

Reverse Osmosis (RO) Systems

Reduction of Total Dissolved Solids from water



'HR' SERIES INDUSTRIAL HIGH REJECTION SYSTEMS



STANDARD FEATURES

PRE-TREATMENT WITH AUTOMATIC MEDIA FILTERS • PRE-RO 5 MICRON FILTRATION • 365 ft² (40") & 575 ft² (60") AREA PER RO MEMBRANE • ANTISCALANT DOSING TO PREVENT HARD WATER SCALING ON RO MEMBRANES • AUTO FLUSH VALVE TO REMOVE DEPOSITION ON MEMBRANES • SOFT-START VARIABLE SPEED DRIVE PUMPS TO PROTECT PIPING & MEMBRANES FROM HYDRAULIC IMPACT ON PUMP START-UP • AUTO DUMP VALVES ON PERMEATE LINES DIVERT HIGH CONDUCTIVITY PERMEATE WHEN RO IS INACTIVE • DUAL CHANNEL CONDUCTIVITY ANALYSER CONSTANTLY MONITORS FEED & PERMEATE QUALITY • FULLY AUTO OPERATION, PLC BASED • HMI OPERATOR INTERFACE • FEED, REJECT, PERMEATE & RECYCLE FLOW METERS • VISIBLE & AUDIBLE ALARMS FOR POOR QUALITY WATER & FAULTS • STAINLESS STEEL VSD PUMPS • AUTO, SEMI AUTO, & MANUAL OPERATING MODES • FULL MANUALS & DRAWINGS

SPECIFICATIONS

MODEL	TYPICAL FLOWRATE M ³ /HR	INLET PIPE SIZE	MEMBRANES		PUMP POWER KW		PREFILTER TANK SIZE
			Size	Qty	FEED PUMP	RO PUMP	
L1-8060HR	2.0	40mm	8"x60"	1	1.5	4.0	18"x65"
L2-8040HR	2.7	40mm	8"x40"	2	2.0	4.0	21"x62"
L2-8060HR	4.0	40mm	8"x60"	2	2.5	5.5	24"x72"
L4-8040HR	5.5	50mm	8"x40"	4	3.0	7.5	30"x72"
L4-8060HR	8.0	50mm	8"x60"	4	4.0	7.5	42"x72"
L6-8060HR	12.0	75mm	8"x60"	6	5.5	11	48"x72"

MACKAY (Head Office)

9-15 Industrial Street
MACKAY QLD 4740
+61 (07) 4969 4949
+61 (07) 4969 4900
info@dowdens.com.au

PROSERPINE

4 Pepper Street
PROSERPINE QLD 4800
+61 (07) 4969 4940
+61 (07) 4969 4900
prossy@dowdens.com.au

ROCKHAMPTON

4 / 415 Yaamba Road
NTH ROCKHAMPTON QLD 4701
+61 (07) 4923 6969
+61 (07) 4923 6900
rocky@dowdens.com.au

BRISBANE

24 / 140 Wecker Road
MANSFIELD QLD 4122
+61 (07) 3828 7000
+61 (07) 3828 7055
brisbane@dowdens.com.au

Reverse Osmosis (RO) Systems

Reduction of Total Dissolved Solids from water



'HR' SERIES DIMENSIONS (approximate, subject to change)

MODEL	L1-8060HR	L2-8040HR	L2-8040HR	L2-8060HR	L4-8040HR	L4-8060HR	L6-8060HR
Length	2.0 m	3.2 m	3.2 m	3.8 m	4.5 m	5.2 m	6.0 m
Width	1.0 m	1.5 m	2.0 m	2.0 m	2.2 m	2.5 m	2.5 m
Height	2.1 m	2.1 m	2.3 m	2.3m	2.3 m	2.3 m	2.3 m
Weight	1000 Kg	1100 Kg	1300 Kg	1500 Kg	1800 Kg	2200 Kg	2800 Kg

ADDITIONAL RO SYSTEMS BY DOWDENS

'ES' ENERGY SAVING SERIES

Employs ultra-low pressure membranes that lower power consumption. Suitable for less-stringent water quality applications and where less capital cost is a factor. Capacities 0.5 - 60.0 m³/hr

'XR' EXTRA-HIGH REJECTION SERIES

Deliver extra-high rejection to purify brackish water with salt contents up to 15.0 gm/l. Capacities 1.0 - 25.0 m³/hr

'SW' SEAWATER DESALINATION SERIES

For desalinating sea water with up to 40.0 gm/l in salt content. Most models offer optional Energy Recovery Devices (ERD) for lower unit cost of water produced. System capacities up to 600.0 m³/day



www.dowdens.com.au

MACKAY (Head Office)

9-15 Industrial Street
MACKAY QLD 4740
+61 (07) 4969 4949
+61 (07) 4969 4900
info@dowdens.com.au

PROSERPINE

4 Pepper Street
PROSERPINE QLD 4800
+61 (07) 4969 4940
+61 (07) 4969 4900
prossy@dowdens.com.au

ROCKHAMPTON

4 / 415 Yaamba Road
NTH ROCKHAMPTON QLD 4701
+61 (07) 4923 6969
+61 (07) 4923 6900
rocky@dowdens.com.au

BRISBANE

24 / 140 Wecker Road
MANSFIELD QLD 4122
+61 (07) 3828 7000
+61 (07) 3828 7055
brisbane@dowdens.com.au

Reverse Osmosis Systems

Demineralisation and Reduction of Total Dissolved Solids from water



'L' SERIES

3 MODELS: 7.2M³ to 28.8M³/DAY

FEATURES

- PLC controlled • Waterproof control box • Stainless Steel
- Multistage pump 230V 50/60 Hz TEFC Motor
- Low pressure switch • 5-micron sediment pre-filter
- Concentrate recycle for higher recovery
- Permeate Recycle & Reject flow-meters
- Stainless steel permeate, recycle and pump throttle valves
- On/Off switch • Emergency shut-off switch
- Reject, feed-water, pre-filter and post-filter pressure gauges
- Stainless or fiberglass membrane housings
- High rejection TFC membranes • Conductivity monitor
- Contacts for product & raw water level control
- Treated water tank high-level float switch
- Automatic flush valve • Automatic feed shut-off valve
- Galvanised steel frame with 2-coat epoxy coating

RAW WATER REQUIREMENTS: ≥30 psi inlet pressure • < 5 SDI
• < 0.1 mg/ltr chlorine feed-water • < 1 NTU turbidity



Pre & post treatment options:

pH correction • antiscalant dosing • Auto iron, sediment & carbon filtration • Bag or cartridge filtration • Softening • Ultrafiltration



SPECIFICATIONS

MODEL	L1	L2	L4
Litres per day¹	7,200	14,400	28,800
Membranes 4" x 40"	1	2	4
Pump Size	1.0kw	1.0kw	1.5kw
Power	230v/50hz	230v/50hz	230v/50hz

WEIGHTS & DIMENSIONS (mm, kgs)

Depth	670	670	670
Width	580	580	740
Height	1720	1720	1720
Weight	80	88	100

¹Permeate flow rate & salt rejection based on: 2000 ppm NaCl, 225 psig (15.5 bar), 77°F (25°C), & 15% recovery. Lower flow rates & operating pressures are advised

MACKAY (Head Office)

9-15 Industrial Street
MACKAY QLD 4740
+61 (07) 4969 4949
+61 (07) 4969 4900
info@dowdens.com.au

PROSERPINE

4 Pepper Street
PROSERPINE QLD 4800
+61 (07) 4969 4940
+61 (07) 4969 4900
prossy@dowdens.com.au

ROCKHAMPTON

4 / 415 Yaamba Road
NTH ROCKHAMPTON QLD 4701
+61 (07) 4923 6969
+61 (07) 4923 6900
rocky@dowdens.com.au

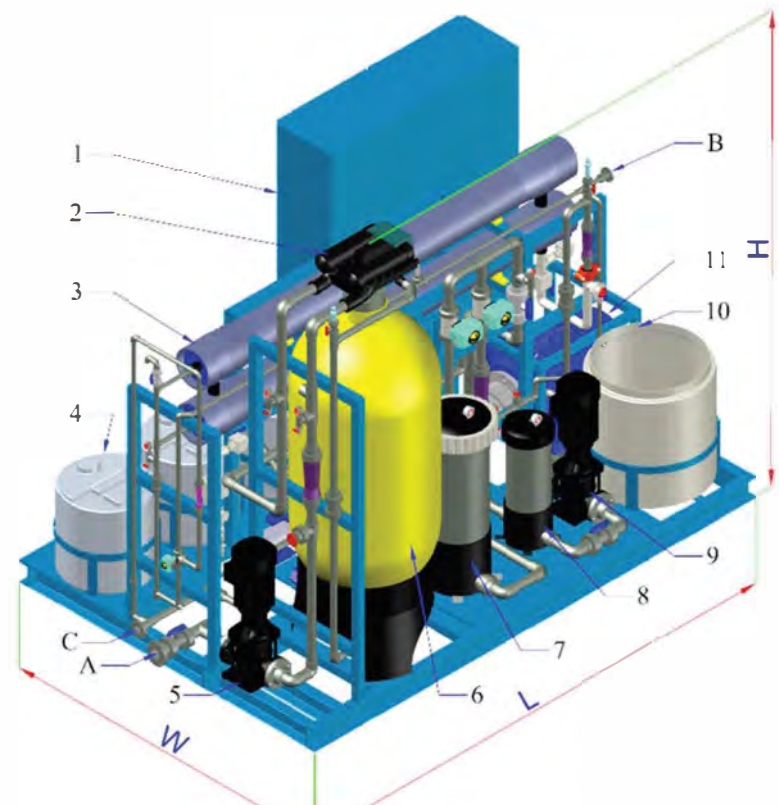
BRISBANE

24 / 140 Wecker Road
MANSFIELD QLD 4122
+61 (07) 3828 7000
+61 (07) 3828 7055
brisbane@dowdens.com.au



Sea Water Reverse Osmosis Systems

7.0m³, 13.0m³, 25m³, 50m³, 75m³, 100.0m³ litres per day



DOWDENS
PUMPING & WATER TREATMENT

www.dowdens.com.au

MACKAY (Head Office)

9-15 Industrial Street
MACKAY QLD 4740
+61 (07) 4969 4949
+61 (07) 4969 4900
info@dowdens.com.au

PROSERPINE

4 Pepper Street
PROSERPINE QLD 4800
+61 (07) 4969 4940
+61 (07) 4969 4900
prossy@dowdens.com.au

ROCKHAMPTON

4 / 415 Yaamba Road
NTH ROCKHAMPTON QLD 4701
+61 (07) 4923 6969
+61 (07) 4923 6900
rocky@dowdens.com.au

BRISBANE

24 / 140 Wecker Road
MANSFIELD QLD 4122
+61 (07) 3828 7000
+61 (07) 3828 7055
brisbane@dowdens.com.au

Sea Water Composition

Typical Sea Water Values	
Cations	mg/L
Na ⁺	10,732
Mg ⁺⁺	1,297
Ca ⁺⁺	417
K ⁺	382
Anions	mg/L
Cl ⁻	19,337
SO ₄ ²⁻	2,705
HCO ₃ ⁻	120
Br ⁻	66

- **Total Dissolved Solids (TDS): 35000 mg/L**
- **All mg/L values as ion (not CaCO₃)**
- **Sea water has little of bicarbonate and silica**
- **The density of sea water is between 1.020 and 1.029 g/L**
- **The pH value of sea water is always between 7.5 and 8.4.**
- **The density of sea water is between 1.020 and 1.029 g/L.**
- **The conductivity of sea water is about 50 mS/cm (50'000 µS/cm) @ 20 °C.**



Technical Features & Data

Table 1: Systems' Models & Typical Flow rates

Model	Open Intake			Beach Well		
	Feed Water (m ³ /hr)	Product Water (m ³ /day)	Reject (m ³ /hr)	Feed Water (m ³ /hr)	Product Water (m ³ /day)	Reject (m ³ /hr)
M•RO-L2-4040SW	1.20	7.0	0.91	1.20	8.0	0.86
M•RO-L2-4040SW(ERD)	1.20	7.0	0.91	1.20	8.0	0.86
M•RO-L4-4040SW	1.60	13.0	1.06	1.60	15.0	0.98
M•RO-L4-4040SW(ERD)	1.60	13.0	1.06	1.60	15.0	0.98
M•RO-L2-8040SW	4.50	25.0	3.40	4.50	30.0	3.25
M•RO-L4-8040SW	5.60	50.0	3.50	5.60	60.0	3.10
M•RO-L4-8040SW(ERD)	5.60	50.0	3.50	5.60	60.0	3.10
M•RO-L6-8040SW(ERD)	10.03	75.0	6.90	9.95	90.0	6.20
M•RO-L8-8040SW(ERD)	11.07	100.0	6.90	11.20	120.0	6.20



Technical Features & Data

Table 2: Pretreatment sizes & pump models

Model	FRP Pressure vessels		Media Quantity		Pump	
	Diameter	Height	Quartz (kg)	Anthracite (kg)	Model	ERD
M•RO-L2-4040SW	Ø18"	65"	90	25	Danfoss (APP1.5)	NA
M•RO-L2-4040SW(ERD)	Ø18"	65"	90	25	Danfoss (APP2.5)	Danfoss (APM2.0)
M•RO-L4-4040SW	Ø18"	65"	90	25	Danfoss (APP1.5)	NA
M•RO-L4-4040SW(ERD)	Ø18"	65"	90	25	Danfoss (APP1.5)	Danfoss (APM1.2)
M•RO-L2-8040SW	Ø30"	72"	300	100	Danfoss (APP5.1)	NA
M•RO-L4-8040SW	Ø36"	72"	432	144	Danfoss (APP6.5)	NA
M•RO-L4-8040SW(ERD)	Ø36"	72"	432	144	Fedco (MSS-1536)	Fedco (HPBe-10)
M•RO-L6-8040SW(ERD)	Ø42"	72"	588	196	Fedco (MSS-1537)	Fedco (HPBe-10)
M•RO-L8-8040SW(ERD)	Ø48"	72"	768	256	Fedco (MSS-1530)	Fedco (HPBe-20)



Technical Features & Data

Table 3: Estimated Power Consumption

Model	Power Consumption (kWh/m ³ product water)		Power Source : 415V, 50Hz /60Hz 3-Phase+Neutral+Earth		Operating Power (kWh)	
	Open Intake	Beach Well	Current	Cable Size (5 Core)	Open Intake	Beach Well
M ●RO-L2-4040SW	6.72	6.32	35A	4.0 mm ²	1.95	2.15
M ●RO-L2-4040SW(ERD)	4.10	3.83	35A	4.0 mm ²	1.19	1.30
M ●RO-L4-4040SW	5.44	5.24	35A	4.0 mm ²	2.94	3.25
M ●RO-L4-4040SW(ERD)	3.70	3.54	35A	4.0 mm ²	2.00	2.20
M ●RO-L2-8040SW	6.59	6.42	63A	10 mm ²	7.25	8.03
M ●RO-L4-8040SW	4.81	4.41	80A	16 mm ²	9.95	11.03
M ●RO-L4-8040SW(ERD)	6.71	6.21	80A	16 mm ²	13.97	15.52
M ●RO-L6-8040SW(ERD)	5.71	5.27	100A	16 mm ²	17.83	19.76
M ●RO-L8-8040SW(ERD)	4.58	4.48	125A	25 mm ²	20.21	22.42

Table 4: Product Water Qualities Achieved

Model	Seawater		Product	
	TDS (mg/L)	pH	TDS (mg/L)	pH
All Models	34,000 ~ 36,000	7.6 ~ 8.4	< 300	6.5 ~ 6.8





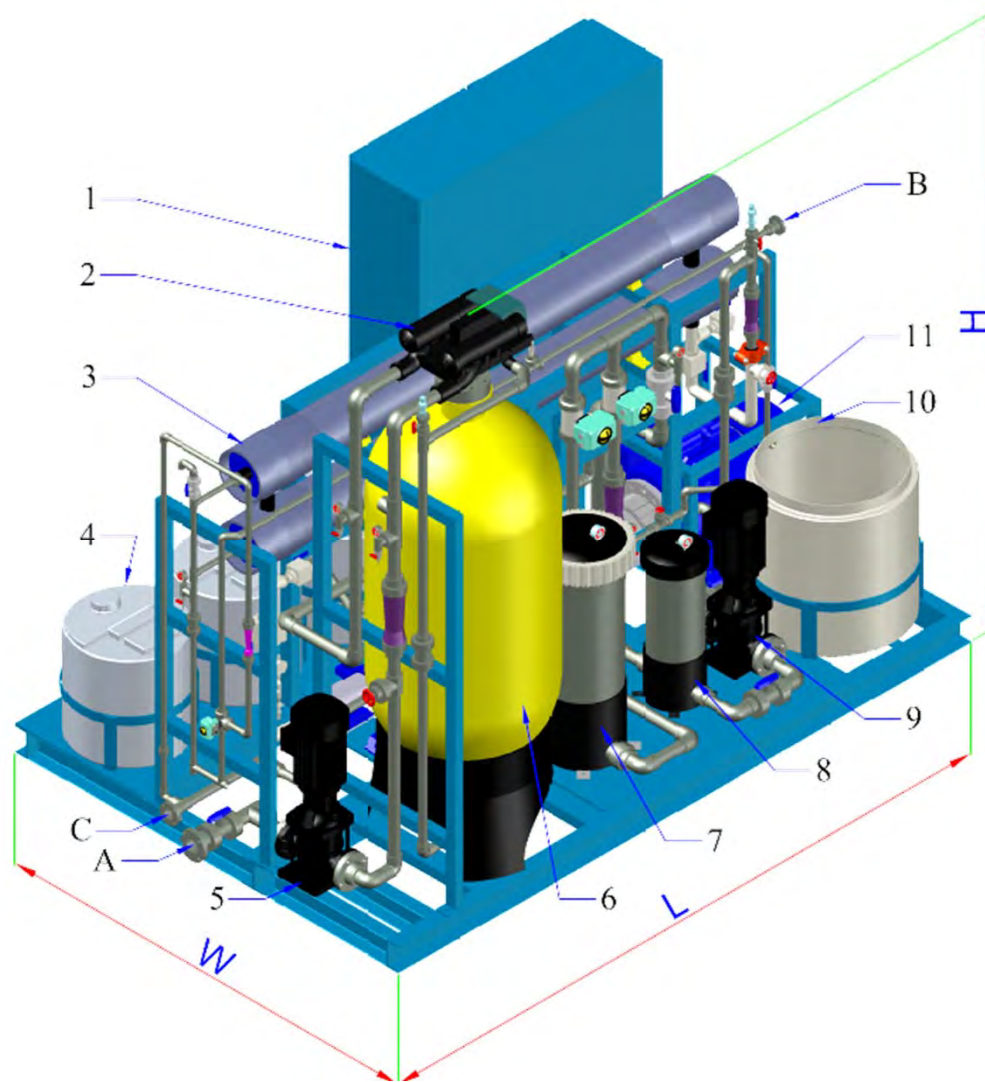
Technical Features & Data

Table 5: Specifications, Layout and Approximate Dimensions

Model	Product Water Capacity (m ³ /day)		Dimension (mm)			Connection (ANSI Flange)		
	Open Intake	Beach Well	L	H	W	Feed	Product	Reject
M●RO-L2-4040SW	7	8	3000	2480	1800	1 ½ "	¾ "	1"
M●RO-L2-4040SW(ERD)	7	8	3000	2480	1800	1 ½ "	¾ "	1"
M●RO-L4-4040SW	13	15	3000	2480	1800	1 ½ "	¾ "	1"
M●RO-L4-4040SW(ERD)	13	15	3000	2480	1800	1 ½ "	¾ "	1"
M●RO-L2-8040SW	25	30	3100	2600	2150	2"	1"	1 ½ "
M●RO-L4-8040SW	50	60	3200	2614	2350	2"	1"	1 ½ "
M●RO-L4-8040SW(ERD)	50	60	3300	2614	2350	2"	1"	1 ½ "
M●RO-L6-8040SW(ERD)	75	90	4000	2700	2400	3"	1"	2"
M●RO-L8-8040SW(ERD)	100	120	5000	2780	2500	3"	1 ½ "	2"

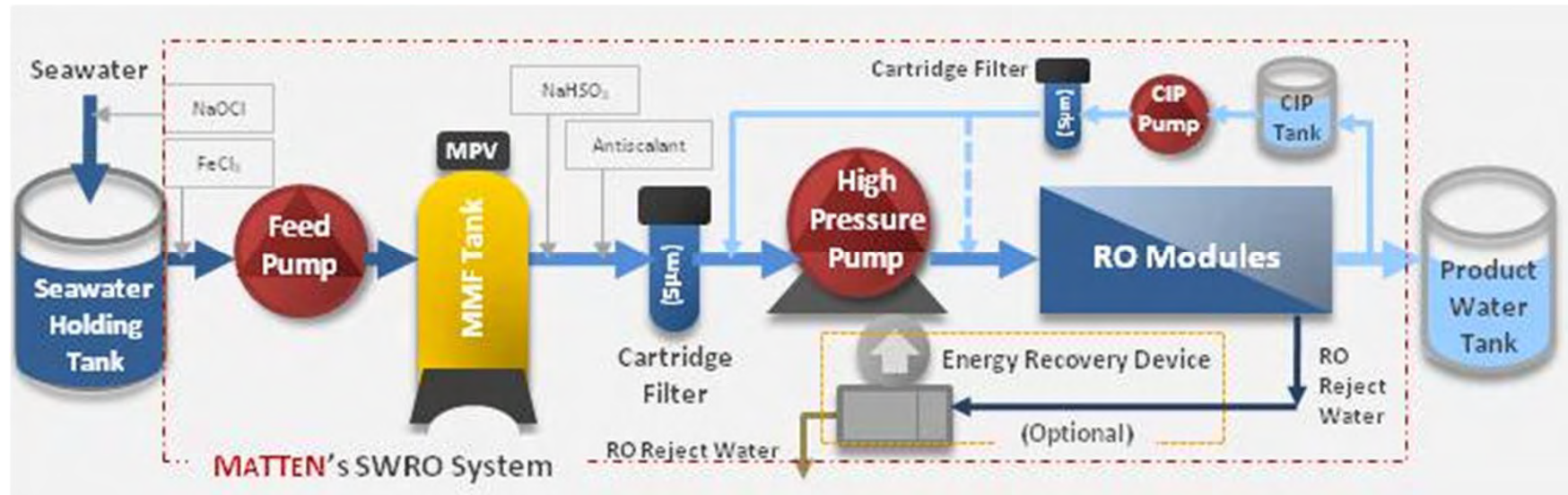
Technical Features & Data

Utility Connections		
A	Feed	Flange Connection Standard - ANSI
B	Product	
C	Reject	
Key Parts & Components		
1	Control panel	
2	Multiport valve	
3	RO vessel c/w RO membrane	
4	Chemical tank	
5	Feed pump	
6	Multimedia filter tank with coagulant injection system	
7	Cartridge filter (service)	
8	Cartridge filter (flush/CIP)	
9	Flush/CIP pump	
10	Flush/CIP tank	
11	High pressure pump	



Design Process

Process Flow Diagram



Design Process

Pre-Treatment Chemical Dosing

The raw seawater is supplied to an appropriate pre-treatment system by RO feed pump. In order to facilitate a good SDI reduction, strong anti-microbial agent and a coagulant will be dosed upstream.

Ferric Chloride (FeCl_3)- coagulant will destabilize the suspended solids rapidly and increases the removal efficiency of Dual media filtration

Sodium Hypochlorite (NaOCl)- will cease the growth of microorganism on the inner pipe walls



Pre-Filtration

Dual media filtration system consisting of anthracite and quartz will increase filtration time and water quality respectively by removing color, smell, organics and large suspended solids.

Equipped with differential pressure switch and Multiport valve (MPV) for automatic backwash either on periodic basis or when a certain pre-set differential pressure kicks in.





Design Process

Pre-treatment Chemical Dosing

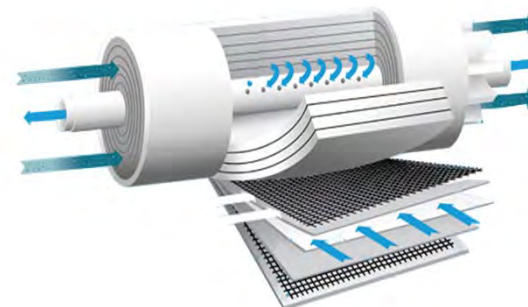


Sodium bisulphite- a dechlorination agent should be injected upstream of cartridge filter to initiate the reduction of free chlorine. The resultant Sodium bisulphate will be removed by cartridge filter - a secondary filter

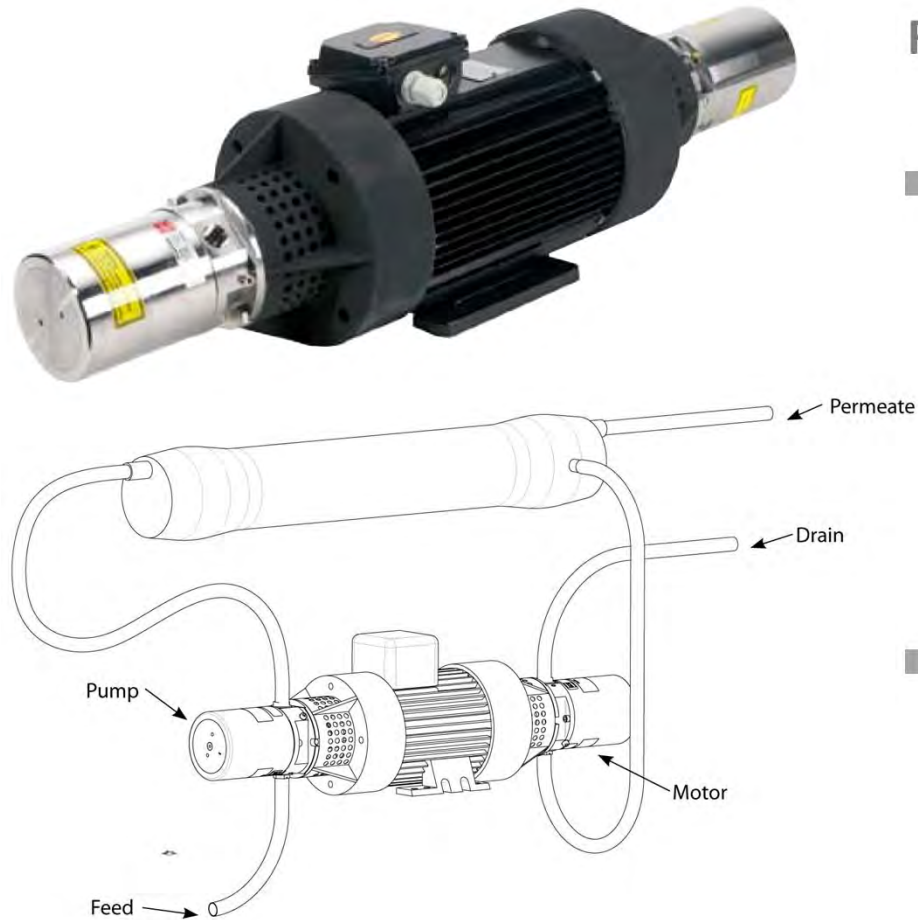
Antiscalant- to minimize the scale formation and frequent cleaning of RO membrane

RO Operation

- RO separation is a pressure driven process, being said that the external pressure shall be provided by RO high pressure pump.
- The pressure transmitters are located at critical upstream and downstream points of the pump to constantly monitor the pressure and send back the real time data to the data logging unit.
- The pressurized water will flow through spirally wound RO membranes, the place of actual separation process.
- An online conductivity transmitter will be used to monitor the conductivity of “permeate” and “offspec”, as the latter being a water with higher conductivity than a specified range.



Design Process



RO Operation – Energy Recovery Device

- The use of an ERD (integral with the high pressure pump), transmits the brine pressure back to the high pressure pump shaft, thus reducing energy required to pressurize the seawater feed through the RO membranes.
- The flexibility in the designs and configuration of our standard SWRO systems allow installation of the ERD on selected models.












Control & Instrumentation Features

- Touch screen HMI for easy optimization at site and entry of process parameters
- Programmable Logic Controller
- Download trend, history, faults, alarms via thumb drive
- High efficiency EFF1 pumps
- VSD driven for all pumps
- Integrated CIP facility

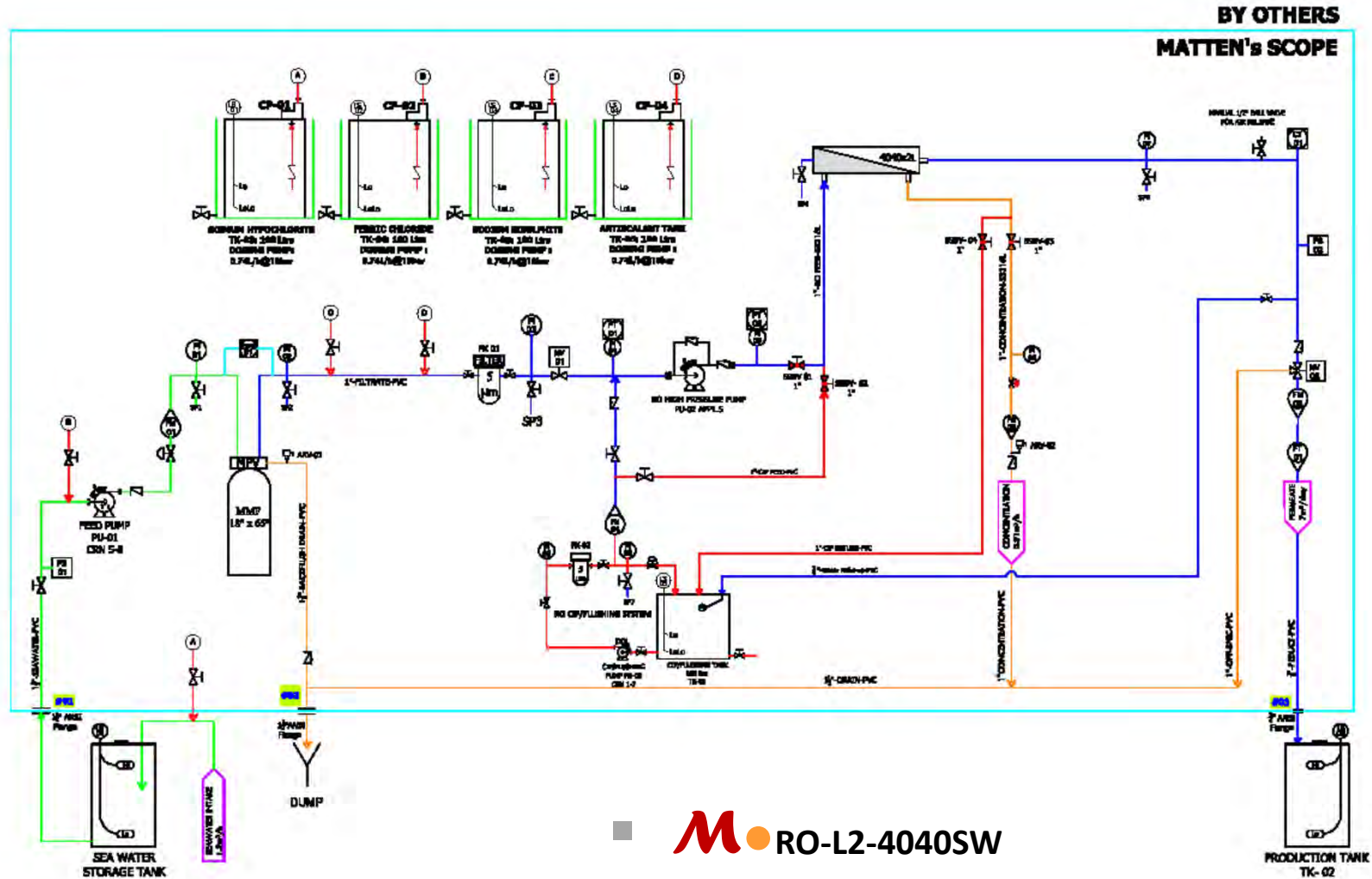


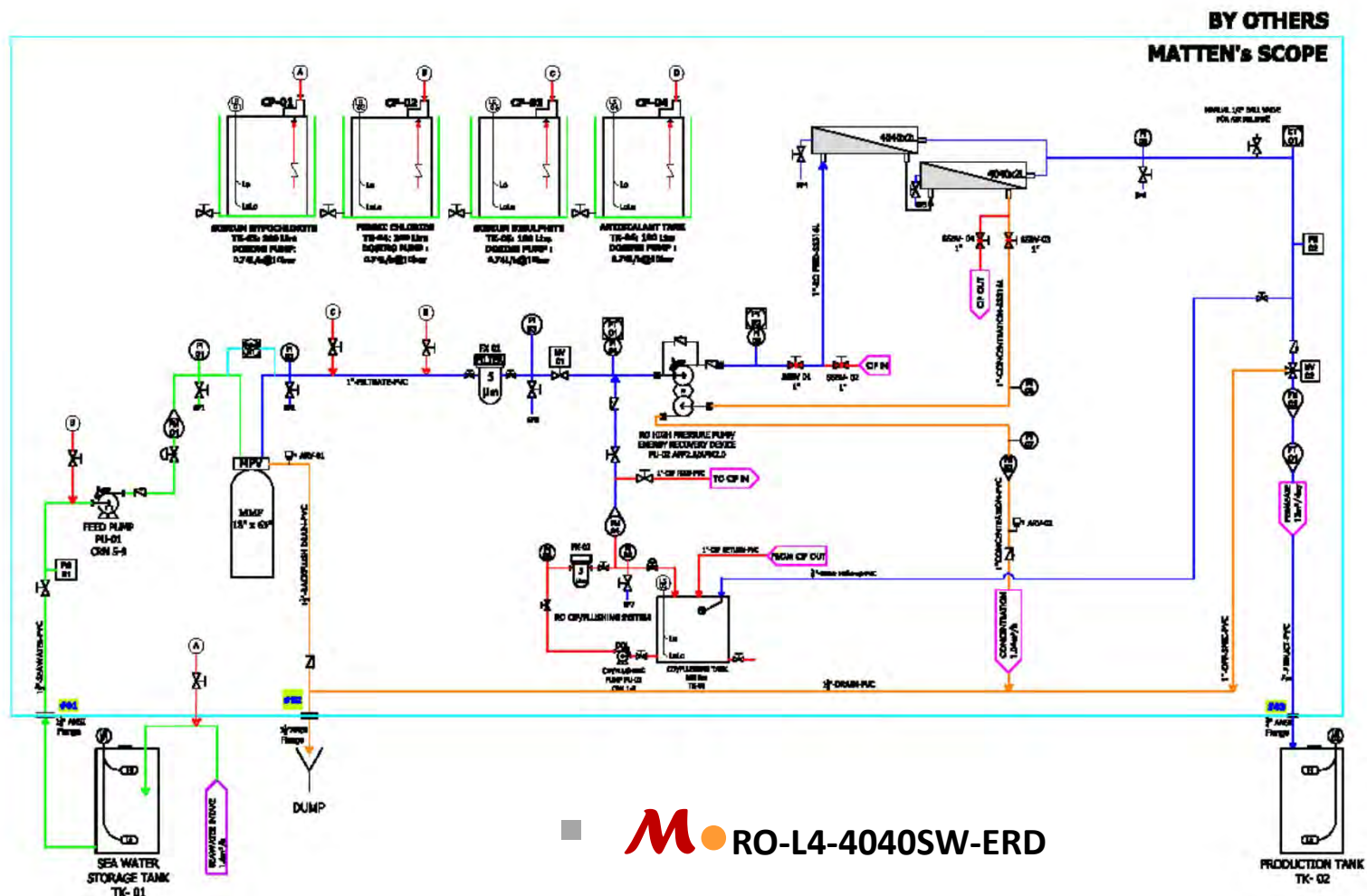


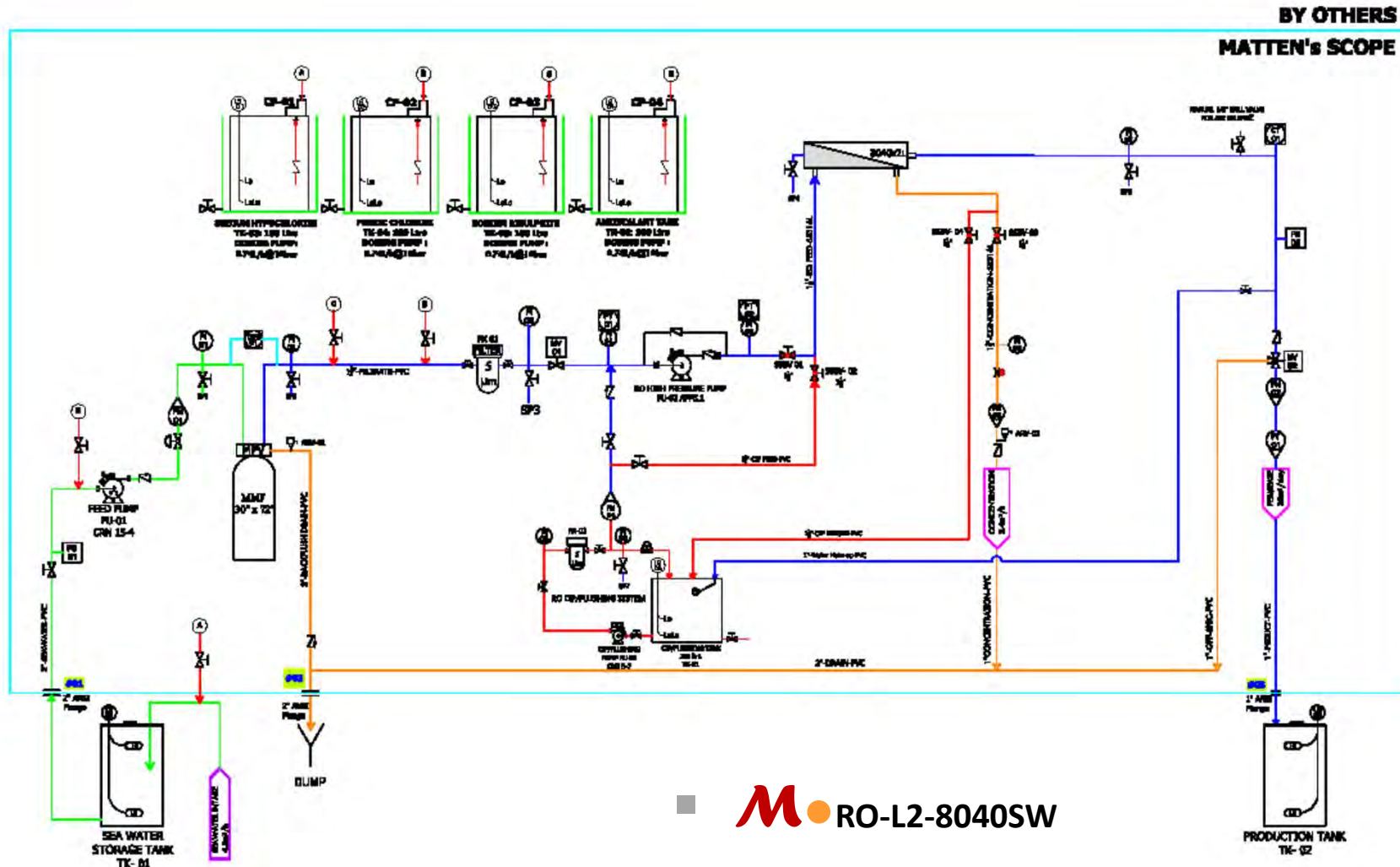
Consumables

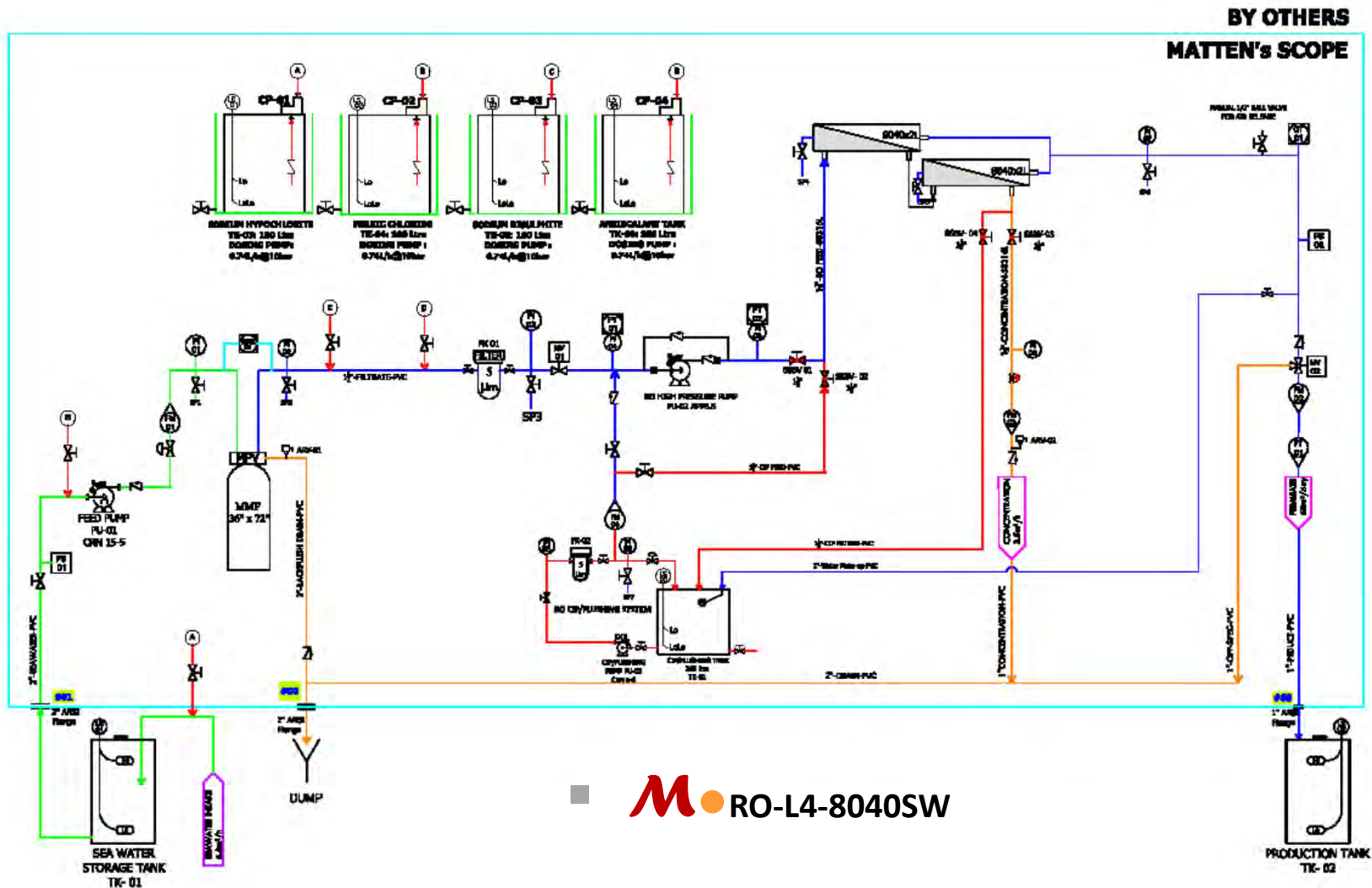
Model	Chemical dosing Systems				Cartridge filter		RO Membranes		
	Use Rate for 1 year						1 st yr	2 nd yr	3 rd yr
	Chlorine (12.5% Cl ₂)	Anti- scalant	SMBS (Powder)	Coagulant (Optional)	RO30"	CIP20"			
 RO-L2-4040SW	32kg	36kg	12kg	100kg	12pcs	12pcs	1 pc	1 pc	-
 RO-L2-4040SW(ERD)	32kg	36kg	12kg	100kg	12pcs	12pcs	1 pc	1 pc	-
 RO-L4-4040SW	44kg	44kg	16kg	132kg	20pcs	16pcs	1 pc	2 pcs	1 pc
 RO-L4-4040SW(ERD)	44kg	44kg	16kg	132kg	20pcs	16pcs	1 pc	2 pcs	1 pc
 RO-L2-8040SW	120kg	120kg	46kg	384kg	32pcs	20pcs	1 pc	1 pc	-
 RO-L4-8040SW	152kg	144kg	58kg	480kg	32pcs	20pcs	1 pc	2 pcs	1 pc
 RO-L4-8040SW(ERD)	152kg	144kg	58kg	480kg	36pcs	20pcs	1 pc	2 pcs	1 pc
 RO-L6-8040SW(ERD)	268kg	264kg	102kg	852kg	36pcs	24pcs	1 pc	3 pcs	2 pcs
 RO-L8-8040SW(ERD)	296kg	288kg	112kg	936kg	36pcs	28pcs	2 pcs	4 pcs	2 pcs

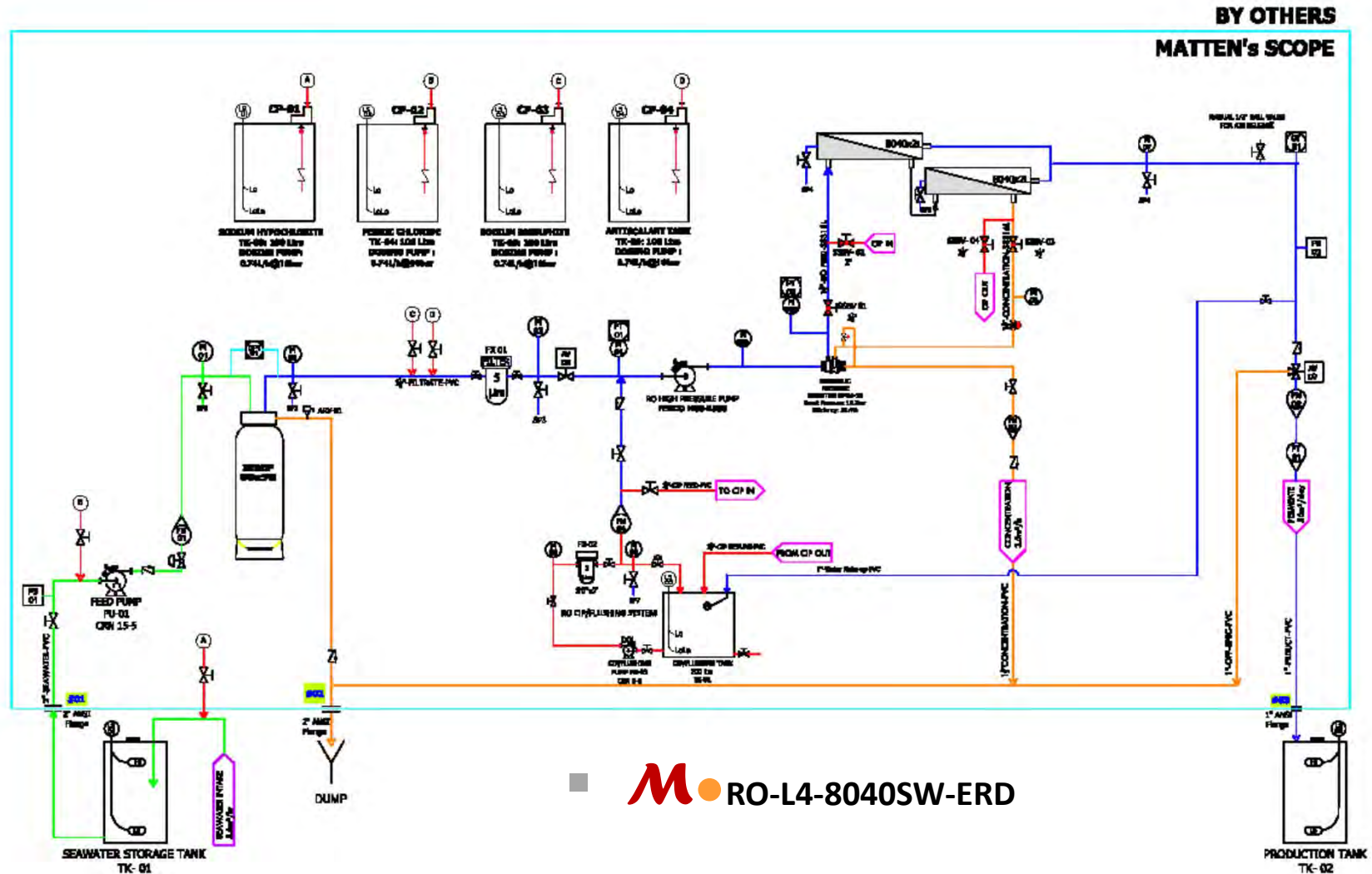
Process & Instrumentation Drawing











RO-L4-8040SW-ERD

