SRP
Separation Recovery Purification

SMART eMBR

Solution Showcase

Introduction

Urban and institutional wastewater treatment is no longer just a capacity problem. It is increasingly a space, reliability, compliance, and operability challenge.

Across housing developments, hospitals, campuses, railways, and public infrastructure, decentralised STPs are expected to fit into constrained footprints, deliver consistent treated water quality, operate with limited skilled manpower, and remain compliant over years—not just at commissioning.

Conventional decentralised technologies often struggle under real operating conditions. Performance varies with operator skill, civil construction quality, and biological stability. Many systems appear adequate on paper but fail gradually in practice.

SMART eMBR was developed to address this gap—by combining membrane-based certainty, standardised engineering, and digital control, specifically for decentralised applications.

What is SMART eMBR ?

SMART eMBR is a **modular, membrane-based, decentralised wastewater treatment platform** designed to deliver predictable performance with simplified operation.

At its core, it integrates:

- Biological treatment
- Submerged membrane filtration (MBR)
- Factory-standardised automation and controls
- Optional IoT-based monitoring

Instead of relying on secondary clarification and operator-dependent process tuning, SMART eMBR uses membranes as the final barrier—ensuring treated water quality is physically enforced rather than biologically assumed.

The platform is not a single fixed layout. It is a family of configurations, scaled and adapted based on flow, site constraints, and execution preference—while keeping the treatment logic consistent

Design Philosophy Behind SMART eMBR

SMART eMBR is built on a few clear principles refined through large-scale decentralised deployments.

Performance Defined by Membrane Operating Limits

- SMART eMBR systems are designed by first defining membrane operating envelopes—design flux, air scouring demand, and solids retention (MLSS/SRT)—and then sizing biological tanks and process volumes to operate safely within those limits.
- This approach ensures effluent quality is governed by membrane-controlled solid–liquid separation rather than secondary settling behaviour, resulting in stable performance under hydraulic and organic load variations, with reduced dependence on civil tolerances and operator-driven process tuning

Standardisation Where It Matters

- Critical elements—membranes, aeration philosophy, control logic, instrumentation—are standardised and factory-aligned. This reduces variability between sites and improves long-term reliability.

Flexibility Where It's Needed

- While process logic remains consistent, the platform allows multiple tank construction options, factory or site-based control integration, and scalability from small to very large flows.

Designed for Real Operations

- Systems are designed assuming limited operator skill, inconsistent influent characteristics, and long operating lifecycles. The objective is not just compliance at commissioning, but repeatable, sustainable performance.

Technology & Process Architecture

SMART eMBR follows a simple, robust treatment logic focused on consistency rather than overcomplexity.

Process Flow Overview

- Preliminary Screening → Biological Treatment → Submerged MBR Filtration → Disinfection / Reuse. This configuration eliminates secondary clarifiers and return sludge pumping, simplifying hydraulics and reducing footprint.

Membrane System

- SMART eMBR uses submerged MBR membranes manufactured in-house. These PVDF-based membranes are designed for wastewater duty, stable flux operation, shock-load tolerance, and easy module-level replacement.

Aeration & Biological Control

- Aeration supports both biological treatment and membrane surface cleaning. The aeration philosophy balances treatment efficiency with energy consumption, avoiding aggressive operating regimes

Automation & Controls

- Factory-defined control logic manages pumps, blowers, membrane cycles, backwash, relaxation, alarms, and interlocks. Controls may be factory-mounted or integrated into site-built control rooms. Optional IoT integration enables remote visibility.

Rapid Preliminary Design Capability

- In-house projection software enables preliminary system design in approximately 2 minutes, generating flow-based membrane sizing, indicative tank volumes, equipment selection, and early-stage power estimates.

Concepts & Configurations

SMART eMBR is offered through five clearly defined concepts, allowing the same treatment logic to be deployed across diverse site conditions while adapting to site constraints and execution preferences.

Concept	Configuration	Capacity Range	Description
Concept 1	MSEP Tank + Factory-Fitted Control Unit	100–1000 KLD	A highly standardised, factory-integrated solution designed for faster deployment with minimal site dependency.
Concept 2	RP Tank + Factory-Fitted Control Unit	5–100 KLD	A compact, plug-and-play configuration suited for small decentralised installations and space-constrained sites.
Concept 3	Civil Tanks + Factory-Fitted Control Unit	250 KLD–2 MLD	A hybrid approach combining site-built civil tanks with factory-tested automation for balanced cost and control.
Concept 4	Civil Tanks + Civil Control Room	250 KLD–10 MLD+	A fully site-engineered solution for large-scale decentralised or semi centralised treatment facilities.
Concept 5	MBR Membranes & Accessories Only	5 KLD–10 MLD+	Technology supply option for EPCs, retrofits, and upgrades where only membrane systems are required.

Smart Layer & Digital Capabilities

- The smart layer focuses on visibility, predictability, and faster response rather than complexity.
- It provides operational insight through key process parameters, equipment status, and alarm notifications—allowing issues to be identified early. Where enabled, remote monitoring supports multi-site management and reduces dependence on continuous on-site supervision.
- Standardised control logic ensures consistent operational behaviour across installations, simplifying training and troubleshooting

Performance Benchmarks & Practical Outcomes

Performance is defined in practical operating terms.

- Consistently low suspended solids and stable organic removal
- Compact footprint due to elimination of secondary clarifiers
- Reduced sensitivity to operator skill and influent variability
- Predictable energy consumption through controlled aeration and stable flux operation
- The emphasis is on operational stability over time, not peak performance claims.

Application Versatility

- SMART eMBR is designed as a platform adaptable across applications without changing core treatment logic.
- Typical applications include residential developments, hospitals, campuses, railways, defence installations, and urban reuse projects. Systems are configured rather than custom-built, enabling faster decision-making and reduced execution risk.

Lifecycle & Commercial Logic

SMART eMBR is positioned around lifecycle performance rather than lowest initial cost.

- CAPEX flexibility is achieved through configurable civil scope, while OPEX remains predictable due to stable operating regimes, modular membrane replacement, and standardised spares.
- The intent is long-term maintainability rather than reactive operation.

Execution Credibility & Deployment Experience

SMART eMBR is supported by extensive decentralised STP execution experience across institutional and infrastructure projects with over 400 Systems delivered. In-house membrane manufacturing and system integration capability inform conservative design assumptions and practical operating limits.

Carbon Steel Tank

FRP Tank

Under Ground Plant

Above Ground Plant

Fully Assembled and Tested Unit

Parameters	MBR Performance	Unit
pH	6.5 - 8.0	Mg/l
BOD	<10	Mg/l
COD	<50	Mg/l
TSS	<5	Mg/l
O&G	NIL	Mg/l
Coliforms	<100	MPN/100 mL
NH3N	< 5	Mg/l

Typical MBR Performance

SRP
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