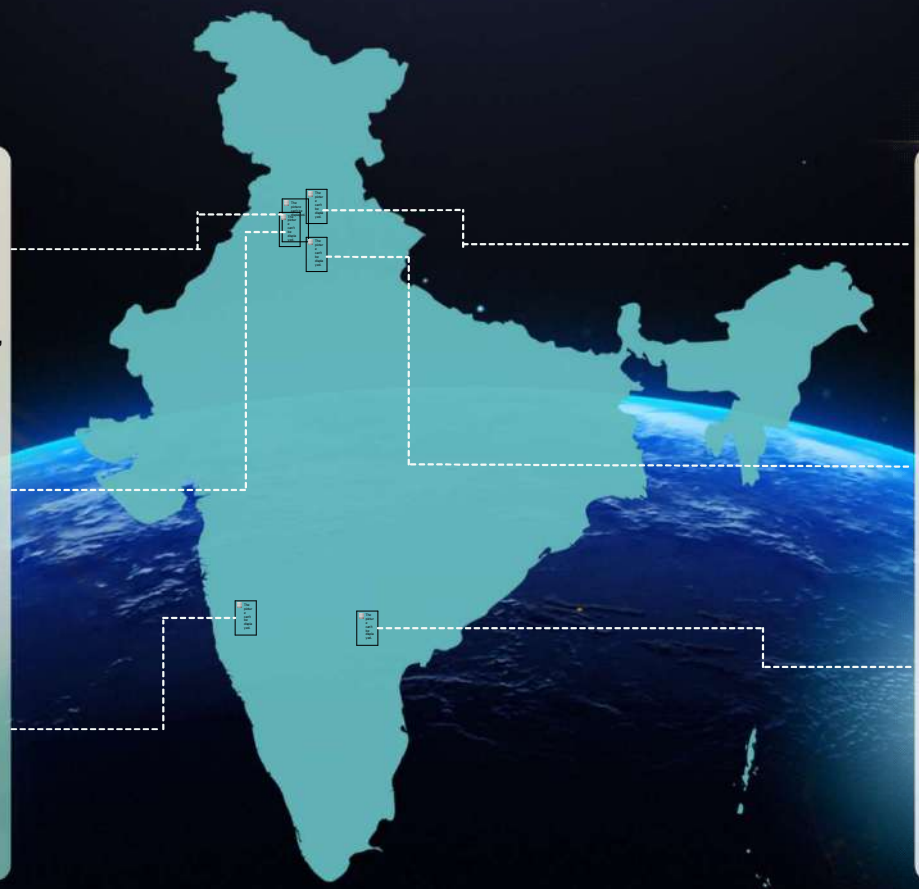
Advanced evaporation systems for energy-efficient concentration of milk powder, juice, salts, liquid glucose, and recycled solvents

ENGINEERING SERVICES

Innovative Technological Solution and advices for energy efficiency to achieve net zero emission

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OUR OFFICES



CHANDIGARH

REGISTERED OFFICE

SCO No. 107, 2nd Floor, Sector 47-C, Chandigarh - 160047

MOHALI

CORPORATE OFFICE

SED, **SPRAY HOUSE**, C-82, I.A., Phase-7, SAS Nagar, Mohali - 160055, Punjab

PUNE

BRANCH OFFICE

BADDI

MANUFACTURING PLANTS

Unit-I, II & III, Baddi, Himachal Pradesh

NOIDA

BRANCH OFFICE

BIDER

JAGGERY R&D UNIT

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INTELLECTUAL PROPERTIES

(Registered - IPRs Granted for Various Innovations)

56+
Innovation Patents

60+
Design Patents

22+
Trademarks

16+
Copyrights

- India
- USA
- Australia
- Japan
- China
- Russia
- Mexico
- Cuba
- Pakistan
- Malaysia
- South Africa
- Thailand
- Vietnam
- Singapore

European Patent (EPO) includes 39 countries

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GLOBAL PRESENCE

40+ Countries

320+ Water Projects



African Region

- Metahara Sugar Ethopia
- White Nile, Sudan
- Golden Sugar Refinery, Nigeria
- Nzoia Sugar, Kenya
- Dangote Sugar Refinery, Nigeria
- Gledhow Sugar, South Africa

- **Lousiana Sugar Refinery, USA**

Brazil

- Cruz Alta
- Santos
- Usina Sao Jose

India

- Gokul Mauli Sugars
- Venkatesh Krupa Sugar
- Vitthal Refined Sugar
- Dhanalakshmi Sugar
- IPL Sugar Group
- Dalmia Bharat Sugar
- Bajaj Sugar Group
- DCM Shriram Group
- Triveni Sugar Group
- EID-Parry Group
- Balrampur Sugar
- NSL Group

Pakistan

- Madina Enterprises
- Ramzan Sugar
- Al-Abbas Sugar
- RYK Mills
- Kashmir Sugar etc.

- **Pfeifer & Langen Polska, SA, Poland**
- **MITR Phol Group, Thailand**
- **Al-Khaleej Sugar Co., Dubai**
- **PT DUS Sugar Refinery, Indonesia**

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MVR BASED LTE®



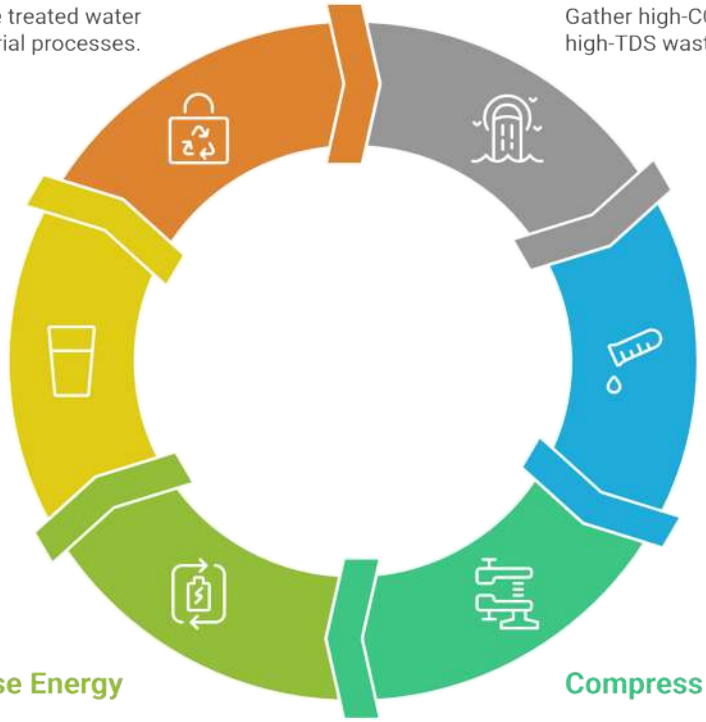
- Avoid Fuel Burning for Zero Emission
- Adopt Thermal Waste Heat Recycling
- Up to 99% Water & Resource Recovery

LTE® : LOW TEMPERATURE EVAPORATOR
MVR : MECHANICAL VAPOUR RECOMPRESSION

- Low Carbon Footprint
- Higher Water Recovery Rate
- Reduced CAPEX
- Low Temperature Operations
- Innovative Heat Recovery System

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MVR BASED LTE®



Recycle Water

Reuse the treated water in industrial processes.

Collect Effluent

Gather high-COD and high-TDS wastewater.

Evaporate at Low Temperature

Use LTE® to evaporate water at low temperatures.

Compress Vapour

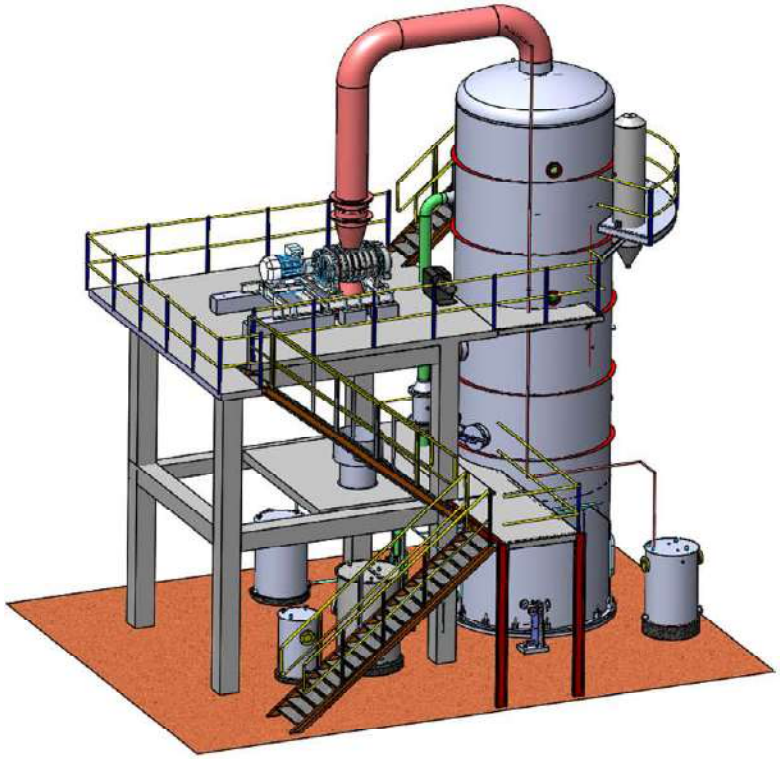
Compress the evaporated vapour to increase energy.

Reuse Energy

Use the compressed vapour's energy to heat more effluent.

Condense Vapour

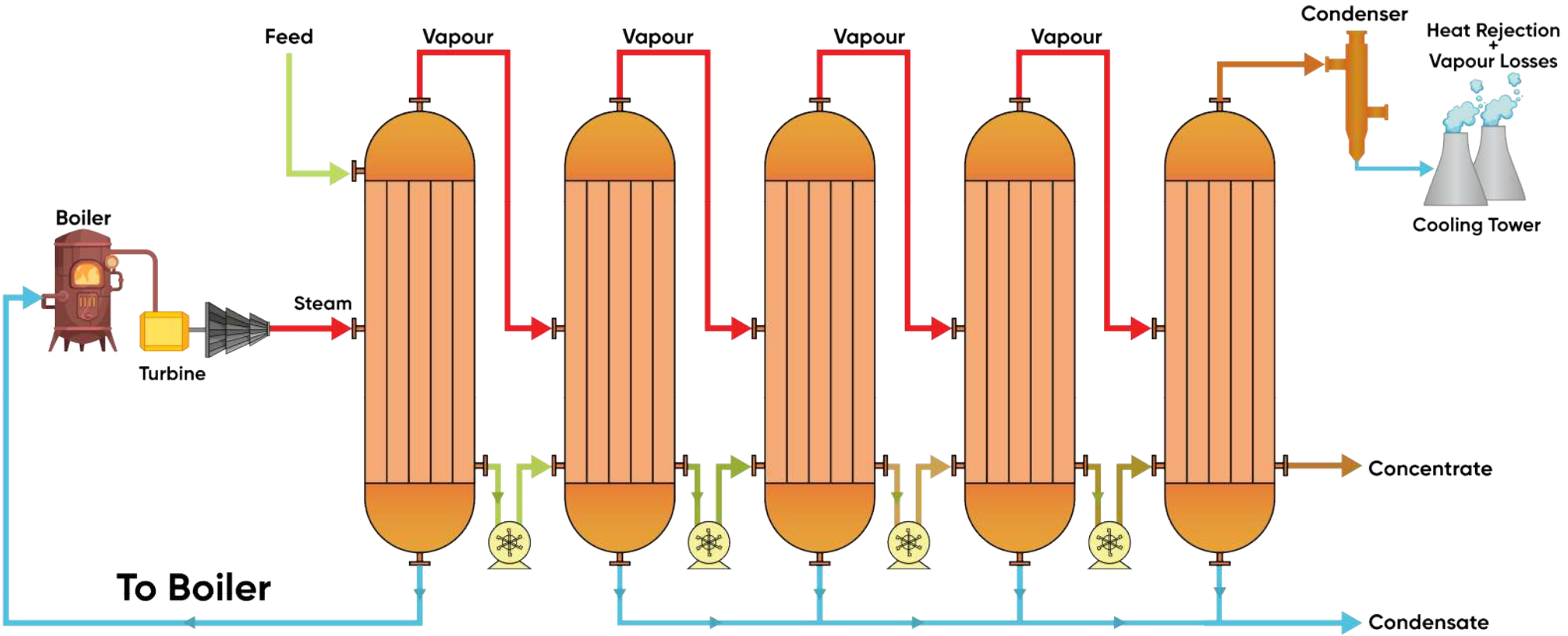
Condense the vapour back into water for reuse.



LTE® : LOW TEMPERATURE EVAPORATION TECHNOLOGY
MVR : MECHANICAL VAPOUR RECOMPRESSION

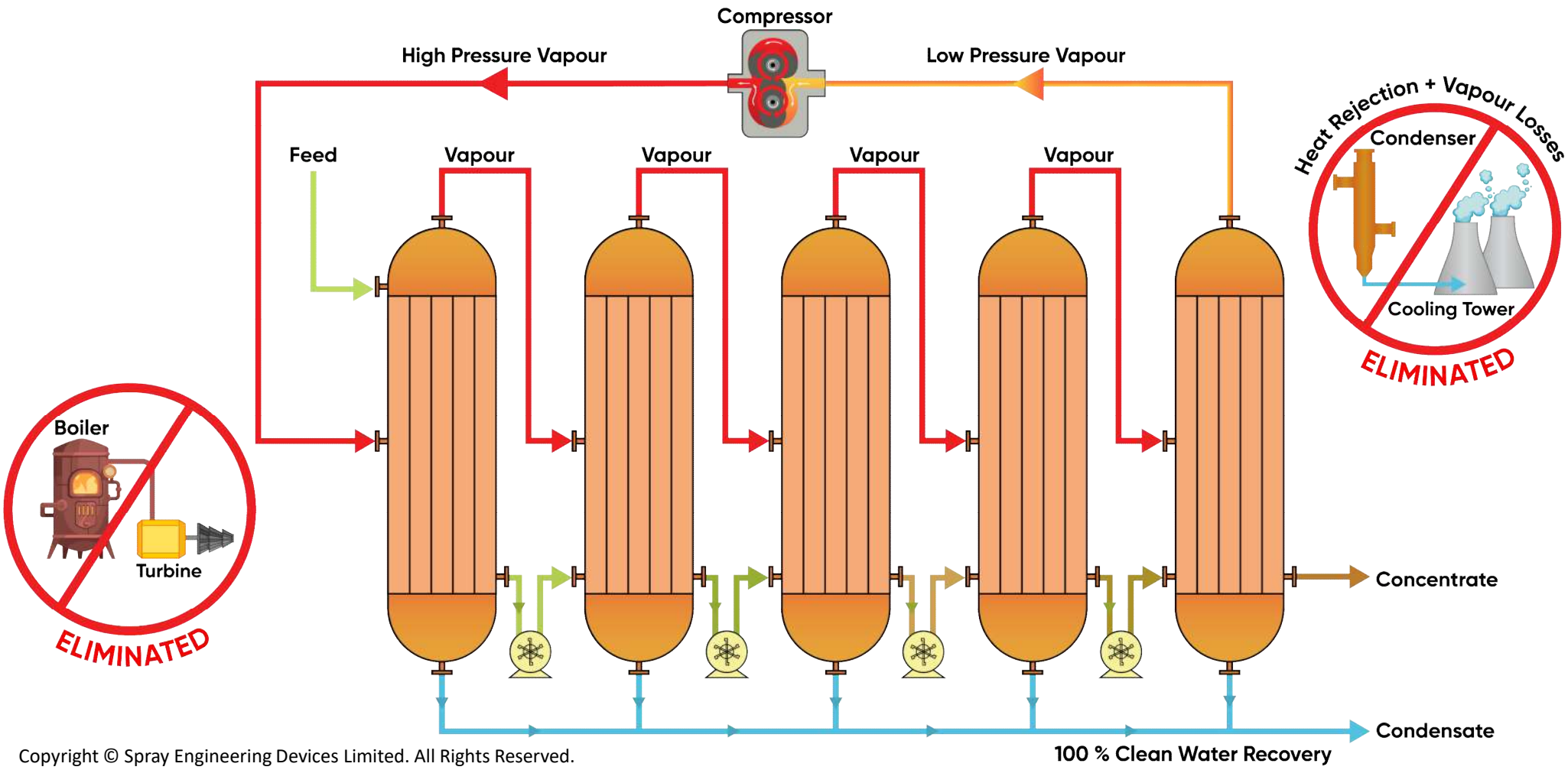
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CURRENT EVAPORATION SCENARIO



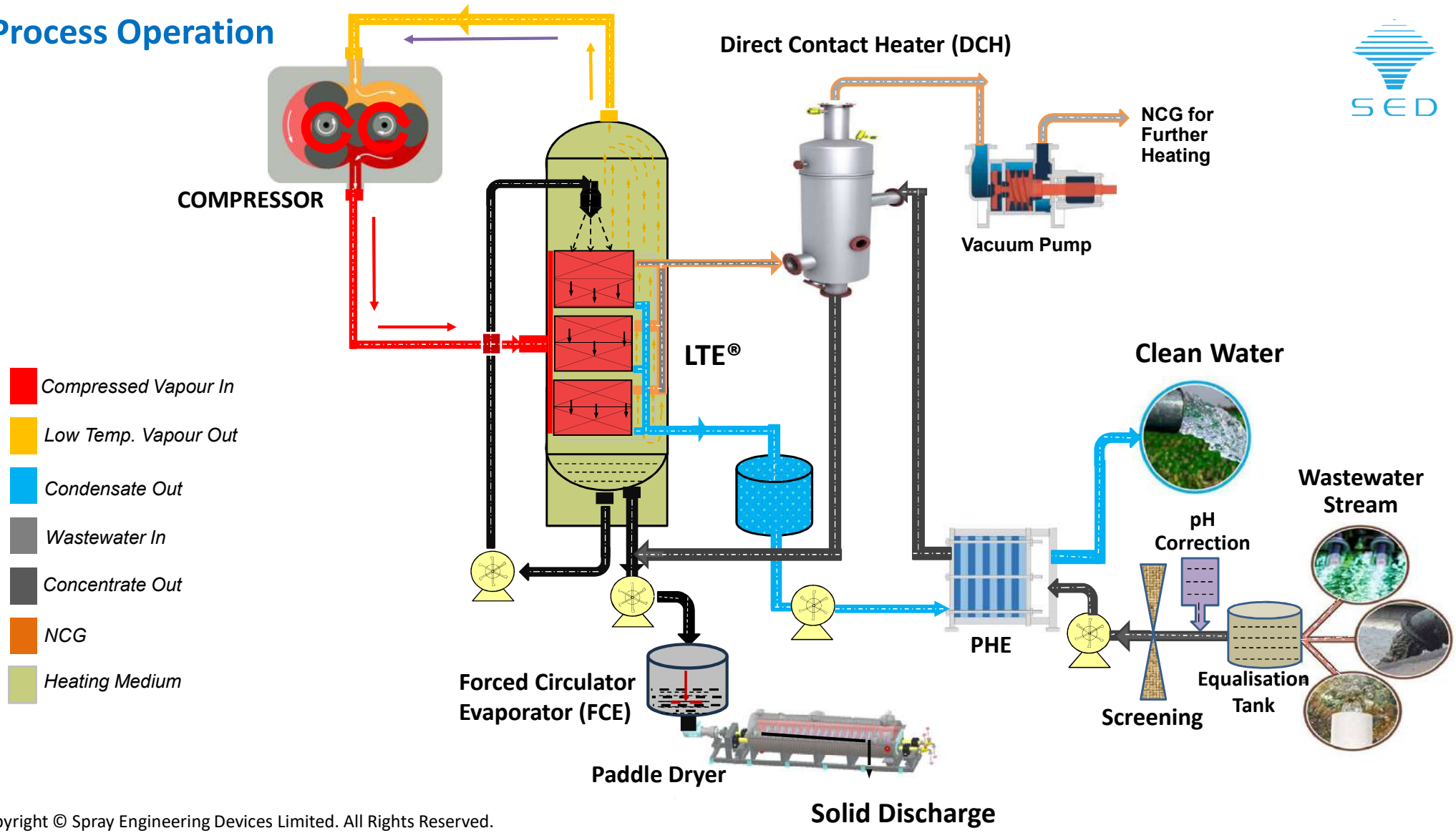
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MVR BASED EVAPORATION SCENARIO

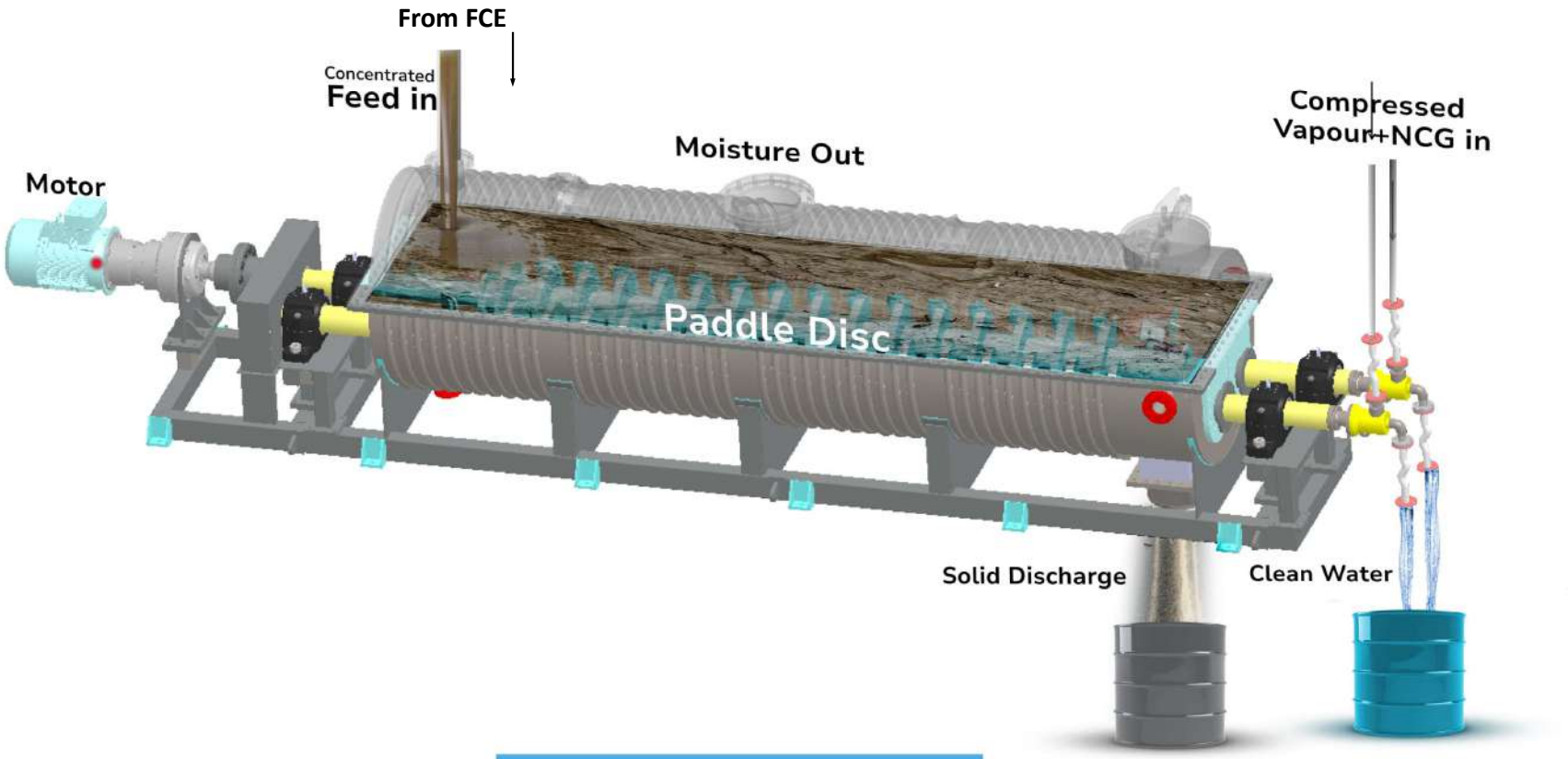


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Process Operation



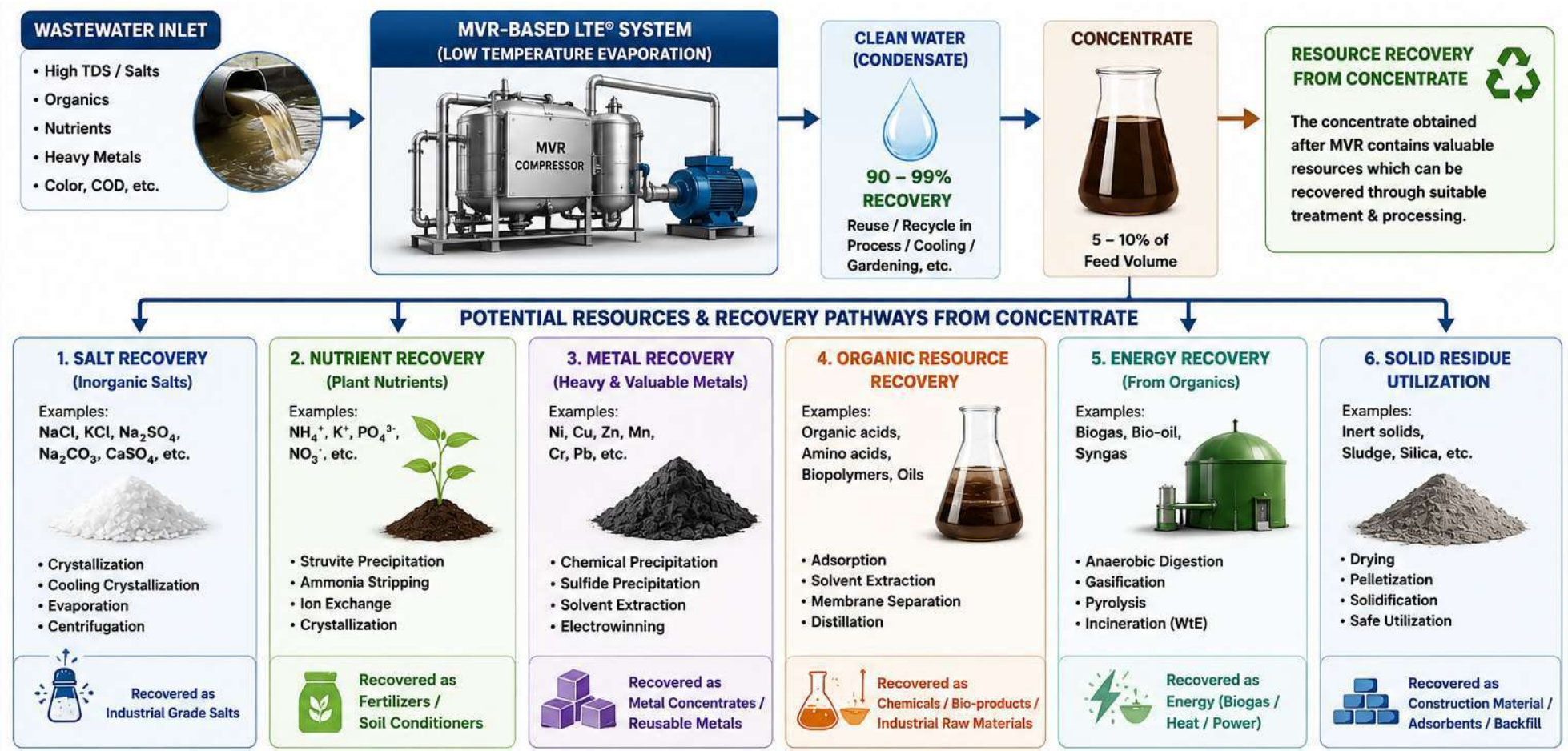
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PADDLE DRYER

www.sprayengineering.com

RESOURCE RECOVERY FROM WATEWATER CONCENTRATE



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MAJOR TAKEAWAYS OF LTE® TECHNOLOGY-USP'S



No Heat Generator and Rejector



No Reverse Osmosis



Water Recovery up to 99%



Lowest Water Recovery Cost



Lowest Carbon Footprint



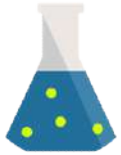
Most Effective Water Management Solution



Minimised Sludge Handling



Direct Wastewater to Cleanwater in Single Step



No Chemical Treatment in Process



Closed Loop, Robust & Automatic

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ADVANTAGES OF LTE®



High Water Recovery
Up to 99% recovery, significantly reducing dependence on fresh and groundwater.

Automation-Driven
PLC & VFD controlled system reduces human intervention and errors

Retrofit Ready & Compact Footprint
Easily integrates with existing plant infrastructure & Requires only ~1/3rd space of traditional evaporators.

Industry Versatile
Proven across chemical, pharma, textile, and allied sectors.

Sustainable Operation & One-Step ZLD
Boiler-free system with near-zero carbon emissions & Minimal pre-treatment with complete zero liquid discharge.

High Uptime
Reduced CIP requirements ensure more continuous operation.

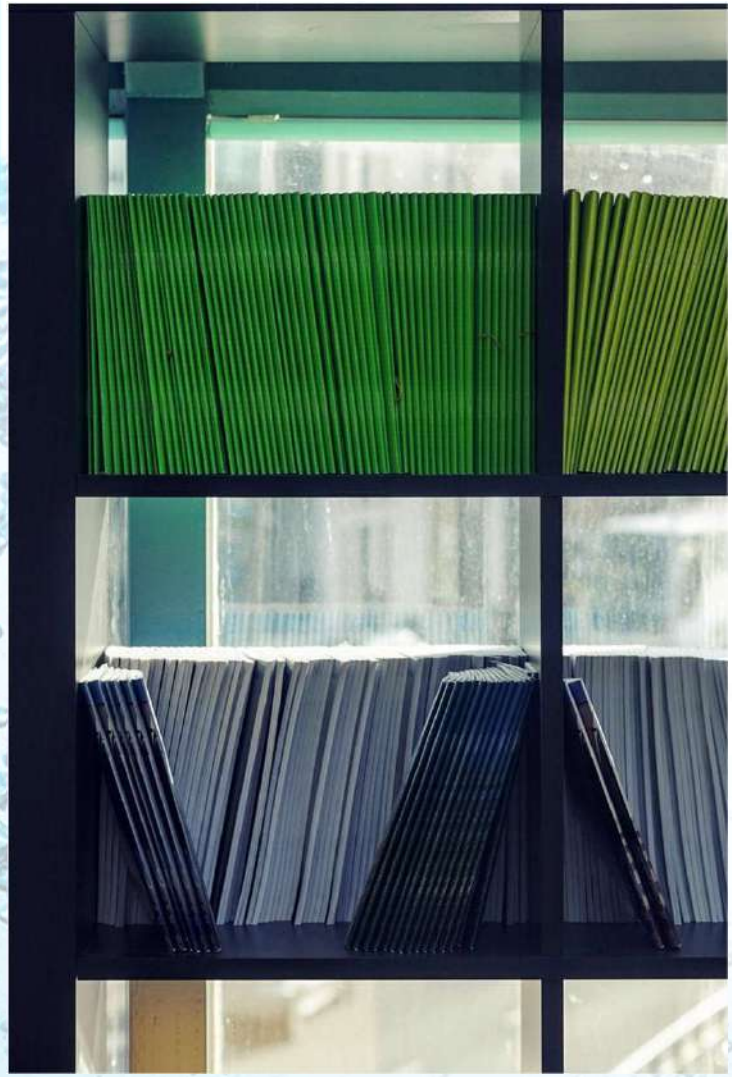
Low-Temperature Evaporation
Minimizes scaling and enhances system longevity.

Resource Recovery
Supports circular economy through water and resource reuse.

Fast ROI
High efficiency with low maintenance; payback within 1.5 years.

Feed Flexibility
Efficiently handles diverse streams like Process Effluent, RO reject and ETP discharge.

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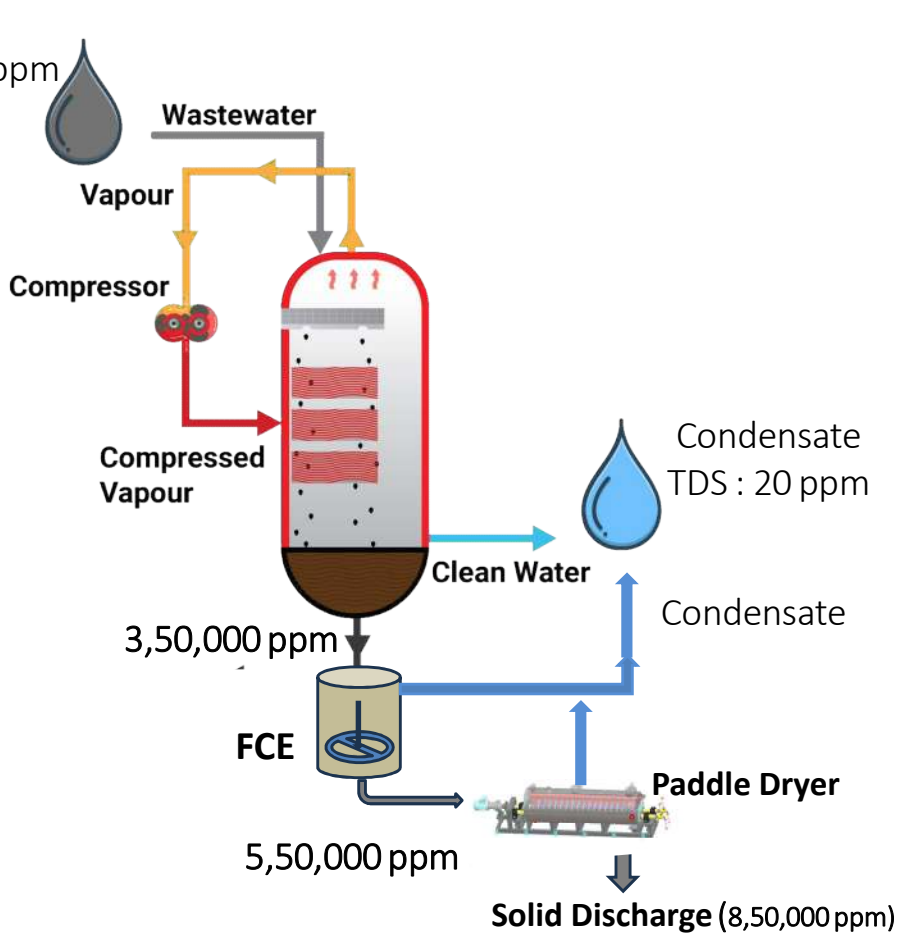
Case Studies (370+ MVR based Low Temperature Evaporators for Wastewater and Heat Recovery)

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KANDHARI BEVERAGES (A UNIT OF COCA COLA), J&K

Product Capacity	:	13 m³/h
Average Water Recovery	:	98%
Power Consumption	:	13 kW-h/m³





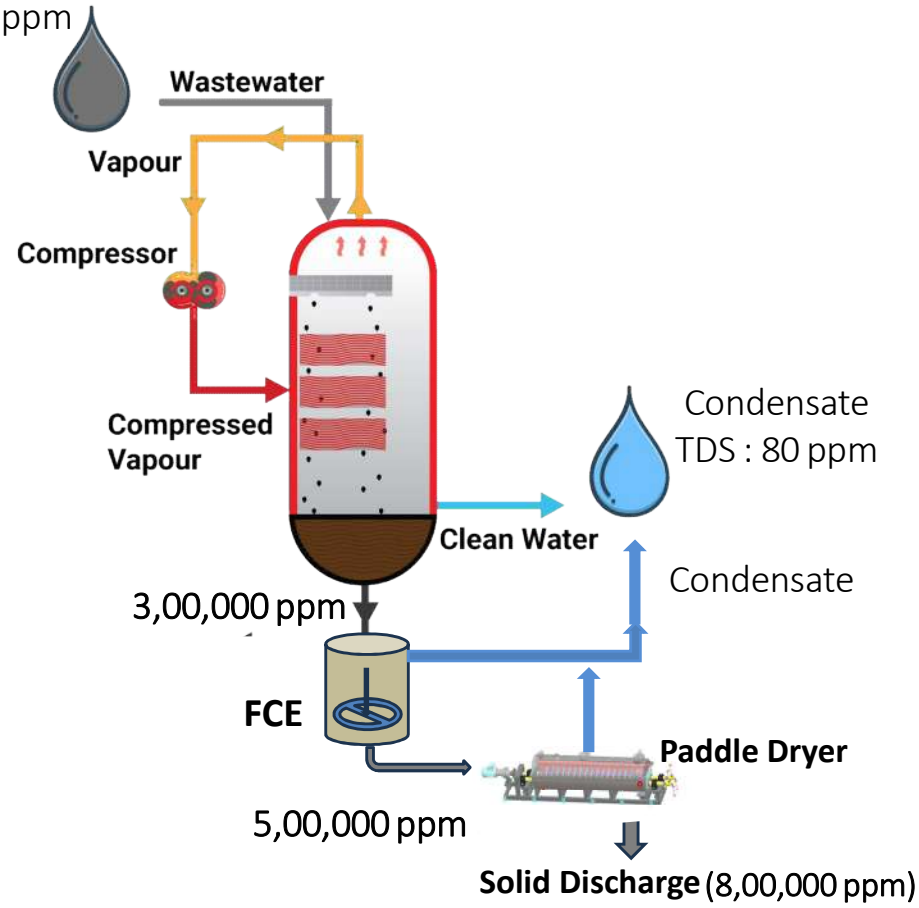
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VRINDAVAN AGRO PLANT, CHATA, VRINDAVAN, UP

Product Capacity	:	20 m³/h
Average Water Recovery	:	85%
Power Consumption	:	22 kW-h/m³

pH : 7.5-8.0
TDS : 100000 ppm



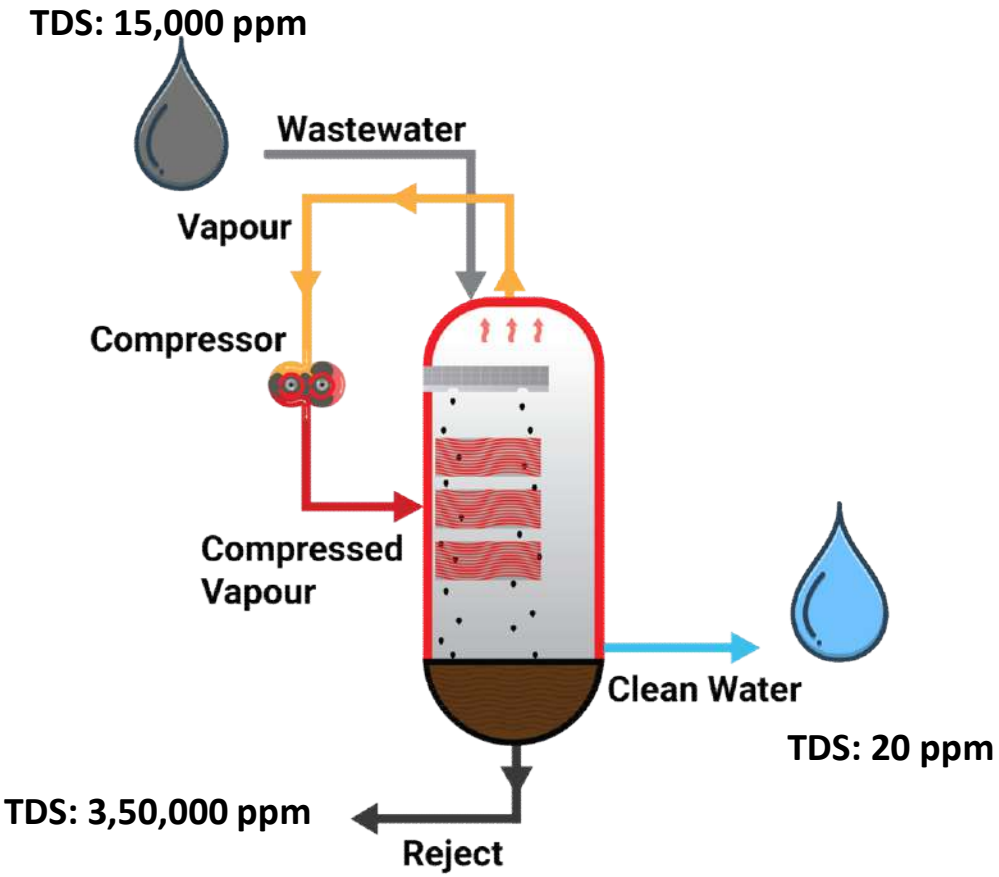


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ENRICH AGRO FOOD PRODUCTS LTD. (COCA-COLA INDIA FBO), GURGOAN, HARYANA

Plant Capacity	:	**7.0 m^3/h**
Condensate Recovery	:	**95%**
Power Consumption	:	**18 kW-h/m^3**





CAUSTIC RECOVERY PLANT



Project Name	:	Vaibhav Processing Mills Pvt. Ltd.
Location	:	Erode, Tamil Nadu
Industry Type	:	Processing Industry
Equipment installed	:	Low Temperature Evaporator
Capacity	:	5 Ton/h
Inlet Feed	:	Caustic Recovery



RAW EFFLUENT (FEED)



RECOVERED WATER (CONDENSATE)



CONCENTRATE (PRODUCT)

Parameter	Feed	Condensate	Reject
TDS (ppm)	120000	30	605000

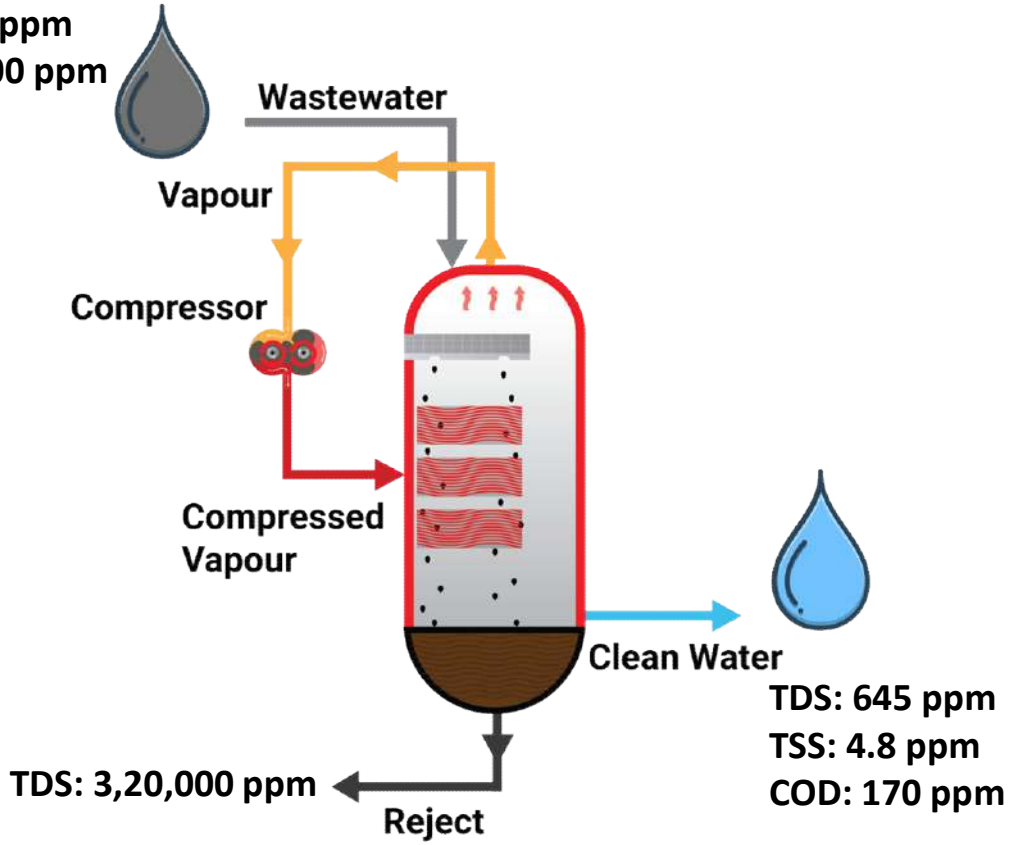
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MSW LEACHATE-RAMKY INFRASTRUCTURE, HYDERABAD

Plant Capacity	**: 84 m^3/h**
Repeat Order Capacity	**: 8 m^3/h, 25m^3/h, 8 m^3/h & 3 m^3/h**
Condensate Recovery	**: 97%**
Power Consumption	**: 15-16 kW-h/m^3**



TDS: 20,300 ppm
TSS: 1,875 ppm
COD: 26,700 ppm

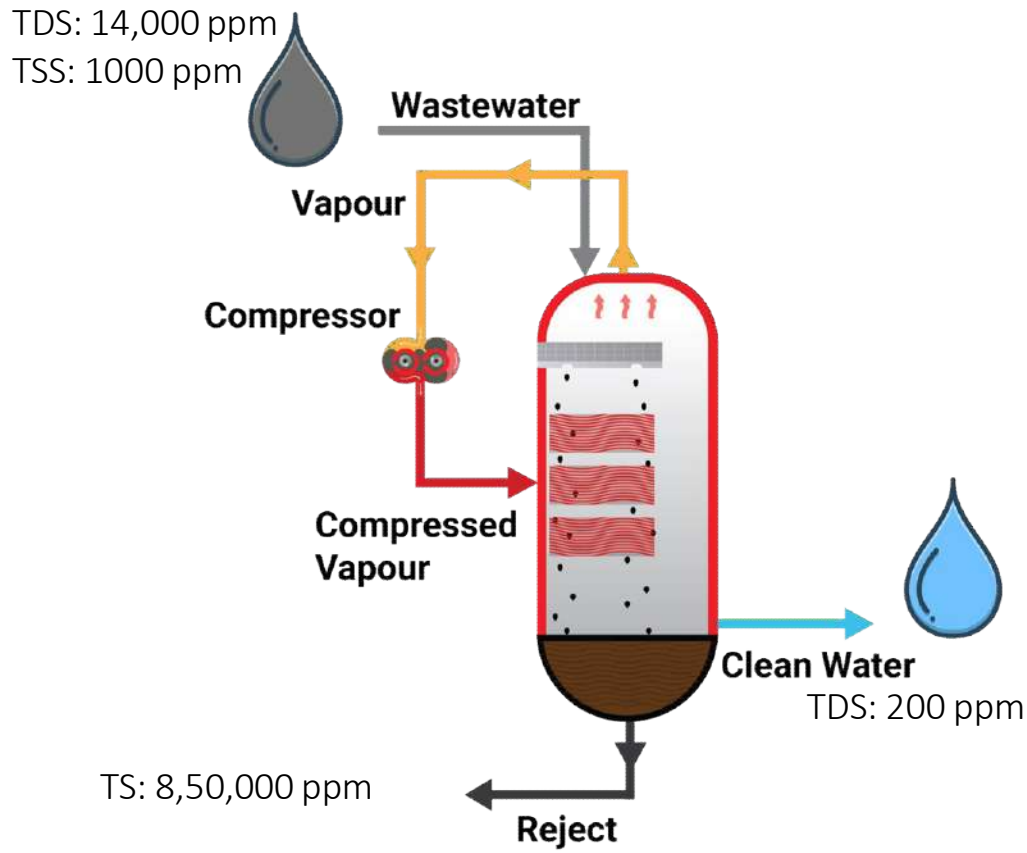


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HEUBACH PIGMENTS PVT LTD, GUJARAT

Plant Capacity	:	17.5 m³/h
Condensate Recovery	:	> 95%
Power Consumption	:	28-32 kW-h/m³



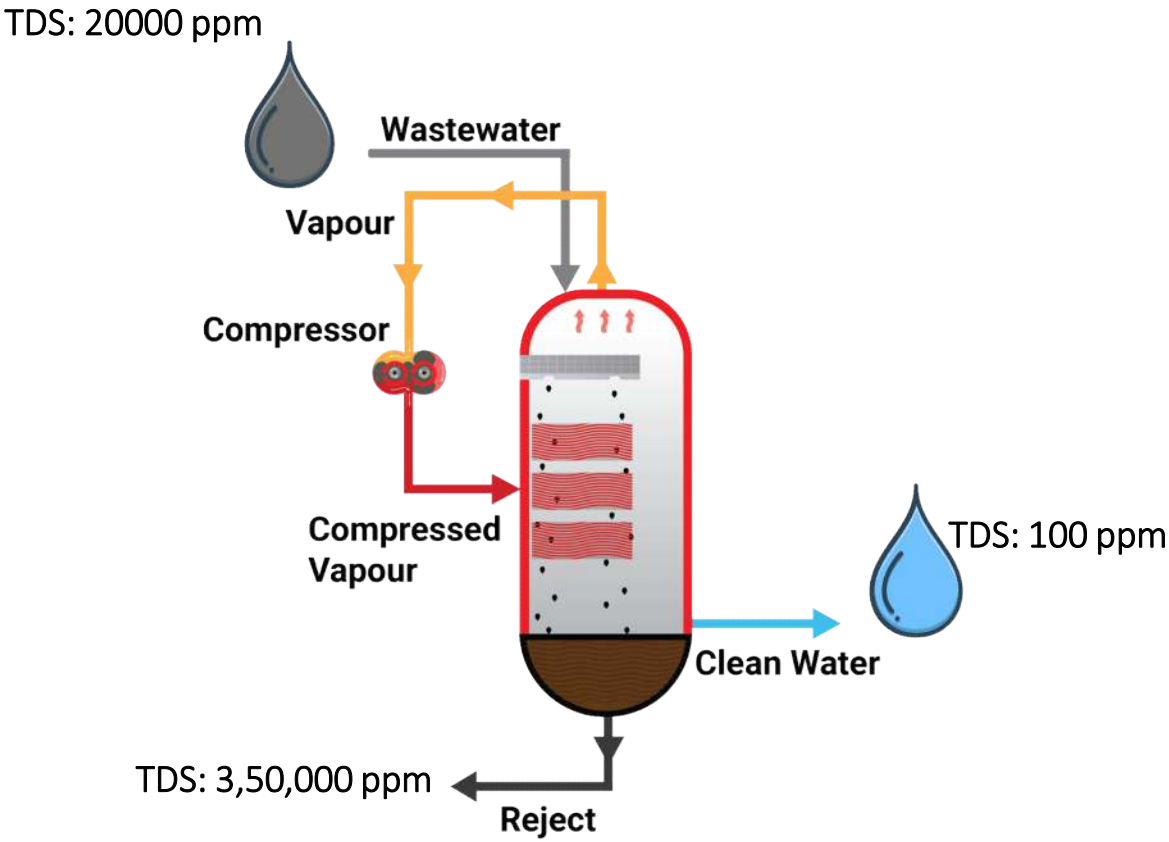


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HERO CYCLES

Product Capacity	:	2.5 m^3/h
Condensate Recovery	:	95%
Power Consumption	:	18 to 20 kW-h/m^3



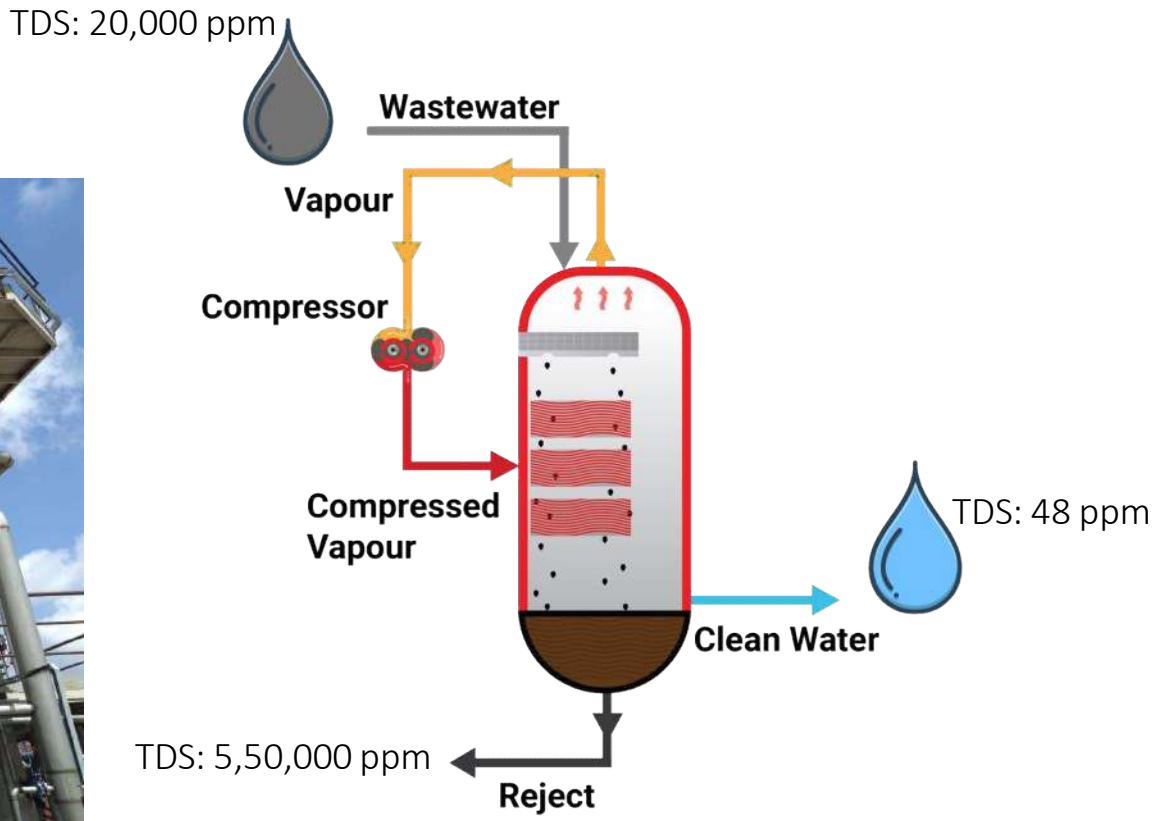


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UNITED BREWERIES LTD., BENGALURU

Product Capacity	:	6 m³/h
Repeat Order Capacity	:	6 m³/h & 6 m³/h
Condensate Recovery	:	95%
Power Consumption	:	19-20 kW-h/m³





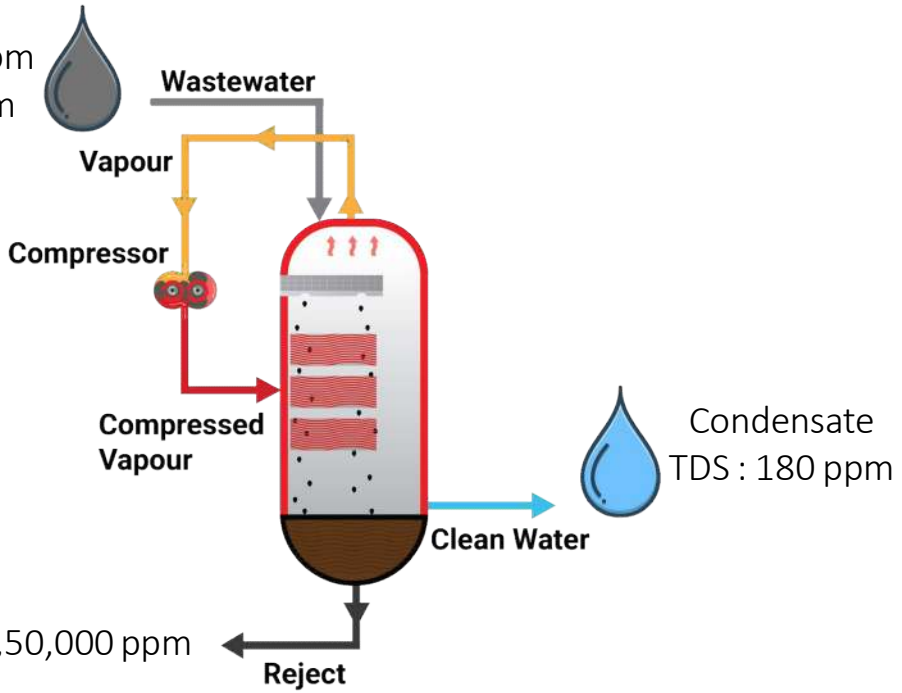
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BAYER VAPI, GUJARAT

Product Capacity	:	1 m³/h
Repeat Order Capacity	:	15 m³/h
Average Water Recovery	:	60-70%
Power Consumption	:	20-22 kW-h/m³



pH : 7.5-9.5
TDS : 1,80,000 ppm
COD : 25,000 ppm



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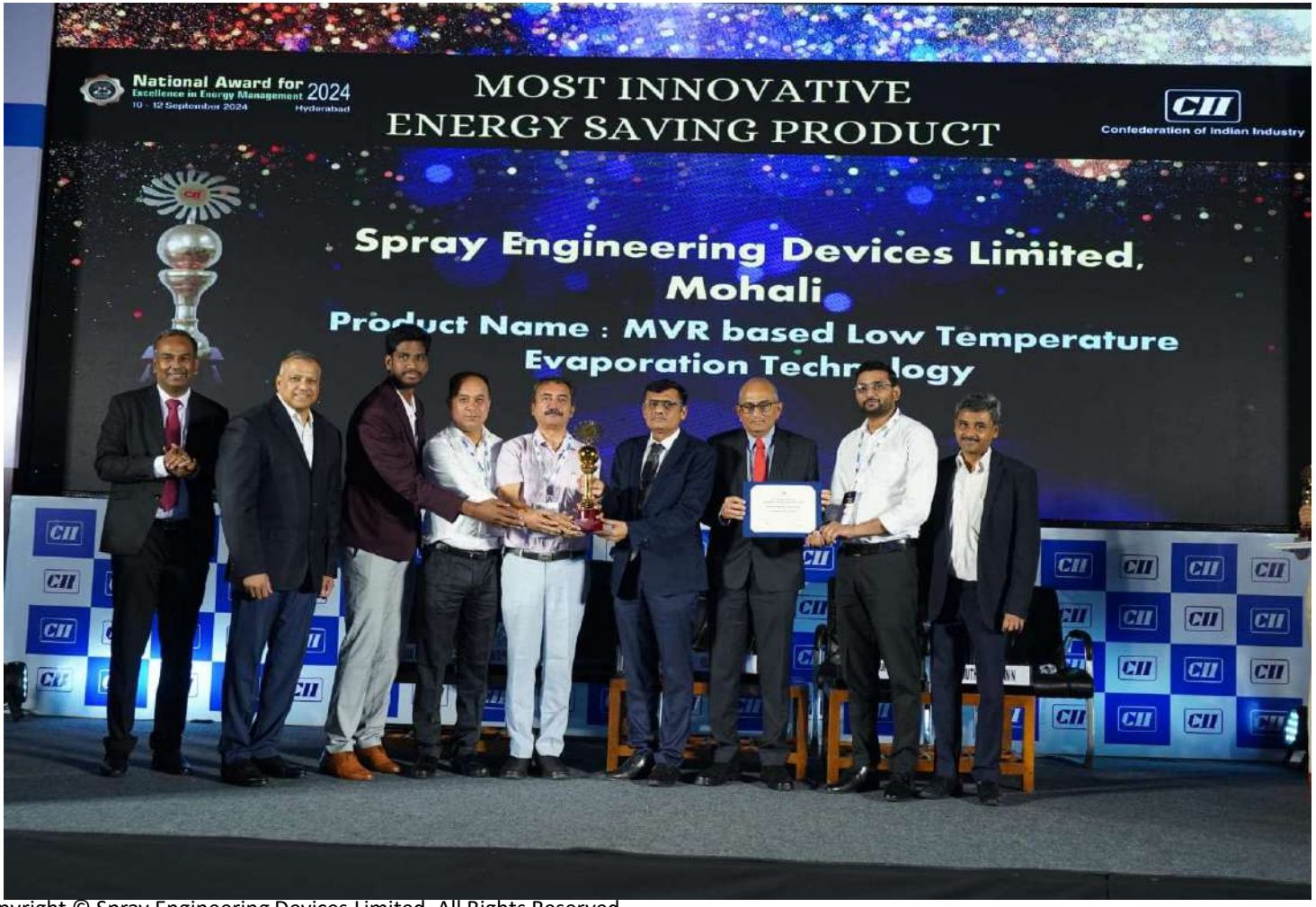
CII-INDUSTRIAL INNOVATION AWARDS-2025 : TOP 50 INNOVATIVE COMPANY IN INDIA





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CII-NATIONAL AWARD FOR EXCELLENCE IN ENERGY MANAGEMENT-2024





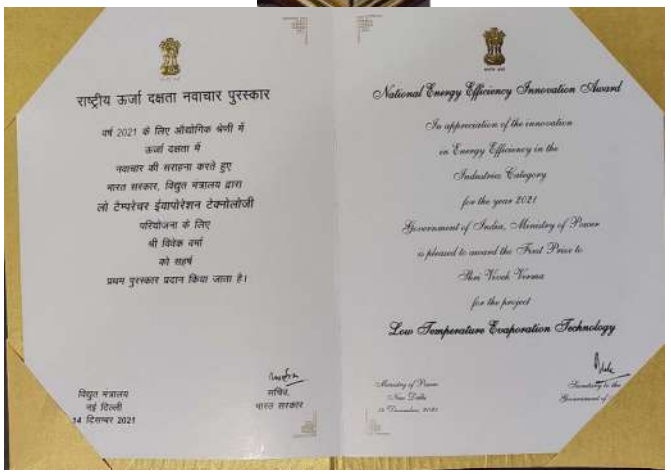


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NATIONAL ENERGY EFFICIENCY INNOVATION AWARD-2021






राष्ट्रीय ऊर्जा दक्षता नवाचार पुरस्कार

वर्ष 2021 के लिए औद्योगिक श्रेणी में
ऊर्जा दक्षता में
नवाचार की सराहना करते हुए
भारत सरकार, विद्युत मंत्रालय द्वारा
लो टेम्परेचर इवापोरेशन टेक्नोलोजी
परियोजना के लिए
श्री विवेक वर्मा
को सादर
प्रथम पुरस्कार प्रदान किया जाता है।

विद्युत मंत्रालय
नई दिल्ली
14 दिसम्बर 2021

सचिव
भारत सरकार

National Energy Efficiency Innovation Award

In appreciation of the innovation
on Energy Efficiency in the
Industries Category
for the year 2021
Government of India, Ministry of Power
is pleased to award the First Prize to
Shri Vivek Verma
for the project
Low Temperature Evaporation Technology

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CSIR DIAMOND JUBILEE TECHNOLOGY AWARD-2020





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PATENTS FOR MVR BASED LTE® TECHNOLOGY



MALAYSIA

CERTIFICATE OF GRANT OF A PATENT

In accordance with Section 31 (2) of the Patents Act 1983 a patent for an invention having grant number MY-204917-A has been granted in respect of an invention having the following particulars:

TITLE : METHOD, PROCESS AND APPARATUS FOR THE VERY LOW TEMPERATURE EVAPORATION SYSTEM

FILING DATE : 13 MARCH 2020

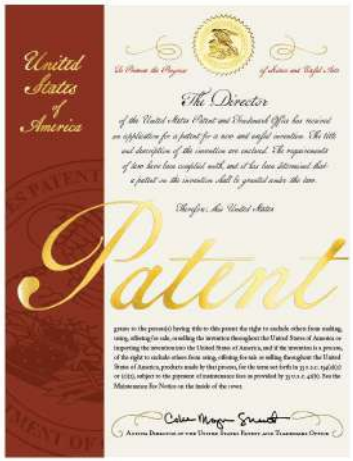
PRIORITY DATE : 14 MARCH 2019

PATENT OWNER : VERMA, VIVEK
SPRAY ENGINEERING DEVICES LIMITED
SPRAY HOUSE, C-62, INDUSTRIAL AREA PHASE 7
SAS NAGAR MOHALI 160055
INDIA

NAME OF INVENTOR : VERMA, VIVEK

DATE OF GRANT : 22 SEPTEMBER 2024

Dated this 22 day of SEPTEMBER 2024



United States of America

The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, the United States

Patent



REPUBLIC OF SINGAPORE
THE PATENTS ACT 1994
CERTIFICATE ISSUED UNDER SECTION 35

I HEREBY CERTIFY that under the provisions of the Patents Act, a patent has been granted in respect of an invention having the following particulars:

TITLE : METHOD, PROCESS AND APPARATUS FOR THE VERY LOW TEMPERATURE EVAPORATION SYSTEM

APPLICATION NUMBER / PATENT NUMBER : 11202110048P

DATE OF FILING : 13 MARCH 2020

PRIORITY DATA : 14 MARCH 2019 - PATENT APPLICATION NO. 201911010031 (INDIA)

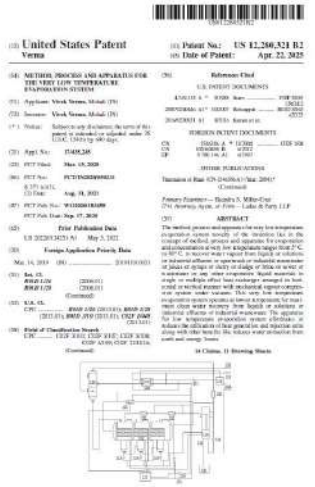
NAME OF INVENTOR (S) : VERMA, VIVEK

NAME(S) AND ADDRESS(ES) OF PROPRIETOR(S) OF PATENT : VERMA, VIVEK
SPRAY ENGINEERING DEVICES LIMITED SPRAY HOUSE, C-62, INDUSTRIAL AREA PHASE 7, SAS NAGAR MOHALI 160055
INDIA

DATE OF GRANT : 18 JULY 2024

DATED THIS 18TH DAY OF JULY 2024

Mrs. Rena Lee
Registrar of Patents
Singapore



(12) United States Patent
Verma

(10) Patent No.: US 12,280,321 B2
(45) Date of Patent: Apr. 22, 2025

(54) METHOD, PROCESS AND APPARATUS FOR THE VERY LOW TEMPERATURE EVAPORATION SYSTEM

(71) Applicant: Vivek Verma, Mohali (IN)

(72) Inventor: Vivek Verma, Mohali (IN)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 680 days.

(21) Appl. No.: 17/405,245

(22) PCT Filed: Mar. 13, 2020

(86) PCT No.: PCT/IN2020/050231
§ 371 (c)(1),
(2) Date: Aug. 31, 2021

(87) PCT Pub. No.: WO2020/183489
PCT Pub. Date: Sep. 17, 2020

(65) Prior Publication Data
US 2022/0235451 A1 May 5, 2022

(30) Foreign Application Priority Data
Mar. 14, 2019 (IN) 201911010031

(51) Int. Cl.
B01D 1/26 (2006.01)
B01D 1/28 (2006.01)
B01D 1/29 (2006.01)

(52) U.S. Cl.
CPC B01D 1/26 (2013.01); B01D 1/28 (2013.01); B01D 1/29 (2013.01); C02F 1/047 (2013.01); C02F 2103/08 (2013.01)

(58) Field of Classification Search
CPC C02F 1/047; C02F 2103/08; B01D 1/26; B01D 1/28; B01D 1/29; B01D 3/065; B01D 3/10; B01D 3/14
(Continued)

(56) References Cited
U.S. PATENT DOCUMENTS
FOREIGN PATENT DOCUMENTS
OTHER PUBLICATIONS
(Continued)

Primary Examiner — Shondrea S. Miller-Cruz
(74) Attorney, Agent, or Firm — Lalka & Parry LLP

(57) ABSTRACT

14 Claims, 11 Drawing Sheets

International application No.
PCT/IN2020/050231

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-10	YES
	Claims	None	NO
Inventive step (IS)	Claims	1-10	YES
	Claims	None	NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims	None	NO

Written Opinion of International Searching Authority for our International Patent Application No. : PCT/IN2020/050231

Granted Patent in India, USA, Singapore, Malaysia, Mexico and European Patent Office (Includes 39 Countries)

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VISIT OF THE HONOURABLE MINISTER SHRI GAJENDRA SINGH SHEKHAWAT JI, MINISTRY OF JAL SHAKTI, GOI., AT JYOTI TEXTILE, PALI, RAJASTHAN











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THANK YOU

Get in Touch — Have more questions? We'll help you find answers.

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PHONE NUMBER

+91 9316037800

WEBSITE

www.sprayengineering.com

EMAIL

Vivek.verma@sprayengineering.com

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