



End-to-End Solutions for Effluent Recycling & Zero Liquid Discharge

With three decades of experience in treatment of most difficult wastewater from various industrial streams, Praj offers comprehensive range of advanced solutions for Effluent Recycling and Zero Liquid Discharge





Introduction

Water scarcity & environmental issues are creating new challenges in various Industries across the globe. Today, Industries are facing major issues like -

- Regulation by Govt. bodies for achieving Zero Liquid Discharge (ZLD) for the new & expansion of existing Industrial facilities
- Social unrest on discharging harmful effluent in the environment
- Limitations of effluent discharge levels
- Capex & Opex required for achieving ZLD
- Lack of compositional & metal compatibility knowledge amongst MEE supplier
- Usage of recycled effluent

Praj offers integrated, energy-efficient solutions for Effluent Recycling & Zero Liquid Discharge for various Industrial applications. Our strong experience of treating most challenging wastewater enables us to offer highly optimised systems with lower footprint and optimised operating costs.





End-to-End Solutions for Effluent Recycling & Zero Liquid Discharge

Membrane based recycling solutions: MF/UF/RO/NF

Zero Liquid Discharge Solutions

- Multi Effect Evaporator
- Forced Circulation Evaporator
- Falling Film Evaporator
- Advanced TVR & MVR systems
- Crystallizer-Centrifuge
- Agitated Thin film Dryer (ATFD)

Solvent Recovery

- Mixed Solvent Stripper
- Extractive Distillation

Value Added Services:

- Water Audits
- Feasibility Analysis
- Basic Engineering
- Detailed Engineering
- Erection
- Commissioning Supervision
- HAZOP studies



Zero Liquid Discharge Solutions

Zero Liquid Discharge Solutions:

Praj is a process engineering company with deep understanding of various industrial processes and related systems Zero Liquid Discharge is achieved using thermal solutions like Evaporators & Dryers.

- More than 30 years of experience in thermal solutions
- Combination of various types of Evaporators based on effluent characteristics
- Appropriate heat transfer areas ensure best results
- Low energy requirement with heat integration Typical Applications
- RO Reject
- Salt Recovery

| Typical comparison of evaporation system | | |
|---|---|--|
| Offerings | Features/Applications | Limitations |
| ECOVAP-FF (Falling Film) | <ul style="list-style-type: none"> • Suitable for effluents with Low TDS & TSS • Higher Heat Transfer Coefficient; hence lower areas • Evaporation happens in Tube • Less Power Consumption | <ul style="list-style-type: none"> • Relatively higher Scaling Tendency • Unsuitable for High viscous liquids, High Silica, Hardness & TDS • Wetting is affected due to scaling |
| ECOPVAP – SF (Special Falling Film) | <ul style="list-style-type: none"> • All advantages of conventional falling film Evaporators • Adequate wetting rate is maintained by using specially designed spraying nozzle • Less prone to fouling as compared with Conventional Falling Film Evaporator. | <ul style="list-style-type: none"> • Reduced Scaling Tendency • Unsuitable for Higher viscous liquids, High Silica, Hardness & TDS |
| ECOVAP – FC (Forced Circulation) | <ul style="list-style-type: none"> • Suitable for effluents with High TDS & TSS • Evaporation happens in Vapor Liquid Separator (VLS) • Suitable for high viscous liquid • Relatively lower CIP frequency | <ul style="list-style-type: none"> • Higher recirculation flowrates, hence higher opex • Lower Heat Transfer Coefficient (HTC) as compared to Falling film leading to higher heat transfer areas |
| Thermo Vapor Recompression (TVR) | <ul style="list-style-type: none"> • Work on Principle of Steam jet Ejector • Uses vapors from First or Second Effect • Increase in Steam Economy-acts as additional effect • Works better on High pressure Steam • Lower maintenance as compared to MVR | <ul style="list-style-type: none"> • Steam condensate gets contaminated with Process vapors • Require relatively longer time for plant stabilization |
| Mechanical Vapor Recompression (MVR) | <ul style="list-style-type: none"> • Driven by electrical energy • Feasible when steam cost is higher & Power cost is lower • Only startup Steam is required for stabilisation • Once stabilised, vapors are recompressed & used for heating | <ul style="list-style-type: none"> • Makeup steam may be required to overcome heat losses • Any vapor carryovers can be an issue with MVR, hence mist eliminators are mandatory and adequate H/D ratio of VLS to be maintained. • Rotating equipment hence requires higher Maintenance as compared to TVR |
| ECODRY - TF (Agitated Thin Film Dryer) | <ul style="list-style-type: none"> • Zero Clearance Hinged Scrapping Blades • Heat recovery to reduce steam consumption • Suitable to achieve Zero Liquid Discharge (Dry powder output) | <ul style="list-style-type: none"> • Energy intensive operations |



Zero Liquid Discharge

ECOVAP FC: Forced Circulation /Flash

The liquid is heated in a heat exchanger and flashed in a flash vessel to achieve desired concentration. Multiple pass are provided to get required flow rate. Evaporative Crystallization can be efficiently achieved in ECOVAP FC.

ECOVAP FB*: Fluidized bed Evaporator

A revolutionary Self-Cleaning Fluidized Bed Evaporator in which fluidizing media (metallic, Ceramic or glass) is added to impart gentle scouring action on tube surface, while moving with the liquid to be evaporated. This keeps the tube clean. Media are being de-fluidized in the top disengagement zone before being re-circulated in the evaporator.

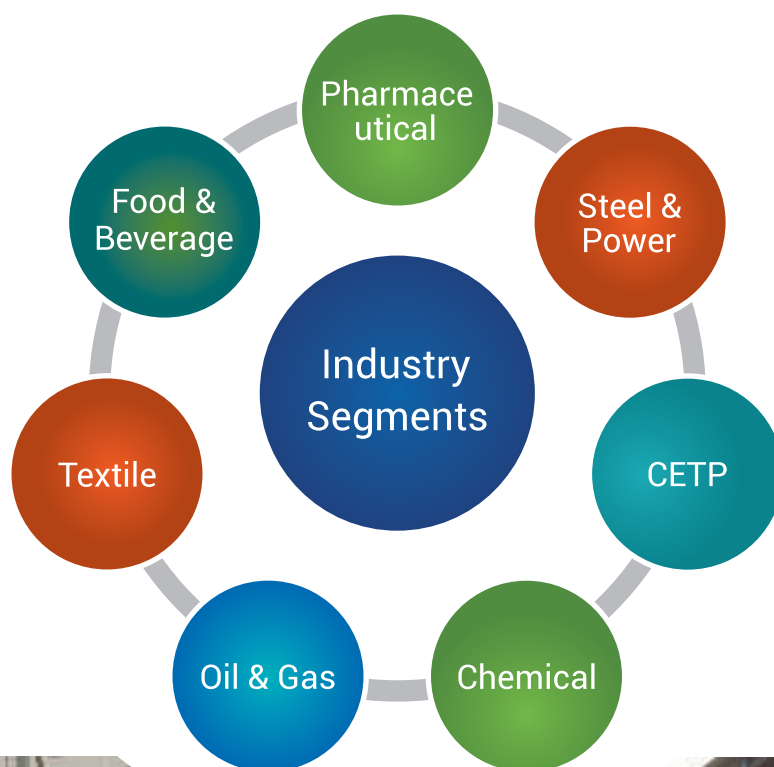
Benefits Of ECOVAP FB*:

- No loss in production time since down time is virtually nil.
- Maintenance cost is nil since no tube cleaning is required.
- Standby unit, related piping and frequent CIP are not required.

Solvent Recovery

- Praj's Solvent recovery system is based on patented Rh-Grid trays
- Rh-Grid trays enables the stripper to deliver maximum efficiency even in the higher suspended solid load
- Process feasibility & optimization through software solutions like chemcad
- Less maintenance, Less CIP ensures long life of equipment
- Proven track record in complex effluent solutions

Solution for Complex Industrial Effluents



100 KLD ZLD system



249 KLD Evaporation plant



350 KLD ZLD System



100 KLD Evaporation plant



91 KLD ZLD System



31 KLD MVR system

Praj Matrix – R&D Center

Praj Matrix is designed along the principles of sustainability and innovation with the goal of providing environment friendly solutions for a future-perfect world. Praj Matrix applies multi-disciplinary experience and expertise, deploying world class laboratory, pilot and scale up facilities to accelerate the development of bio-based technologies. These facilities ensure development of robust technology packages that exceed customer expectations of performance, cost and quality. The department of Scientific and Industrial Research, Government of India has certified Praj Matrix – the R & D Center as an In-House R & D laboratory unit. The R & D campus has received status of Private Sector Bio Tech Park by the Government of Maharashtra. Located in Pune (India), Praj Matrix is built on a 5 acre expanse with a built-up area of about 85000 square feet.

The R & D Facility is organized around the principle of Centers of Excellence. It has 5 major Centers of Excellence. Molecular Biology and Microbiology; Bioprocess Technology, Analytical Sciences; Chemical Sciences; and Scale up and Process engineering. Praj Matrix actively focuses on advanced solutions for Bio-ethanol, Effluent Recycling & Zero Liquid Discharge. Among many others, following facilities are available at Praj Matrix:

- **Lab Scale Stripping & Evaporation**
- **Pilot scale Evaporation system**
- **Pilot scale ATFD plant (Agitated Thin Film Dryer)**

Above mentioned facilities help us to evaluate the treatment feasibility, calculate indicative Opex and study the outcomes of the process. These facilities can support customers to optimise the process for treating their wastewater and to achieve Zero Liquid Discharge.





Resources

The key to delivering over 600 successful projects across different geographies lies in our vast, multi-disciplinary, multi-locational and dedicated resource base.

Design & Engineering

In-house core team of professional engineers from different disciplines (Chemical, Piping, Mechanical, Electrical, Instrumentation, Civil, etc.) together with other technical staff ensure that your projects are engineered in the most optimum way, taking into consideration aspects such as plant ergonomics, energy efficiencies, water usage, product quality and wastewater management, etc. This approach to engineering avoids extra site modifications, delayed startups and consequent loss of production.

Project Management, Construction & Commissioning

With strong focus on project planning and scheduling and innovative execution strategies, the Project Management team works with every individual customer from day one to ensure that the project is completed within the agreed time frame.

Procurement & Quality Assurance

Quality Assurance teams at Praj pursue stringent testing at various stages of procurement and production; not only in our own Manufacturing Plants but also at vendors facilities and project sites.

Manufacturing Facilities

Equipment manufacturing is carried out at our well-equipped manufacturing units spread over an area of 71,000 m² (covered space : 34,750 m²). Subject to rigorous Quality Assurance Plans, the equipment are manufactured in accordance with different international standards and codes.

Manufacturing Highlights

- 16500 T/Year (Expandable)
- Maximum Dimensions : 8.5 m dia x 50 m length x 300 T weight
- Maximum thickness : 150 mm

Global Standards and Codes

ASME Sec VIII Div. I & II, IS 2825, Ad Merkblatter, PD 5500, TEMA, Pressure Equipment Directive, SMPV, Rules, DIN, API 650 and AS 1210.

Praj Worldwide

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