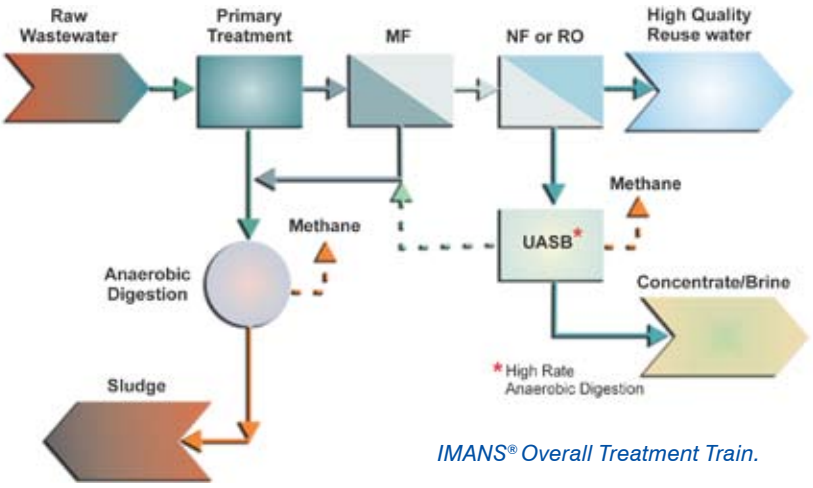
The IMANS® System – A Novel Membrane Approach to Wastewater Treatment

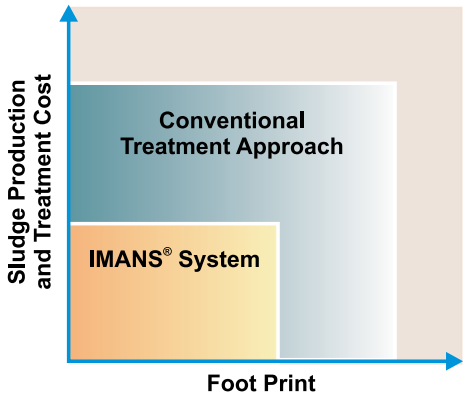
The IMANS® (integrated membrane anaerobic stabilization) approach to wastewater treatment is a simple and innovative approach to treating wastewater to a selected range of finished quality. Physical separation using gravity, screens and membranes, and anaerobic digestion technologies form the backbone of the IMANS® treatment approach.



IMANS® Overall Treatment Train.

Treatment technologies can be removed from the overall treatment train or modified to suit the desired effluent quality. Very high-quality water for groundwater recharge can be obtained in only three treatment steps.

IMANS® was technically proven during an 18-month pilot test at the Orange County Sanitation District.



The IMANS® approach has a lower cost and smaller footprint.

Conventional aerobic biological treatment processes (such as activated sludge) convert the natural energy in wastewater (in the form of BOD) into biosolids, which is costly for treatment and disposal.

By eliminating the use of aerobic treatment, the IMANS® approach conserves and concentrates the natural energy in the wastewater for conversion into useful energy (methane) by anaerobic treatment.

The Benefits of IMANS®

- No activated sludge treatment.
- Significantly less biosolids.
- More biogas potential.
- Tailored to meet discharge needs.
- Small footprint.
- Less odor.
- Can be built in phases.
- Can use existing infrastructure.
- Lower cost.

The IMANS® System

"Dedicated to creative, responsive, quality solutions for those we serve."

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Summary of Pilot Plant Results

During 18 months of pilot testing at the Orange County Sanitation District (OCSD), the IMANS® system treated more than 4.5 million gallons of wastewater were treated. The tables below present average water quality data collected during the pilot work.

UASB Performance - Typical

Parameter	Value
COD Removal (%)	20 - 25
Gas Composition	
Methane Concentration (%)	66
Hydrogen Sulfide (ppm)	0
Carbon Dioxide (%)	2.2

MF Performance

Parameter	MF Feed (Primary Effluent)	MF Product
TSS (mg/l)	39	< 0.2 to 1.9
BOD (mg/l)	124	65
COD (mg/l)	274	138
Oil & Grease (mg/l)	22	4
Fecal Coliform (MPN/100 ml)	2.4×10^7	$<10 - 10^2$
Total Coliform (MPN/100 ml)	2.4×10^7	$<10 - 10^3$
Coliphage (PFU/100 ml)	8.4×10^5	$<10 - 10^3$

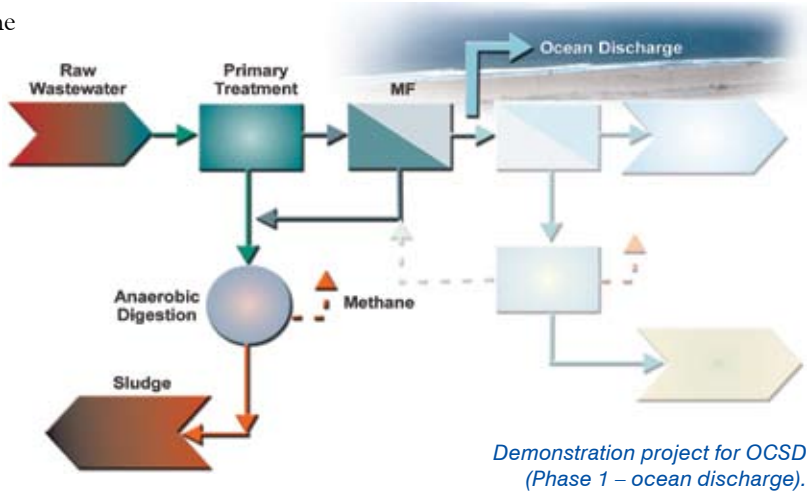
RO Performance

Parameter	MF Product	Old Membranes	New Membranes
TDS (mg/L)	1,086	138	24
BOD (mg/L)	67	ND	-
COD (mg/L)	138	16	-
TOC (mg/L)	44	5.7	1.8
Ammonia – N (mg/L)	20	4.1	1.3
Chloride (mg/L)	245	45	12
Sodium (mg/L)	237	46	-
Fecal Coliform (MPN/100 ml)	10 - 102	<2	<1

**ND = non detectable*

On-going Development

OCSD, encouraged by the pilot plant results and preliminary cost estimates for the process, decided to proceed with a demonstration-scale plant (about 0.5 mgd). The concept is that OCSD will use a portion of the IMANS® treatment train to treat effluent to a quality that can be discharged to the ocean. The downstream processes can then be added later to provide additional high quality water for reclamation.



Demonstration project for OCSD (Phase 1 – ocean discharge).