

250 m³/d Design Scheme of Municipal/Domestic Wastewater MBR System

1. Feed water type

Feed water type Municipal/Domestic WastewaterDaily running time 24 hCapacity 250 m³/d 10.4 m³/h

Remark: The feed water should be treated by 1 mm grid.

2. Membrane module selection

Cassettes of MSFSF8020T*48 are recommended. The details of cassette is as follows:

Capacity	250.0	m ³ /d
Membrane material	PVDF	
Membrane module	MSFSF8020T	
Module membrane area	20	m ²
Quantity of membrane module	48	pcs
The estimated instantaneous flux	15	LMH
The actual instantaneous flux	13.7	LMH
The average flux	10.9	LMH
Backwash flux	24	LMH
Mode of operation	Negative pressure suction, continuous aeration	
Operating pressure	≤ -0.05	MPa
Backwash pressure	MAX 0.2	MPa
Operating temperature	5-35	°C
Backwash time	60-120	s
Backwash interval	2-12	h

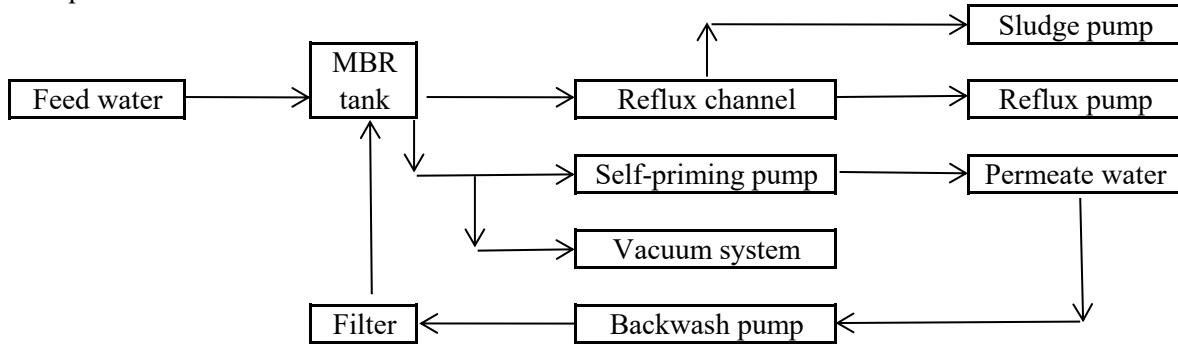
3. Operation mode and process flow

The MBR system adopts the operation mode of "continuous aeration and intermittent suction"; Operation mode:

The backwash cycle is 2-12 h.

Filtration 8 min
Pause 2 min

The process is as follows



4. Calculation of quantity of membrane cassettes

Quantity of cassettes 0.9 Set
Select 1 SetSize per cassette: L= 2250 W= 1440 H= 2550Feed flange: DN80Air blower flange: DN50 Quantity of interfaces 2

5. Verify the actual flux

Quantity of membrane modules	<u>48</u>	pcs
Total membrane area	960	m ²
The actual flux	13.7	LMH
A single membrane cassette produces water flow	13.2	m ³ /h
Total flow	13.2	m ³ /h
Permeate pipe interface	68.0	mm Select <u>DN80</u>
Permeate main pipeline	55.7	mm Select <u>DN65</u>

6. Calculate aeration flow

Aeration flux	<u>240</u>	LMH
Aeration flow	230.4	Nm ³ /h 3.8 Nm ³ /min
A single membrane cassette	230.4	Nm ³ /h 3.8 Nm ³ /min
Air blower pipe interface	45.7	mm Select <u>DN50</u>
Air blower main pipeline	64.6	mm Select <u>DN65</u>

7. Main equipment selection

7.1 Self-priming pump

The system is equipped with 1 sets of permeate systems, 1 permeate pumps are used, and the spare pumps are selected according to needs.

System quantity	<u>1</u>	train(s)
Quantity of cassettes per train	1	cassette(s)
Permeate of single cassette	13.2	m ³ /h
selection conditions are as follows:		
Flow	14.47	m ³ /h
Head of delivery	12	m
Power	0.91	kW Select <u>0.75</u> kW
Efficiency	52%	
Inlet pipe diameter	65.3	mm Select <u>DN80</u>
Outlet pipe diameter	53.3	mm Select <u>DN65</u>

7.2 Backwash water pump

This system sets up 1 set of backwash system, 1 water production pumps are used, and the spare pumps are selected according to needs.

Selection conditions are as follows:

Flow	25.3	m ³ /h
Head of delivery	10	mH
Power	1.06	kW Select <u>1.1</u> kW
Efficiency	65%	
Inlet pipe diameter	77.3	mm Select <u>DN80</u>
Outlet pipe diameter	63.8	mm Select <u>DN65</u>

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This system sets up 1 set of blower system, 1 blower are used, and the spare pumps are selected according to Selection conditions are as follows:

Flow	3.80	Nm ³ /min
Water depth of the membrane tank	<u>4</u>	m
Air pressure	4.5	mH20
Power	5.18	kW
Efficiency	55%	Select <u>5.47</u> kW
Inlet pipe diameter	64.3	mm
Outlet pipe diameter	64.3	mm
		Select <u>DN65</u>
		Select <u>DN65</u>

7.4 Sodium hypochlorite dosing pump

This system sets up 1 set of sodium hypochlorite dosing system, 1 dosing pump(s) are used, and the spare pumps are selected according to needs; the cleaning agent is sodium hypochlorite.

Dosing concentration	500	ppm
Concentration of dispensing	10%	
Dosing pump flow	127	L/H

7.5 Citric acid dosing pump

This system sets up 1 set of acid dosing system, 1 dosing system are used, and the spare pumps are selected according to needs; the cleaning agent is citric acid.

Dosing concentration	2000	ppm
Concentration of dispensing	50%	
Dosing pump flow	101	L/H

7.6 Sludge reflux pump

Reflux ratio of mixed liquid	<u>1</u>	
The reflux flow	10.4	m ³ /h

Select 1 reflux pumps, and the spare pumps are selected according to needs;

Selection conditions are as follows:

Flow	11.4	m ³ /h
Head of delivery	10	m
Efficiency	65%	
Power	0.5	kW
Inlet pipe diameter	55.8	mm
Outlet pipe diameter	45.0	mm
Reflux main pipeline	42.9	mm
		Select <u>DN65</u>
		Select <u>DN50</u>
		Select <u>DN50</u>

7.7 Sludge pump

This system sets up 1 set of sludge discharge system, 1 sludge pump are used, the spare pumps are selected according to needs;

Selection conditions are as follows:

Flow	2.5	m ³ /h
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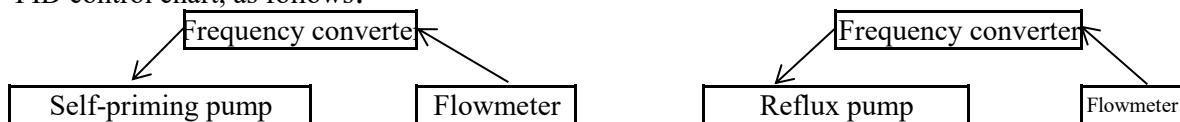
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Head of delivery	10	m	
Efficiency	65%		
Power	0.1	kW	
Inlet pipe diameter	27.1	mm	Select <u>DN32</u>
Outlet pipe diameter	22.2	mm	Select <u>DN25</u>

8. Operation control instruction**8.1 Pump and flowmeter, variable frequency interlock**

The self-priming pumps in each group of the system adopt frequency conversion control and are interlocked with the permeate flowmeter. The design parameters of the flowmeter are the peak flow rate of the system.

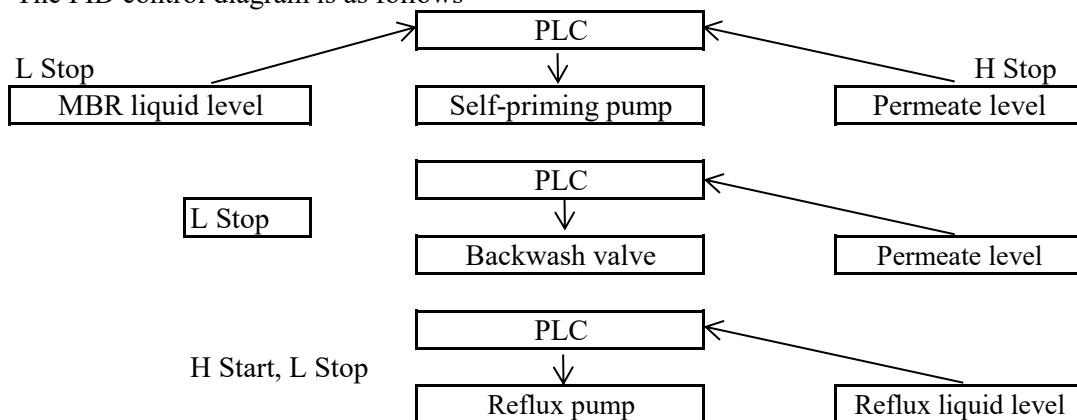
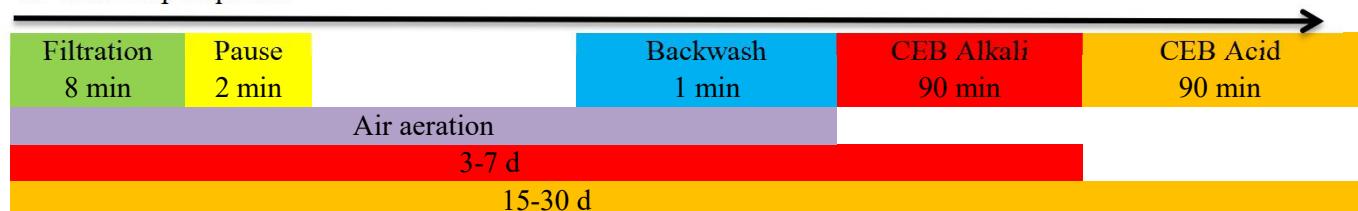
PID control chart, as follows:

**8.2 The pump is interlocked with the level signal**

The system is equipped with liquid level record and liquid level switch control. The start and stop of the pump is controlled by the level signal.

1. When the level is L in MBR tank, the self-priming pump will stop automatically,
2. When the level is L in permeate tank, the backwash pump stops automatically,
3. When the level is H in permeate tank, the self-priming pump automatically stops,
4. When the reflux level is L, the reflux pump will stop automatically; when the reflux level is H, the reflux pump will start automatically.

The PID control diagram is as follows

**8.3 Time step sequence****8.4 The status of valve and pump at each step**

Step sequence	Self-priming pump	Backwash pump	Permeate water valve	Backwash valve	Aeration valve	Acid dosing pump	Alkali dosing pump

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Suction	Open		Open		Open		
Backwash		Open		Open			
CEB alkali		Open		Open	Open		Open
CEB acid		Open		Open	Open	Open	