

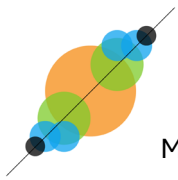


Water Desalination Proposal

PHAENORAN WATER SYSTEMS

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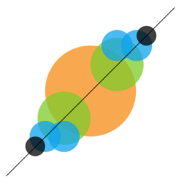
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Executive Summary

Access to reliable potable water is a critical infrastructure requirement for municipalities, industrial clusters, coastal developments, and decentralized communities.

Phaenoran Water Systems, a specialized subsidiary of the Mairav Group, delivers desalination infrastructure through an integrated **engineering, procurement, and construction (EPC) approach**, combining proven reverse osmosis technologies with modular system design.

The solution is based on reverse osmosis (RO) systems designed to treat:

- Seawater (TDS up to ~35,000 mg/L)
- Brackish water (TDS ~1,000–5,000 mg/L)
- Industrial and municipal wastewater (subject to pre-treatment)

The system produces potable water compliant with World Health Organization (WHO) standards. Depending on feed water type, system configuration, recovery rates, and energy consumption are optimized to ensure cost-effective operation.

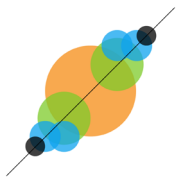
Phaenoran adopts a **vendor-agnostic engineering model**, integrating best-in-class components from global manufacturers into scalable, containerized systems. Industry-proven modular platforms (typically ~50 m³/hour per unit) enable:

- Plug-and-play deployment in standard 40-ft containers
- Rapid installation timelines (typically 3–6 months)
- Scalable capacity expansion through modular additions
- Remote monitoring and automated operations

Project Delivery Model

Phaenoran delivers desalination infrastructure through a **Client-Owned EPC + O&M model**, where:

- The client owns the desalination asset and water output
- Phaenoran provides:
 - Engineering and system design
 - Procurement and system integration
 - Construction and commissioning
 - Operations and maintenance support (optional or long-term)



This model ensures full asset ownership for the client while leveraging Phaenoran's technical and execution capabilities.

Engineering-Led Approach

All projects are initiated through a **Detailed Project Report (DPR)**, which defines:

- Process design basis (feed water, recovery rates, quality)
- System sizing and configuration
- Equipment selection and OEM integration
- Energy consumption and performance parameters

A **USD 45,000 DPR fee** is applicable and adjustable against final project cost upon award.

Execution Advantage

A key differentiator for Phaenoran is the integration of **engineering expertise with modular system deployment**, enabling:

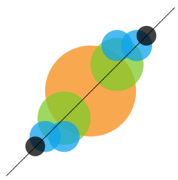
- Faster implementation compared to conventional plants
- Reduced civil infrastructure requirements
- Scalable expansion aligned to demand
- Reliable performance using globally proven technologies

Ideal Applications

- Coastal municipalities
- Industrial zones
- Island or remote communities
- Mining and port infrastructure
- Resort developments
- Emergency or rapid-deployment water supply
- Mineral water bottling facilities

Mairav Group

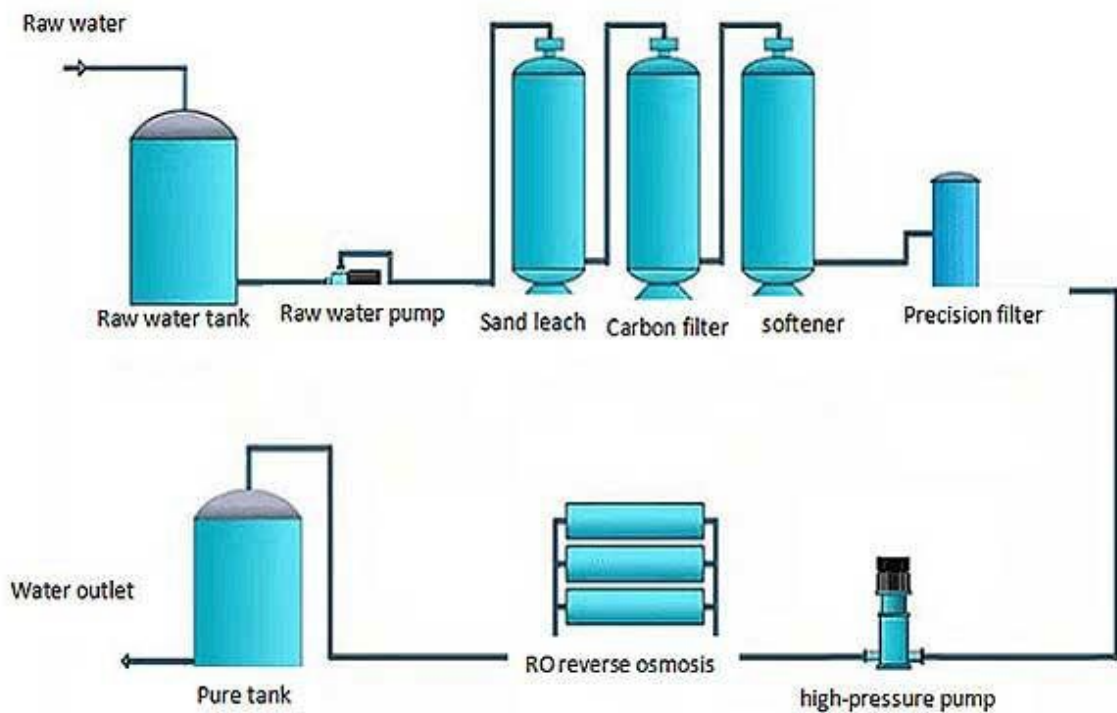
The **Mairav Group**, founded in the early 1990s by Dr. I.S. Mittal and led by its Group CEO, Mr. Vaibhav Gupta, has a strong track record across renewable energy, real estate development, and infrastructure delivery. With decades of experience launching and scaling business verticals, including large-scale solar projects and strategic land initiatives, the Group brings a deep operational and execution capability to complex infrastructure programs.



Solution Overview

The desalination system follows a structured and proven treatment sequence designed to convert seawater or groundwater into potable water through a combination of filtration, reverse osmosis, and post-treatment processes. Phaenoran delivers desalination systems as **modular, containerized water treatment plants**, engineered for rapid deployment, scalability, and reliable operation across a wide range of environments.

Each system is designed to treat **seawater or groundwater (up to 35,000 mg/L TDS)** using **reverse osmosis (RO) technology**, producing potable water compliant with **World Health Organization (WHO) drinking water standards**.



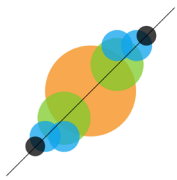
Modular Plant Configuration

The desalination solution is deployed as a **containerized system**, typically structured into modular units that integrate all major treatment stages. The modular system can be configured to treat multiple water sources, including seawater, brackish water, and treated wastewater, with appropriate pre-treatment and system optimization.

A standard base configuration includes:

Desalination Module (Core RO System)

- Reverse osmosis membranes and pressure vessels
- High-pressure pumps and energy recovery systems
- Pre-filtration (sand filters, carbon filters, cartridge filters)



- Chemical dosing systems (anti-scalant, dechlorination, pH control)

Typical performance benchmarks from industry-standard systems include:

- ~50 m³/hour (50 KL/hour) per module
- Recovery rates of ~45–50%
- Salt rejection rates of 97–99%

Water Processing & Conditioning Module

- Post-treatment polishing
- Mineralization systems
- UV / disinfection systems
- Storage and distribution integration

This module is designed to support **higher aggregate throughput**, enabling multiple desalination modules to operate in parallel.

Two-Container Architecture (Standard Deployment)

The system is typically deployed using a **two-container configuration**:

- Container 1: Desalination (RO + high-pressure systems)
- Container 2: Post-treatment, conditioning, and control systems

This architecture enables:

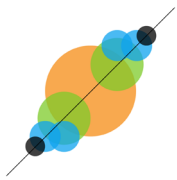
- Independent scaling of desalination capacity
- Optimized footprint and layout flexibility
- Simplified maintenance and system upgrades

Plug-and-Play Deployment

Modern containerized desalination systems are designed for **plug-and-play installation**, with:

- Pre-assembled and factory-tested modules
- Integrated piping, wiring, and control systems
- Rapid on-site commissioning

Typical systems are delivered in **standard 40-ft containers**, enabling easy transport and installation.



Scalable Capacity

The modular design allows capacity to be increased by adding additional desalination units.

For example:

- 1 module → ~50 m³/hour
- 3 modules → ~150 m³/hour
- 5 modules → ~250 m³/hour

This allows clients to align infrastructure investment with **demand growth over time**.

Operational Flexibility

The system is designed to operate across multiple use cases, including:

- Coastal municipalities
- Industrial water supply
- Remote or off-grid installations
- Resorts, islands, and ports

Advanced systems also support:

- Remote monitoring and control
- Automated operation
- Integration with renewable energy sources

Engineering Customization via DPR

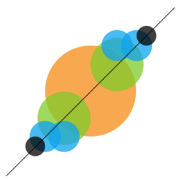
While the modular system provides a standardized foundation, the final configuration is determined through a **Detailed Project Report (DPR)** based on:

- Feed water characteristics
- Site conditions
- Required output capacity
- Energy and utility availability

This ensures that each deployment is **optimized for performance, efficiency, and cost**.

Process Design & Engineering Framework

Phaenoran's desalination systems are designed using a structured engineering methodology that ensures performance, efficiency, and reliability across diverse operating environments.



The design approach integrates **proven reverse osmosis (RO) desalination technology** with site-specific engineering inputs, enabling optimized system configuration for each project.

Process Design Basis

Each desalination system is designed based on clearly defined process parameters:

Feed Water Characteristics

The system is designed to handle multiple feed water types:

- Seawater: TDS ~30,000–35,000 mg/L
- Brackish water: TDS ~1,000–5,000 mg/L
- Wastewater (treated effluent): variable TDS and contaminants (requires enhanced pre-treatment)
- Additional parameters such as turbidity, organics, and contaminants are evaluated during the DPR phase.

Product Water Quality

- Designed to meet World Health Organization (WHO) drinking water standards
- Typical output TDS levels: ≤ 200 mg/L

Recovery Rate

- Typical recovery: ~45–50% (dependent on feed water conditions and system design)

Feed Water Comparison & Performance Ranges

The performance of RO systems varies based on feed water type:

Seawater:

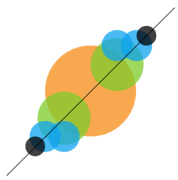
- TDS: ~30,000–35,000 mg/L
- Energy Consumption: ~2.5–4.0 kWh/m³
- Recovery Rate: ~45–55%

Brackish Water:

- TDS: ~1,000–5,000 mg/L
- Energy Consumption: ~1.5–2.0 kWh/m³
- Recovery Rate: ~55–75%

Wastewater (Post-Treatment):

- TDS: variable



- Energy Consumption: depends on pre-treatment + RO configuration
- Recovery Rate: typically 60–80% (depending on quality and system design)

Engineering Design & Sizing

System design includes:

- Mass balance calculations (input vs output water volumes)
- Equipment sizing based on flow rates and recovery targets
- Pressure and energy optimization
- Redundancy planning for critical components

Detailed engineering calculations and system sizing are developed during the **Detailed Project Report (DPR)** phase.

Utilities & Performance Parameters

Key operational parameters include:

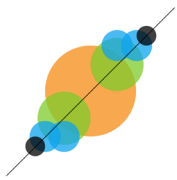
- Energy Consumption: typically in the range of ~2–4 kWh/m³ (depending on system design and energy recovery integration)
- Installed Power: ~250–330 kW for a 50 m³/hr class system
- Chemical Usage: optimized based on feed water quality and scaling potential
- Footprint: containerized deployment minimizes land requirements
- Intake & Reject Volumes: determined through process design

Performance Guarantees

Final system performance parameters are defined during project finalization and DPR, including:

- Water production capacity (m³/hour)
- Product water quality
- Recovery rate
- Energy efficiency

All systems are designed and tested to meet agreed technical specifications prior to commissioning.



Layout & Civil Requirements

The desalination system is designed for **modular, containerized deployment**, minimizing civil works while ensuring flexibility across different site conditions.

Detailed layout and civil design are finalized during the **Detailed Project Report (DPR)** based on site-specific parameters.

MODULAR DESALINATION INFRASTRUCTURE
ENGINEERED FOR RAPID DEPLOYMENT & SCALABLE WATER SECURITY

- MODULAR**
Plug-and-play containerized systems
- RAPID DEPLOYMENT**
Complete installation in 3-6 months
- SCALABLE**
Scale capacity as demand grows
- RENEWABLE READY**
Designed for integration with solar & clean energy
- SMART OPERATIONS**
Remote monitoring & automation for 24/7 reliability

GLOBAL REACH
Projects across Asia, Africa, Middle East, Europe & Americas

APPLICATIONS
Municipal | Industrial | Coastal
Mining | Ports | Resorts | Islands

SUSTAINABLE WATER. SMARTER INFRASTRUCTURE. SECURE FUTURE.

PHAENORAN WATER SYSTEMS

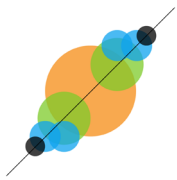
Site Layout Overview

A typical installation includes:

- Containerized desalination modules (40-ft units)
- Raw water intake system
- Pre-treatment and process equipment area
- Product water storage tanks
- Brine discharge system
- Access and maintenance pathways

The layout is optimized to ensure:

- Efficient process flow
- Ease of maintenance access
- Safety and environmental compliance



Containerized Plant Footprint

The core desalination system is housed in:

- Two primary 40-ft containerized modules:
 - Desalination (RO system)
 - Post-treatment and control systems

Additional space is required for:

- Storage tanks
- Pumps and piping
- Electrical panels

This modular design significantly reduces construction complexity compared to conventional plants.

Civil Infrastructure Requirements

Typical civil works include:

Foundations

- Concrete foundations for container placement
- Equipment base structures for pumps and tanks

Water Storage Systems

- Raw water storage tanks (if required)
- Product water storage tanks
- Chemical storage tanks

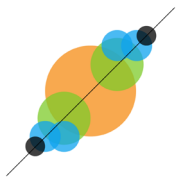
Piping & Plumbing

- Intake pipelines from source
- Interconnecting process pipelines
- Product water distribution lines
- Brine discharge pipelines

Intake & Outfall Structures

- Seawater intake systems (with screening)
- Brine discharge/outfall system

These are designed based on environmental and regulatory requirements.



Electrical & Utility Requirements

The system requires:

- Electrical power supply connection
- Control panel installation area
- Cable routing and protection systems

Optional integration with:

- Solar or hybrid power systems

Site Preparation Scope

Site preparation is the responsibility of the client and includes:

- Land clearing and leveling
- Foundation construction
- Utility connections (water, power)
- Access road development (if required)

Phaenoran provides detailed engineering specifications and supervision support as part of the EPC scope. DPR-Driven Layout Finalization

All civil and layout requirements are finalized during the **Detailed Project Report (DPR)**, which includes:

- General Arrangement (GA) drawings
- Equipment layout plans
- Civil and structural requirements
- Piping and instrumentation layout

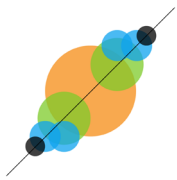
Project Delivery Model

Phaenoran delivers desalination infrastructure through a Client-Owned EPC + O&M model, designed to provide full asset ownership to the client while leveraging Phaenoran’s engineering and execution capabilities.

Model Overview

Under this model:

- The client owns the desalination infrastructure and water output
- Phaenoran is responsible for:
 - Engineering and system design



- Procurement and integration of equipment
- Construction and commissioning
- Operations and maintenance support (optional or long-term)

Commercial Structure

- Capital investment is made by the client
- Phaenoran is engaged under:
 - An **EPC contract** for design and construction
 - An optional **O&M agreement** for ongoing operations

Roles & Responsibilities

Phaenoran Responsibilities

- Engineering design and system configuration
- Procurement and integration of equipment
- Construction and commissioning of the plant
- Performance validation and system testing
- Provision of operations and maintenance services (if contracted)
- Technical support and performance optimization

Client Responsibilities

- Capital investment for the project
- Provision of land and site access
- Site preparation (land clearing, foundations, utilities)
- Regulatory approvals and compliance (as applicable)
- Operation of the plant (if O&M is not contracted to Phaenoran)

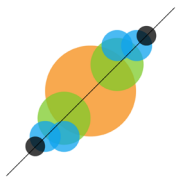
Optional O&M Structure

Where Phaenoran is engaged for operations and maintenance:

- Phaenoran manages day-to-day plant operations
- Preventive and corrective maintenance is handled by Phaenoran
- Performance monitoring and reporting is provided
- Service levels and uptime targets are defined contractually

Key Advantages

- Full ownership of infrastructure and water output
- Transparent and standard EPC structure
- Flexibility in operations (self-operated or outsourced)



- Use of proven, vendor-agnostic technologies
- Scalable system expansion aligned to demand

Ideal Use Cases

- Government and municipal water authorities
- Industrial and manufacturing facilities
- Utilities and infrastructure developers
- Clients seeking long-term asset ownership

Project Development Phases

The project is executed in the following stages:

Stage 1: Site Assessment & Data Collection

- Evaluation of feed water source and quality
- Site survey and infrastructure assessment
- Identification of intake and discharge requirements

Stage 2: Detailed Project Report (DPR)

The DPR forms the foundation of the project and includes:

- Process design basis
- Process flow diagrams (PFD)
- Equipment selection and sizing
- Layout and civil design
- Utility and performance parameters
- Cost estimation

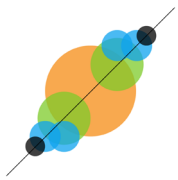
Stage 3: Engineering & Permitting

- Detailed engineering design
- Preparation of construction drawings
- Regulatory approvals and permits (as required)

Stage 4: Procurement & Fabrication

- Sourcing of major equipment and components
- Fabrication of modular container systems
- Factory assembly and testing

Modular systems are **pre-assembled and tested off-site**, reducing on-site construction time.



Stage 5: Site Preparation & Civil Works

- Land preparation and foundation construction
- Installation of tanks, piping, and intake systems
- Electrical and utility connections

Stage 6: Installation & Commissioning

- Delivery and placement of containerized modules
- System integration and testing
- Performance validation and commissioning

Stage 7: Operations & Water Production

- Transition to operational phase
- Continuous water production
- Ongoing monitoring and maintenance

Typical Project Timeline

Phase	Duration
Site Assessment & DPR	2–4 weeks
Engineering & Permits	4–8 weeks
Procurement & Fabrication	6–10 weeks
Installation & Commissioning	2–4 weeks

Total Estimated Timeline: 3–6 months

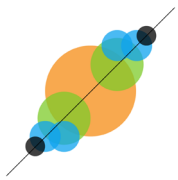
This timeline is significantly shorter than conventional desalination plants (typically 12–24 months), due to:

- Modular containerized design
- Parallel execution of activities
- Reduced civil construction requirements

Parallel Execution Advantage

Phaenoran’s execution model enables **parallel progress across multiple phases**, including:

- DPR and preliminary engineering
- Equipment procurement and fabrication



- Site preparation and civil works

This reduces overall project timelines and accelerates time to water production.

Commissioning & Performance Validation

Before full-scale operation:

- Systems are tested under operational conditions
- Performance is validated against design parameters
- Water quality is verified to meet WHO standards

Only after successful validation does the system transition to full operational status.

Transition to Operations

Following commissioning:

- The system moves into continuous operation
- Monitoring systems track performance in real time
- Maintenance protocols are activated

Why Phaenoran

Phaenoran Water Systems delivers desalination infrastructure through an integrated approach combining **engineering expertise, modular system design, and backing of a global group.**

We are not an equipment supplier — we are a **water infrastructure partner**, capable of designing, building, and operating desalination systems aligned with client requirements.

Engineering-Led Approach

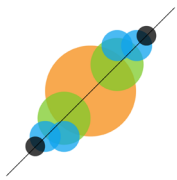
Phaenoran adopts a structured, engineering-driven methodology:

- Design based on defined process parameters and site conditions
- DPR-led project development ensuring technical and commercial clarity
- Integration of proven desalination technologies and industrial components

This ensures that every project is **technically sound, optimized, and scalable.**

Vendor-Agnostic System Integration

Unlike single-technology providers, Phaenoran operates a **vendor-agnostic sourcing model:**



- Selection of best-fit components from global manufacturers
- Flexibility in design and procurement
- Reduced dependency on any single supplier

This approach enhances:

- Reliability
- Cost competitiveness
- Long-term maintainability

Modular & Rapid Deployment

Phaenoran leverages modular, containerized system design to deliver:

- Faster deployment timelines (typically 3–6 months)
- Reduced civil infrastructure requirements
- Scalable capacity expansion

This enables clients to implement water infrastructure quickly and efficiently.

End-to-End Project Capability

Phaenoran provides complete project lifecycle capabilities:

- Engineering and design
- Procurement and system integration
- Construction and commissioning
- Operations and maintenance

This ensures seamless execution from concept to operation.

Risk-Aligned Execution

Phaenoran's project structures are designed to align risk with responsibility:

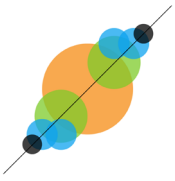
- Defined performance and delivery accountability
- Structured maintenance and operational frameworks

This reduces risk exposure for clients and improves project reliability.

Proven Technology + Practical Deployment

Phaenoran combines:

- Proven reverse osmosis desalination systems
- Industry-standard equipment and components



- Practical, field-tested engineering design

This ensures solutions are:

- Technically reliable
- Operationally stable
- Easy to maintain

[Backed by Mairav Group](#)

As part of the Mairav Group, Phaenoran benefits from:

- Strong infrastructure execution experience
- Proven track record in large-scale projects
- Capability to manage complex, multi-phase developments

Phaenoran Water Systems provides a **scalable, reliable, and financially flexible approach to desalination infrastructure**, enabling clients to secure long-term water supply with confidence.

We welcome the opportunity to conduct a site assessment and develop a **Detailed Project Report (DPR)** tailored to your requirements.