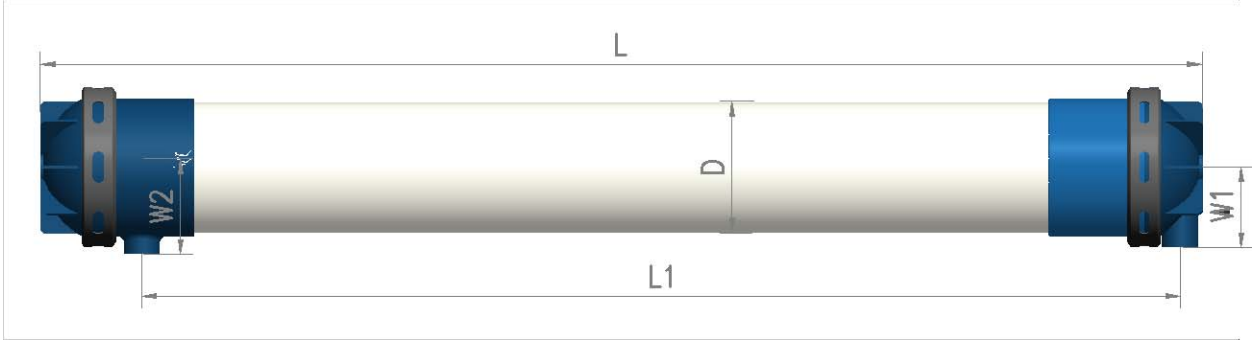
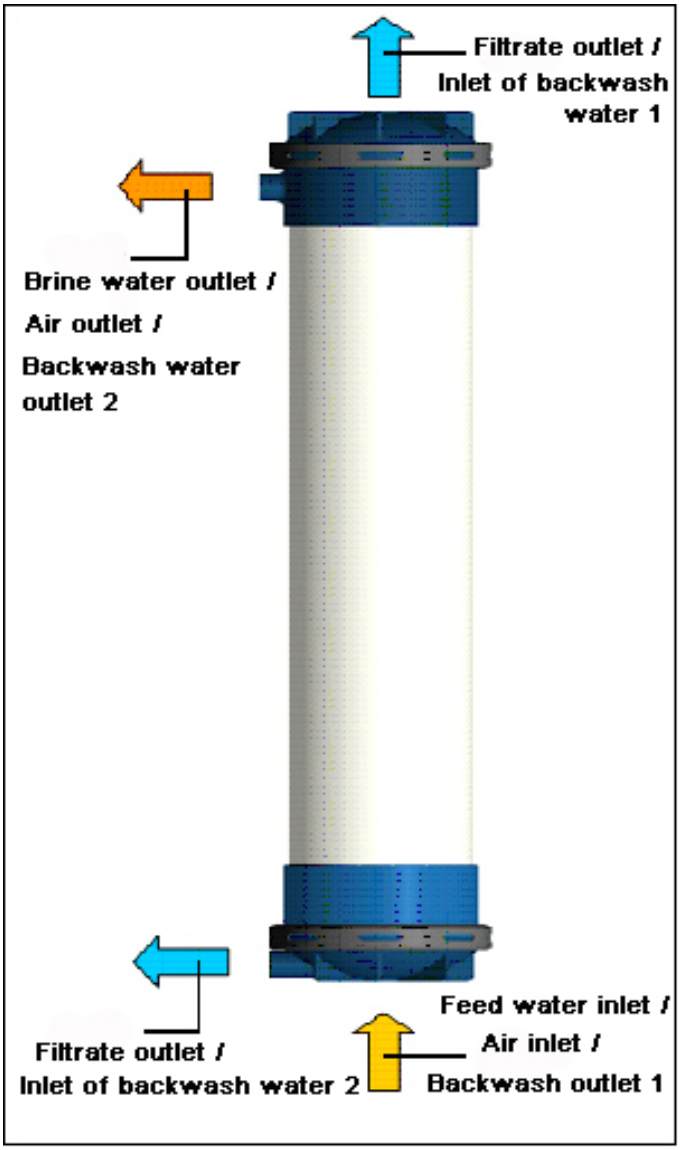
PVDF Hollow Fiber UF Membrane PVDF-1808

Table1 PVDF-1808 HUF Module Specification Sheet

Item	Specification
Model	PVDF -1808
Membrane fiber material	PVDF
Membrane fiber I.D./O.D.	0.7 / 1.3 mm
Membrane surface area	66 m^2
Nominal pore size	0.03 μm
Membrane module length L	2000±2 mm
Membrane module out diameter D	225 mm
Side connectors distance L1	1786±2 mm
The distance from bottom connector to the axle W1	138 mm
The distance from top connector to the axle W2	149 mm
Out connectors (for all)	DN 40
Casing material	White UPVC
End caps material	Blue UPVC
Using Conditions	
Design flux	2.5-6.0 m^3/h (according to raw water, see details at Table2-3)
Max. feed water(inlet) pressure	0.3 MPa
Max. TMP	0.15 MPa
Operating temperature range	5-45 ℃
Operating pH range	3-10
Chemical cleaning pH range	2-12




Filtrate outlet /
Inlet of backwash
water 1
Brine water outlet /
Air outlet /
Backwash water
outlet 2
Feed water inlet /
Air inlet /
Backwash outlet 1
Filtrate outlet /
Inlet of backwash water 2

1. Using Conditions

1. Suitable for following applications:

Drinking water production (raw water as tap water, ground water, surface water, etc.),

Reuse of sewage (filtration of secondary effluent),

Pretreatment for RO membrane process (seawater desalination, wastewater reuse, industrial water production),

Reuse of industrial wastewater (waste water standard: SS ≤ 30ppm, COD ≤ 120ppm, BOD_5 ≤ 30ppm);

2. pH range: 3-10 (2-12 when doing cleaning);

3. Max. input water turbidity: 15NTU;

4. Max. feed water pressure: 0.30MPa;

5. Pretreatment filter mesh size: smaller than 100 micron meter;

6. Oil concentration in raw water must be less than 2mg/L, otherwise it must be removed by pretreatment;

7. Design pure water flux: 2.0-6.0 m^3/h;

8. Max. TMP (trans-membrane pressure): 0.15MPa (chemical cleaning is needed when TMP is more than 0.12MPa.);

9. Operating temperature range: 5-45 ℃;

10. Max. free chlorine concentration in cleaning solution: 1000 mg/L;

11. Operation type: cross flow or full flow.

2. Standard operation conditions

Standard operation mode: Filtration – Backwash and air-scrubbing – Backwash 1 – Backwash 2.

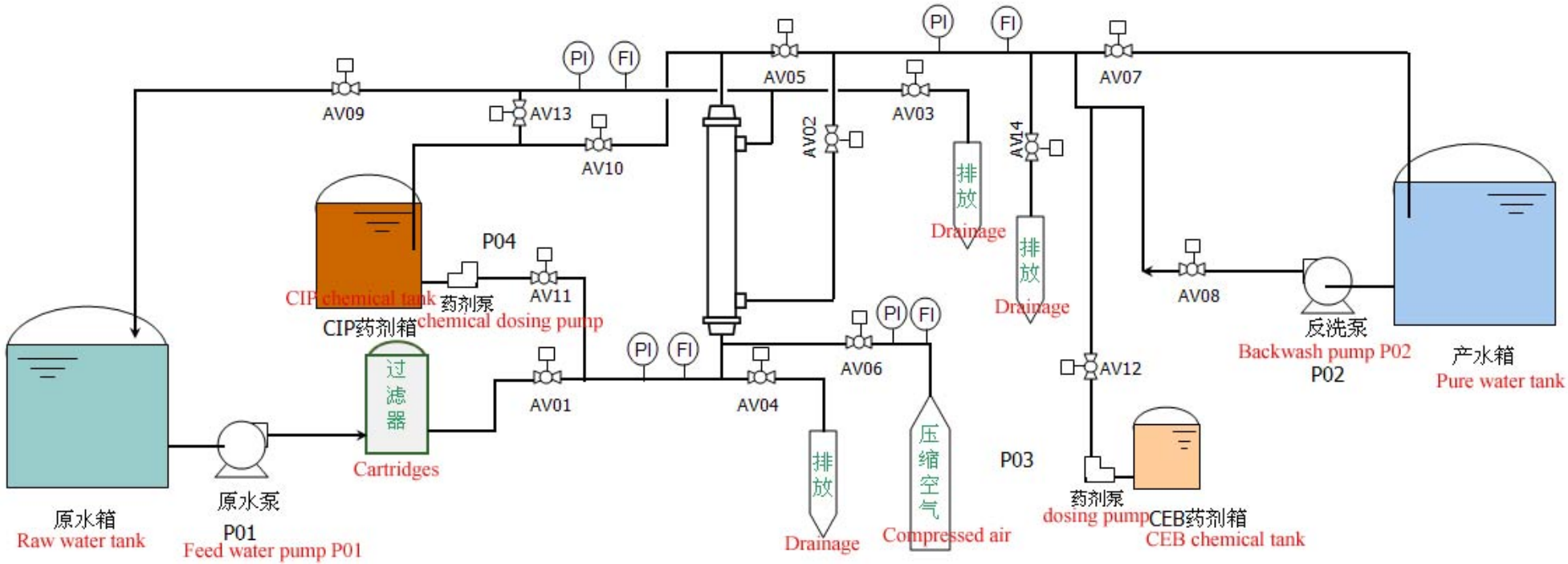
Table 2 Standard operation conditions

Items		Conditions	Attention!!
Pretreatment		Use less than 100μm filter mesh or other filtering products.	
Filtration	Time	20-60 min	According to raw water quality
	Brine water recovery rate	0-50 %	According to raw water turbidity
Backwash and air-scrubbing	Time	20-60 S	According to raw water quality
	Backwash flow rate	1 m^3/h	▪feed backwash water from bottom filtrate outlet, but close the top filtrate outlet, and drain backwash water from brine water outlet. ▪ NaClO may be added in backwash water according to raw water quality.
	Air-scrubbing flow rate	4-6 Nm^3/h	
	Air-scrubbing pressure	0.1 MPa compress air without oil	
Backwash 1	Time	20-90 s	inlet of backwash water 2 – backwash water outlet 2
	Flow rate	120% of flux water	
Backwash 2	Time	20-90 S	Inlet of backwash water 1 – backwash water outlet 1
	Flow rate	120% of flux water	

Table 3 PVDF -1808 UF Module Suggested Design Pure Water Flux

Feed Water Condition		Flux (L/m^2.h)	Backwash Frequency (min)	CEB (chemical enhanced backwash)
Feed Water Type	Turbidity (NTU)			
Ground water	<3	60-90	60	Not recommend
Tap water	<3	50-70	60	Optional
Surface water (after sand filtration)	<3	50-70	60	Optional
Surface water	3~15	40-60	30	Recommend
Seawater	3~15	40-60	30	Recommend
Seawater (after sand filtration)	<3	50-70	60	Optional
Secondary sedimentation output water or deeply treated wastewater	<15	30-50	20	Recommend

3. UF System



UF filtration, CEB, CIP process diagram

The UF system includes filtration, CEB, CIP. See detailed control and procedure at table 4.

Table 4 UF system operate control and procedure

			Operation Status					
			Filtration	Backwash and air-scrubbing	Backwash 1	Backwash 2	Filtration	St
Pumps	P01	Feed water pump	√				√	
	P02	Backwash pump		√	√	√		
	P03	CEB chemical dosing pump						
	P04	CIP chemical dosing pump						
Valves	AV01	Feed water valve	√				√	
	AV02	Backwash bottom feed water valve	√	√	√		√	
	AV03	Backwash top drainage valve		√	√			
	AV04	Backwash bottom drainage valve				√		
	AV05	Backwash top feed water valve	√			√	√	
	AV06	Air inlet valve		√				
	AV07	Pure water valve	√				√	
	AV08	Backwash feed water total control valve		√	√	√		
	AV09	Brine water valve	√				√	
	AV10	CIP pure water recover valve						
	AV11	CIP feed water valve						
	AV12	CEB chemical inlet valve						
	AV13	CIP recover valve						
	AV14	Pure water drainage valve						
	Time		20~60min	20~120s	20~90s	20~90s	20~60min	
	Flow rate（m^3/h）		2.5~5.0	Air: 4~6，Water: 1	4~6	4~6	2.5~5.0	
Note	1. Run the UF system as following procedure: Filtration – Backwash and air-scrubbing – Backwash 1 – Backwash 2 – Filtration; 2. “√”means valves or pumps are open or running; 3. Valves positions are marked in the diagram.							

			CEB Status								
			Stop	BAS[1)]	backwash 1	Backwash 2	immersed	drain down	backwash 1	backwash 2	filtration
Pumps	P01	Feed water pump									√
	P02	Backwash pump		√	√	√			√	√	
	P03	CEB chemical dosing pump			√	√					
	P04	CIP chemical dosing pump									
Valves	AV01	Feed water valve									√
	AV02	Backwash bottom feed water valve		√	√				√		√
	AV03	Backwash top drainage valve		√	√			√	√		
	AV04	Backwash bottom drainage valve				√		√		√	
	AV05	Backwash top feed water valve				√				√	√
	AV06	Air inlet valve		√							
	AV07	Pure water valve									√
	AV08	Backwash feed water total control valve		√	√	√			√	√	
	AV09	Brine water valve									√
	AV10	CIP pure water recover valve									
	AV11	CIP feed water valve									
	AV12	CEB chemical inlet valve									
	AV13	CIP recover valve									
	AV14	Pure water drainage valve									
Time				20~120s	20~90s	20~90s	30~60min	20~30s	20~90s	20~90s	20~60min
Flow rate（m^3/h）				Air: 4~6 Water: 1	4~6	4~6			4~6	4~6	2.5~5.0

1. BAS means backwash and air-scrubbing. 2. CEB is needed after the system running for 24hrs, cleaning frequency may be adjusted according to different feed water. 3. “√” means valves and pumps are open or running. 4. CEB is operated as following procedure: stop – BAS – backwash 1 – backwash 2 – immersed – drain down – backwash 1- backwash 2 – filtration.

			CIP Status											
			BAS[1)]	backwash 1	backwash 2	drain down	recycle	immersed	recycle	drain down	backwash 1	backwash 2	flush	filtration
Pumps	P01	Feed water pump											√	√
	P02	Backwash pump	√	√	√						√	√		
	P03	CEB chemical dosing pump												
	P04	CIP chemical dosing pump					√		√					
Valves	AV01	Feed water valve											√	√
	AV02	Backwash bottom feed water valve	√	√			√		√		√		√	√
	AV03	Backwash top drainage valve	√	√		√				√	√		√	
	AV04	Backwash bottom drainage valve			√	√				√		√		
	AV05	Backwash top feed water valve			√		√		√			√	√	√
	AV06	Air inlet valve	√											
	AV07	Pure water valve												√
	AV08	Backwash feed water total control valve	√	√	√						√	√		
	AV09	Brine water valve												√
	AV10	CIP pure water recover valve					√		√					
	AV11	CIP feed water valve					√		√					
	AV12	CEB chemical inlet valve												
	AV13	CIP recover valve					√		√					
	AV14	Pure water drainage valve											√	
Time			20~120s	20~90s	20~90s	20~30s	30min	30~60min	20~90s	20~30s	20~90s	20~90s	20~30s	20~60min
Flow rate			Air: 4.0~6.0 Water:4.0~6.0	4.0~6.0	4.0~6.0		1				4.0~6.0	4.0~6.0		2.5~5.0

1. BAS means backwash and air-scrubbing. 2. CIP (cleaning in place) is needed when TMP gets to 0.12MPa or the system has been running for 3-6monthes. 3. "√" means valves or pumps are open or running. 4. CIP operate as following procedure: BAS – backwash 1 – backwash 2 – drain down – recycle – immersed – recycle – drain down – backwash 1 – backwash 2 – flush – filtration.

3.1 CEB

1. Make sure to remove most fouling before CEB.

2. Make sure to immerse the module in chemicals completely. Control the backwash water flow rate at 4-6 4~6m^3/h when adding chemicals. Clean it for 30-60mins.

3. Make sure to back flush all chemicals from the complete system.

4. Chemicals are chosen according to different fouling. If the membrane is mainly polluted by inorganic fouling, use HCl (pH=3-4). While for organic fouling, use mixture of NaClO （200~500mg/L）+NaOH，control the pH at 10-11.

5. Sometimes, CEB（NaOH/NaClO）and CEB（HCl）can be used simultaneously or in turn.

3.2 CIP

① CIP A：

Use citric acid or HCl solution, and adjust pH value at 2-3. It is suitable for iron pollutes and carbonate crystallization fouling.

CIP with acid solution is done as following procedures:

1. Preparation;

1.1 Close all valves;

1.2 Prepare citric acid or HCl solution (pH value=2-3) in cleaning solution tank and mixed completely.

2. Control the chemical solution's temperature at 20-30℃.

3. Clean.

3.1 BAS and backwash must be completely done before CIP. And drain down water from membranes before CIP too. (Attention: Insert chemicals to membranes immediately after draining down all water.)

3.2 Start cleaning pump, slowly open cleaning pump outlet valve and UF system cleaning solution inlet and outlet valves. Control the cleaning solution flow rate at 1m^3/h for each membrane module and re-flow to cleaning solution tank. Recycle cleaning time is 30min. Test pH value, if it is more than 3, drain down cleaning solution, re-prepare cleaning solution and clean again.

3.3 Close cleaning pump, immerse 30-60min without running.

3.4 Recycle for 30min at same flow rate after immersing.

3.5 Drain down cleaning solution tank and cleaning filter, and flush them with pure water.

4. Flush UF system.

Flush UF system to remove remaining chemicals.

4.1 Open UF system brine water discharge valve and pure water discharge valve, drain down all chemical cleaning solution.

4.2 Open UF system feed water valve. Feed water flow into UF membrane modules, make it as Filtration status and goes into automatic Cleaning status, discharge brine water and pure water. Make pure water flow into pure water tank until its pH value is more than 6.

4.3 Go back to production running status.

② CIP B：

NaClO（500~1000mg/L）+ NaOH mixture solution, pH=11~12, it is suitable to clean organic fouling and bacteria pollution.

CIP B is operated as following:

1. **Preparation**

1.1 Close all valves.

1.2 Prepare NaClO（500~1000mg/L）+ NaOH mixture solution in cleaning tank. Make pH value at 11-12, and mix it completely.

2. **Control the standard chemical solution's temperature at 20-30℃.**
3. **Cleaning**

If the cleaning solution's pH value is less than 10, then drain down all solution, and re-prepare chemical cleaning solution.

All the other procedures are the same as CIP A.

4. NOTICE

1. PURAN PVDF-1808 hollow fiber UF modules need to be cleaned before initial use as following:

1.1 After installing the modules well in your plant, run the plant in normal operating process, and keep the feed water pressure at a low value of less than 0.10MPa.

1.2 After running 10mins later, clean the modules for 30seconds with backwash and air-scrubbing, then do backwash 1 for 30seconds and then do backwash 2 for 30seconds.

1.3 Discharge the pollutants from the modules.

1.4 Repeat the above procedures till the pH value of feed water is the same as brine water. By now the UF plant is ready to start working.

Caution!!! When cleaning new modules, here are attentions for different types of cleaning:

When doing backwash and air-scrubbing, the air flow rate should be ≤3 Nm^3/h for each piece, and backwashing water flow rate should be ≤0.4 m^3/h for each piece.

When doing backwash 1 and backwash 2, the backwashing water flow rate should be ≤2 m^3/h for each piece.

2. PURAN PVDF-1808 hollow fiber UF modules using instructions

2.1 The max. feed water pressure is 0.30MPa.

2.2 Backwashing water flow rate is 4-6 m^3/h for each piece, and control the backwashing water inflow pressure at ≤0.15 MPa

2.3 Air inflow is 4-8 Nm^3/h for each piece (backwashing water inflow could be 1 m^3/h when doing backwash and air-scrubbing), and air inflow pressure should be controlled ≤0.2 MPa.

2.4 The max. trans-membrane pressure (TMP) is 0.15 MPa. When TMP is ≥ 0.12 MPa, chemical cleaning (CIP) must be done immediately.

3. Chemical cleaning notices

3.1 All cleaning chemicals must inflow from feed water inlet.

3.2 Backwash and air-scrubbing and backwash1 & 2 must be done completely before chemical cleaning (CIP).

3.3 The complete chemical cleaning process needs about 2-4hrs. If the modules are seriously polluted, then the modules need to be immersed in chemicals for more than

12hrs.

3.4 If the UF plant would stop working for more than 3days after chemical cleaning, then the UF plant must be protected and serviced according to long term stop requirements.

3.5 The chemical cleaning solution must be diluted with UF pure water or better quality water.

3.6 Pollutants, which possibly exit in the chemical cleaning solution, must be removed before inputting chemical cleaning solution into the UF modules.

3.7 When Mixture of chemical cleaning solution are necessary, then the chemical cleaning solution and the bactericide should not do damage to membrane fibers and UF modules. Discharge chemical cleaning solution completely after each cleaning, and flush the system with UF pure water or RO water, and then do chemical cleaning again.

Caution!!! Make sure to keep PURAN PVDF hollow fiber UF membranes wet at any time. Once the membrane fibers are dry, they will be damaged irreversibly.

4. How to protect UF plant during long-term stop.

4.1 If the UF plant stops working for short time (less than 3days), do one backwash and air-scrubbing and backwash 1 & 2 everyday, and then close all valves.

4.2 If the UF plant stops working for 4-7days, run the system for 30-60mins every day (thereinto it must include one backwash and air-csrubbing and backwash 1 & 2), and then close all valves.

4.3 If the UF plant stops working for more than 7days, membrane modules must have complete chemical cleaning, then inject protect liquid (1% hydrosulfite of sodium solution) into membrane modules, and then close all valves. Make sure to test pH value of the protect liquid every month, and change the protect liquid immediately when the pH value is ≤3.

4.4 If restart the plant after long-time stop, make sure to flush the UF plant continuously until there is no foam in the pure water.

4.5 Make sure to keep UF membranes wet during the stop, once the membrane fibers are dry, they will be damaged irreversibly.

Caution!!! Make sure to keep PURAN PVDF hollow fiber UF membranes wet at any time. Once the membrane fibers are dry, they will be damaged irreversibly.

5 Applications

5.1 Guangdong Foshan Datang Wastewater Treatment

9.1.1 Profile

Capacity: 2 x 30000m^3/d

Process: Secondary sediment tank + Ozonator + Self-cleaning Cartridge + UF + RO (one pass)

9.1.2 Operating data：

1）UF feed water quality：

Feed water: water from secondary sediment tank.

COD：≤100 mg/l

SS：≤20 mg/l

Conductivity：≤3200 μs/cm

Color：100

Temperature：≤35℃

2）UF pure water quality：SDI<3

3) UF pure water flux：1250m^3/h

4) Filtrate type：Cross flow.

5.2 Zhejiang Jiaming Dyeing Wastewater Treatment

9.2.1 Profile

Capacity: 5000m^3/d.

Process: Raw water tank + Multi-cartridges + UF + RO

9.2.2 Operating data：

1）UF feed water quality：

Raw water type	Main pollutants	Concentration (mg/L)
Dyeing wastewater	PH	6.8-7.6
	Conductivity	4000～5000μs/cm
	CODcr	30～50mg/l
	Color	30～60
	Total hardness	4～5 mg/L
	Total alkalinity	1.0～2.0mg/L
	Total P	0.053～0.158
	Chloride ion	400～600 mg/L
	Total free chlorine	0.3～0.6 mg/L
	Total iron	0.1 mg/L
	BOD	5～6 mg/L

2）UF pure water quality：SDI<3

3) UF pure water flux：240m^3/h

4) Filtration type: cross flow.

5.3 Indonesia Seawater Desalination

9.3.1 Profile

Capacity: 18000m^3/d

Process: DAF + Multi-cartridges + UF + RO

9.3.2. Operating data：

1）UF feed water quality：

COD：≤400 mg/l

Turbidity：≤13 NTU

Conductivity：≤41000 μs/cm

pH：7.3

Temperature：≤30℃

2）UF pure water quality：SDI<1.3

3) UF pure water flux：750m^3/h

4) Filtration type: cross flow.