iMBR (INTEGRATED MEMBRANE BIOREACTOR) SYSTEM

TriTech

The Tritech® PermaMax™ Integrated Membrane Bioreactor (iMBR) system is a combination of biological wastewater treatment and high efficient solids/liquid separation. Mechanically pre-screened wastewater is treated biologically and separated from the activated sludge using Tritech® PermaMax™ hollow fiber MBR membrane. The pores are small enough to prevent passage of all solids and bacteria, cells, fats, oils, colloids as well as viruses.

iMBR Base System Build

ADVANTAGES OF iMBR

The key advantages of MBRs are that they provide a higher level of treatment and are much more resistant to upsets due to fluctuating influents flows. In addition, if land is at a premium, the MBR system can be designed to have a much smaller footprint of about 25% that of conventional plant

Product features and benefits

• Excellent quality product water

Tritech® PermaMax™ iMBR hollow fiber membrane module utilizes PVDF (or PP) membrane with nominal pore size of 0.08 µm, and is capable of producing product water of reliable quality with below 1 NTU. The treated water is free from E. coli and has minimal suspended solids.

• Low capital cost and compact design

The iMBR system does not require a final sedimentation tank and can be retrofitted into existing plant with ease. With a higher MLSS, of 8000-15000 mg/L, than conventional method, the iMBR system can accept high organic (BOD) loading with less excess sludge production.

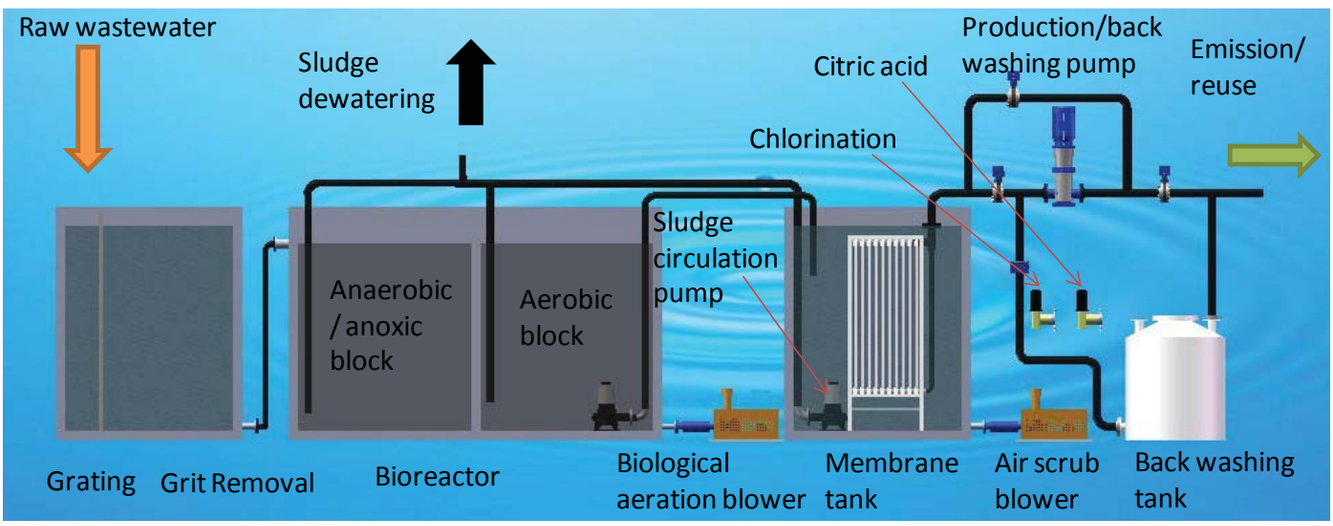
• Ease of maintenance

Minimal maintenance personnel required with full automation on system backwash and chemical clean-in-place (CIP).

PERMAMAX™ INTEGRATED MEMBRANE BIOREACTOR (iMBR) PROCESS

Tritech® iMBR includes pretreatment screening, biological activated sludge treatment and submerged membrane filtration. Mechanical screening with 1mm screen size removes fibrous materials and other suspended solids from used water influent. Following screening, the influent flows into a biological tank for the removal of COD and ammonia (and phosphorus) using activated sludge process. The mixed liquor then flows into a membrane tank consisting of immersed Tritech® PermaMax™ hollow fiber membrane modules, which separates permeate water from mixed liquor suspended solids via filtration through the membrane into the clean water tank. The production flow rate of the PermaMax™ membrane is maintained using automated backwashing and chemical cleaning to reduce membrane fouling.

PROCESS FLOW



TRITECH'S iMBR SYSTEM

Benefits

1. Tritech® PermaMax™ iMBR membrane effectively blocks and removes particles, bacteria, viruses and cysts from water supply
2. Complete system incorporates screening, biological treatment, membrane, tanks, equipment skids and disinfection.
3. PLC control provides cost-effective operation and maintenance
4. Compact footprint allows installation inside existing building or infrastructure
5. Prefabricated equipment minimizes site work and reduces on site installation costs
6. Pretreatment for RO membrane
7. Expandable modular design
8. Two train systems provide process redundancy. The plant is still operational during maintenance.

Base system

1. Membrane tanks with aeration blowers
2. Skid mounted permeate pumps, valves control, PLC HMI interface
3. Backwash system

Application Dependent options

1. Biological equipment includes screening, process blowers, diffuser, sludge return pumps
2. Chemical systems for membrane cleaning
3. Effluent quality real time monitoring system
4. UV disinfection
5. Biological Tanks and aeration system

BROAD RANGE OF APPLICATION FOR THE TREATMENT OF HIGH BOD AND/OR SUSPENDED SOLIDS CONTAINING WASTEWATER

- Municipal sewage treatment
- Industrial wastewater treatment including chemical waste and food waste
- Livestock wastewater treatment
- Landfill leachate treatment

ADVANTAGES

- Good treated water quality, able to meet more stringent discharge limits, treated water is fit for direct reuse
- Small space, approximately 20-30% of the traditional treatment plant
- Generate much less sludge, saves sludge treatment and disposal cost
- Easy conversion for existing plant upgrading and expansion

PERMAMAX™ MBR HOLLOW FIBER MEMBRANE FEATURES

- ***High performance***

  High and stable permeate flux with excellent separation capability.

- ***High reliability***

  Narrow pore size distribution guarantees excellent treated water quality. PVDF material provides exceptional chemical compatibility and durability.

- ***High mechanical strength***

  PermaMax™ MBR hollow fiber membranes are made exceptionally tough to abate breakage under harsh environment.

- ***Long lifespan***

  Longer service life reduces maintenance and replacement frequency. This reduces system downtime and sustains performance KPIs.

PERMAMAX™ MEMBRANE SPECIFICATIONS

	Module Type		STM08008	STM15015	STM15020	STM20028
Membrane	Membrane Area	m^2	8	15	20	28
	Fiber ID/OD	m^2	1.0/1.8			
	PVDF (PP) Pore Size	µm	0.1 (0.4)			
Operating Condition	Filtration Mode		Submerged membrane with suction filtration			
	Designed Flux *	m^3/d	2.9-6.7	5.2-12.7	7.2-16.8	10.2-23.7
	Max. Transmembrane Pressure (TMP)	kPa	300			
	Operation Temperature	°C	5 - 40			
	pH Range **		2 - 10			
Material	Membrane Material		PVDF/PP			
	Module Material		ABS resin			
	Potting Material		Polyurethane Resin			
Connection	Pipe Connection		DN32			

* Designed flux varies depending on feed water quality or system design basis. Please consult Tritech Water for further information.

**Above specified pH range may be exceeded during chemical cleaning. Please refer to operation manual for further information.

TRITECH® PERMAMAX™ iMBR PRODUCT WATER QUALITY

Tritech® PermaMax™ iMBR can produce high quality water, the product water can be directly reused as non-drinking water or industrial water. Product water's quality is better than "Discharge standard of municipal sewage treatment plant" (GB18918-2002) First A grade, "Municipal wastewater recycle, municipal non-drinking water quality" (GB/T 18920-2002), "Municipal wastewater recycle, industrial water quality" (GB/T 19923-2005) and is in accordance to Guidelines for the safe use of wastewater, excreta and greywater. WHO

	COD	BOD	TSS	Ammonia Nitrogen	Total Nitrogen	Total Phosphorus	Turbidity	Total Coliforms	SDI
Municipal wastewater	<30mg/L	<2mg/L	<1mg/L	<0.5mg/L	<3mg/L	<0.05mg/L*	<0.5NTU	<100cfu/100mL	<3
Industrial wastewater	>90%	>98%	>99%	>90%	>90%	>90%	<1 NTU	<100cfu/100mL	<3

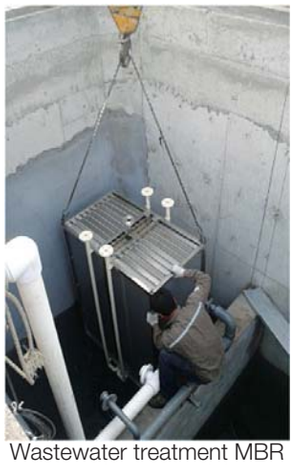
**Chemical phosphorus removal with biological removal of phosphorus*

MEMBRANE MODULE USED

Tritech® PermaMax™ hollow fiber membrane module for integrated membrane bioreactor (iMBR)

Tritech® PermaMax™ Membrane module

Membrane Skid (PermaMax-080)



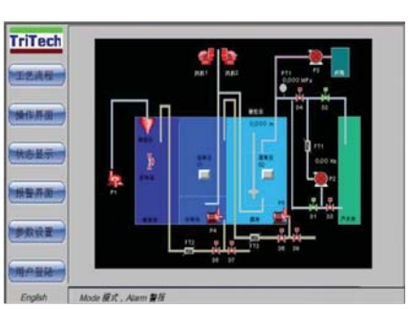
Wastewater treatment MBR membrane module (Taiqinggong, Laoshan)

SPECIFICATIONS FOR MEMBRANE SKID

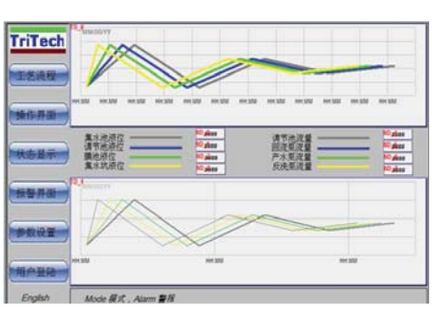
Type	Skid Model Series	Membrane series used	No. of modules	Total membrane area (m^2)	Treatment capacity (m^3/d)	Size est. L x W x H (m)
I	PermaMax-080	STM08008	10	80	29	1.0 x 0.75 x 1.5
II	PermaMax-160	STM08008	20	160	57	1.0 x 1.5 x 1.5
III	PermaMax-300	STM15015	20	300	108	1.0 x 1.5 x 2.1
IV	PermaMax-400	STM15020	20	400	144	1.0 x 1.5 x 2.1
V	PermaMax-560	STM20028	20	560	200	1.0 x 1.5 x 2.7

Note: Treatment capacity based on water flux of 15 LMH

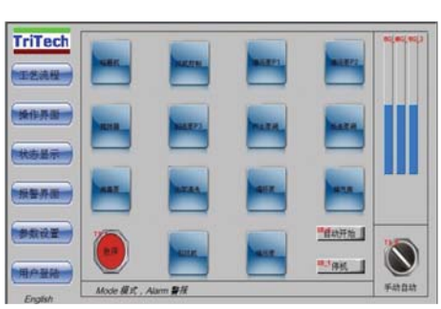
PLC HMI



Process flow monitoring

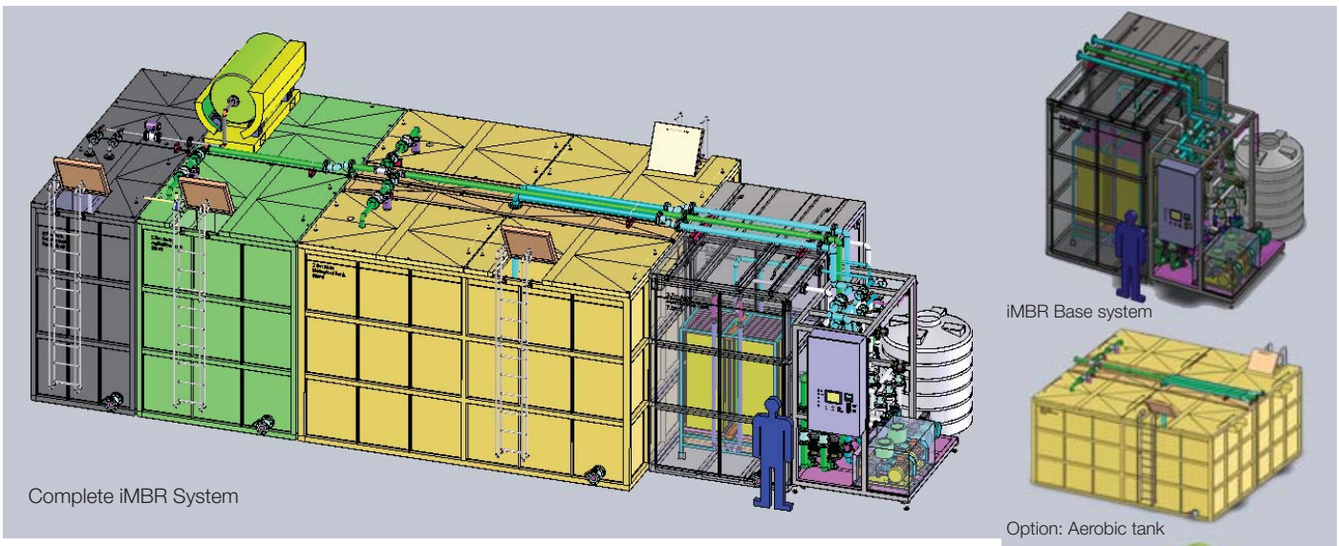


Historical trends



Control panel

TRITECH® INTEGRATED MEMBRANE BIOREACTOR (iMBR) MODULAR DESIGN

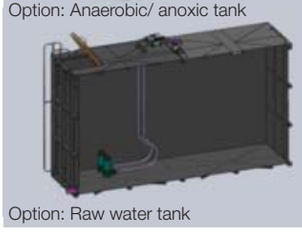


Complete iMBR System

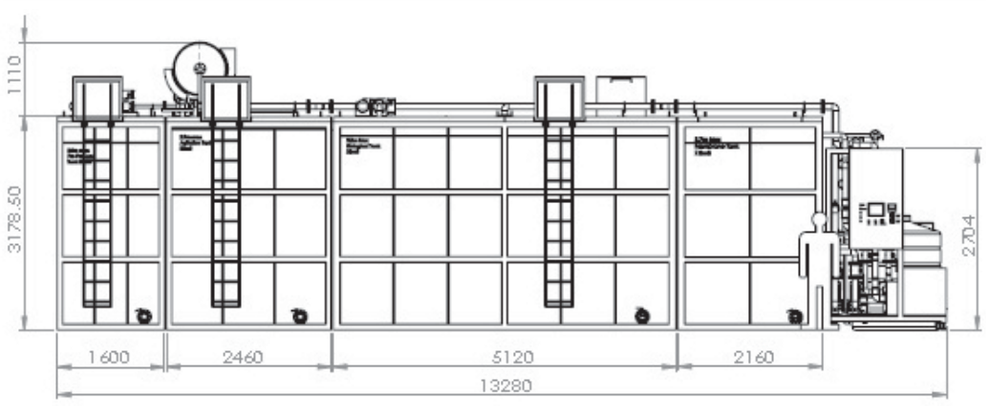
iMBR Base system

Option: Aerobic tank

Option: Anaerobic/ anoxic tank



Option: Raw water tank

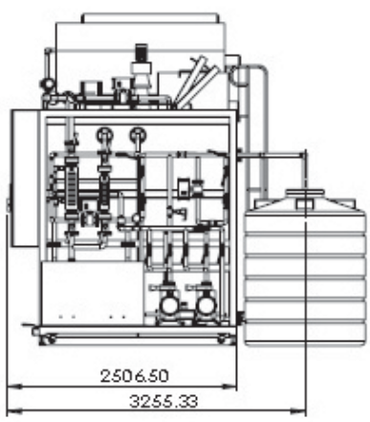


Mechanical drawing for iMBR – M22

PRODUCT RANGE FOR TRITECH INTEGRATED MBR (iMBR) SYSTEM

Pre-engineered Package Plants are cost effective and compact solutions for waste water treatment

Type	Model Series	Model	Membrane series used	Design capacity (m^3/d)
I	iMBR-S	S03	PermaMax-080	29
		S06	PermaMax-160	57
		S11		114
		S17		171
II	iMBR-M	M11	PermaMax-300	108
		M22		216
		M33		324
		M44		432



Side view of the iMBR Base System for iMBR S03

iMBR Base System Build