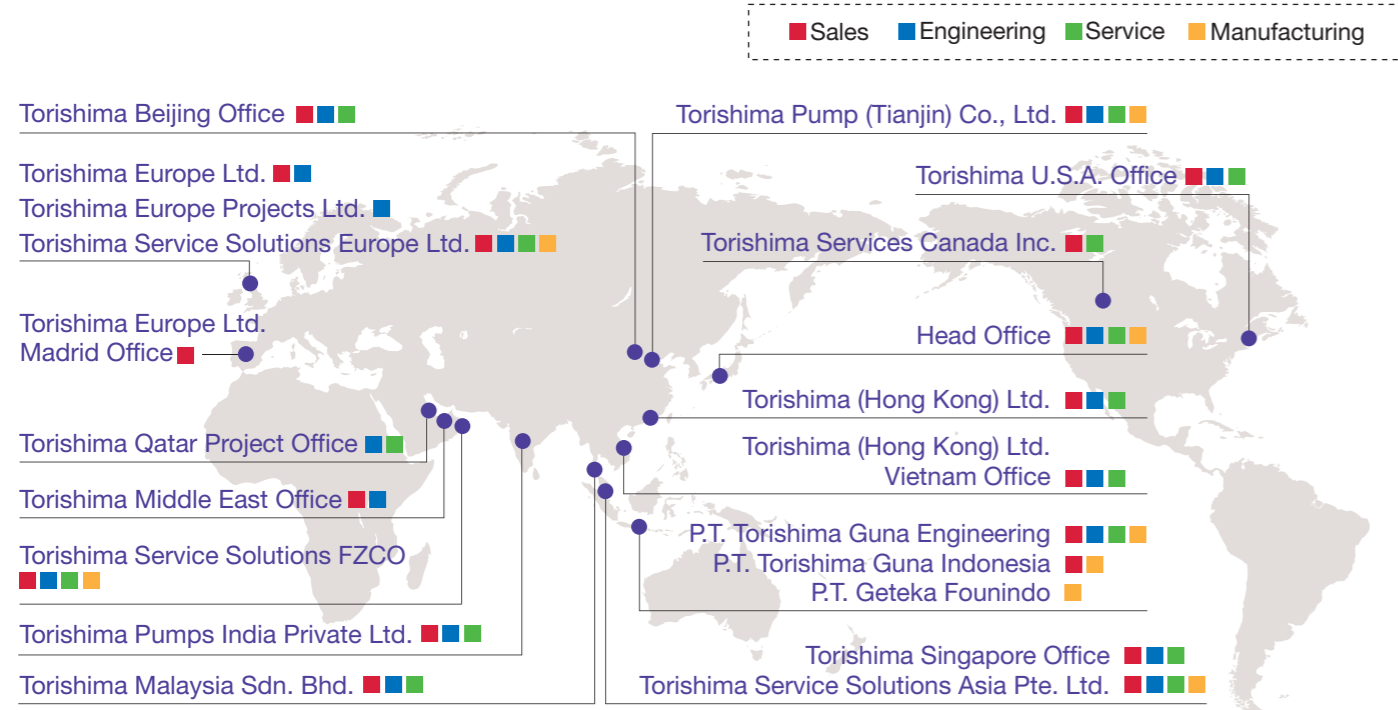


Global Network



TORISHIMA PUMP MFG. CO., LTD.

HEADQUARTERS

1-1-8 Miyata-cho, Takatsuki-city, Osaka 569-8660 Japan
Tel : +81-72-690-2308 / Fax : +81-72-690-2329

KYUSHU TORISHIMA

9857-13, Ohaza Kawako, Wakagi-cho, Takeo-city, Saga 840-0813 Japan
Tel : +81-954-26-3081 / Fax : +81-954-26-3080

TORISHIMA CHINA

BEIJING

Rm707, Building 1, KUNSHA CENTER,
No.16 Xinyuanli, Chaoyang District, Beijing,
P.R.China PC:100027
Tel : +86-10-84682891 / Fax : +86-10-84682890

TIANJIN

No.9 Gaoxin Road, Wuqing Development Zone,
Tianjin, China P.R.
Tel : +86-22-59695601 / Fax : +86-22-59695609

TORISHIMA HONG KONG

Unit A, 21/F., Tower A, Billion Centre, 1 Wang Kwong Road,
Kowloon Bay, Kowloon, Hong Kong
Tel : +852-2795-1838 / Fax : +852-2754-3293

TORISHIMA VIETNAM

No.76 Bui Thi Xuan Street, Hai Ba Trung District,
Hanoi, Socialist Republic of Vietnam
Tel : +84-4-943-7880 / Fax : +84-4-943-7876

TORISHIMA SINGAPORE

30 Ubi Crescent #01-02 Ubi Techpark, Singapore 408566
Tel : +65-6779-0123 / Fax : +65-6779-6900

TORISHIMA SERVICE SOLUTIONS ASIA

48, Toh Guan Road East, #02-142, Enterprise
Hub Singapore 608586
Tel : +65-6933-8772 / Fax : +65-6933-8777

TORISHIMA MALAYSIA

Lot 19, 1st Floor Bangunan Ipmuda Jalan 13/2 46200
Petaling Jaya Selangor, Malaysia
Tel : +60-3-7960-5771 / Fax : +60-3-7960-5772

TORISHIMA INDIA

Tower B 1106, Millennium Tower, Sector27
Gurgaon-122022, Haryana, India
Tel : +91-124-4728950 / Fax : +91-124-4728950

TORISHIMA INDONESIA

TORISHIMA GUNA ENGINEERING

Jalan Rawa Sumur Timur No.1
Pulogadung Industrial Estate,
P.O.Box 1160, Jakarta, Indonesia
Tel : +62-21-460-3963 / Fax : +62-21-460-3937

TORISHIMA GUNA INDONESIA

Jalan Rawa Sumur Timur No.1
Pulogadung Industrial Estate,
P.O.Box 1160, Jakarta, Indonesia
Tel : +62-21-460-3963 / Fax : +62-21-460-3937

GETEKA FOUNINDO

JL Pulo Ayang Kav. AA2 Pulogadung Industrial Estate,
P.O.Box 1160 JAT, Jakarta 13011 Indonesia
Tel : +62-21-460-3963 / Fax : +62-21-460-3937

TORISHIMA U.A.E.

MIDDLE EAST OFFICE

5th Floor Office No.503 Al Salmeeen Golden Tower
Electra Street, P.O.Box 53567, Abu Dhabi, U.A.E.
Tel : +971-2-674-3880 / Fax : +971-2-674-3881

TORISHIMA SERVICE SOLUTIONS

Plot of Land TP010501 Techno Park - Jebel Ali
P.O.Box 37603 Dubai, U.A.E.
Tel : +971-4-886-5622 / Fax : +971-4-886-5633

TORISHIMA QATAR

Office No.11, 1st Floor, West corner centre,
Salwa Road, P.O.Box 37027 Doha, Qatar
Tel : +974-4450-6915 / Fax : +974-4450-6916

TORISHIMA EUROPE

Sunnyside Works, Gartsherrie Rd,
Coatbridge, Scotland ML5 2DJ
Tel : +44-1236-443951 / Fax : +44-1236-702875

MADRID OFFICE

Avda, Fuente Nueva 12A Edif, Monterrey, 28703
San Sebastian de los Reyes, Madrid, Spain
Tel : +34-91-284-6909 / Fax : +34-91-284-6901

TORISHIMA EUROPE PROJECTS

Hartham Park, Corsham,
Wiltshire, England SN13 0RP
Tel : +44-1249-700-290

TORISHIMA SERVICE SOLUTIONS EUROPE

Sunnyside Works, Gartsherrie Rd,
Coatbridge, Scotland ML5 2DJ
Tel : +44-1236-442390 / Fax : +44-1236-702875

TORISHIMA U.S.A.

100 Grove Street, Suite 217,
Worcester MA 01605-2654 U.S.A.
Tel : +1-508-753-6600 / Fax : +1-508-753-8276

TORISHIMA SERVICES CANADA

Suite 2800, 350-7th Ave S.W.
Calgary, Alberta T2P 3N9, Canada
Tel : +1-403-705-1933

Pumps for Seawater Desalination



A World-leading Pump Manufacturer since 1919

Founded in 1919 in Osaka, Japan, Torishima has been contributing to society by providing engineered pump solutions across all industries for over 90 years, and established a solid reputation for high technology in pumps. The Torishima brand is built on reliability, flexibility, and customer satisfaction.

A Pioneer in Pumps for Seawater Desalination

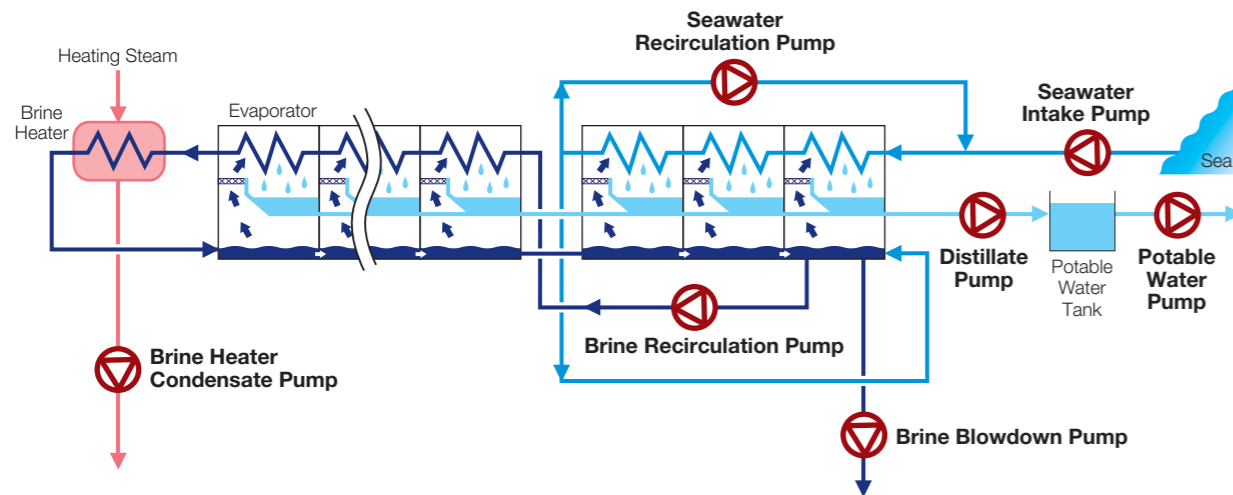
The useable fresh water in the world amounts to 0.01% of the world's water. There is no doubt that water demand is increasing with the growth of population and industrialization. Consequently the necessity of seawater desalination plants is rapidly increasing. This requires innovative pumping solutions to provide clean drinking water to all.

Desalination pumps are required to operate in harsh climates 24 hours a day, 365 days a year; they must be highly durable, resistant to corrosion from seawater, and outstanding efficiency to minimize power consumption.

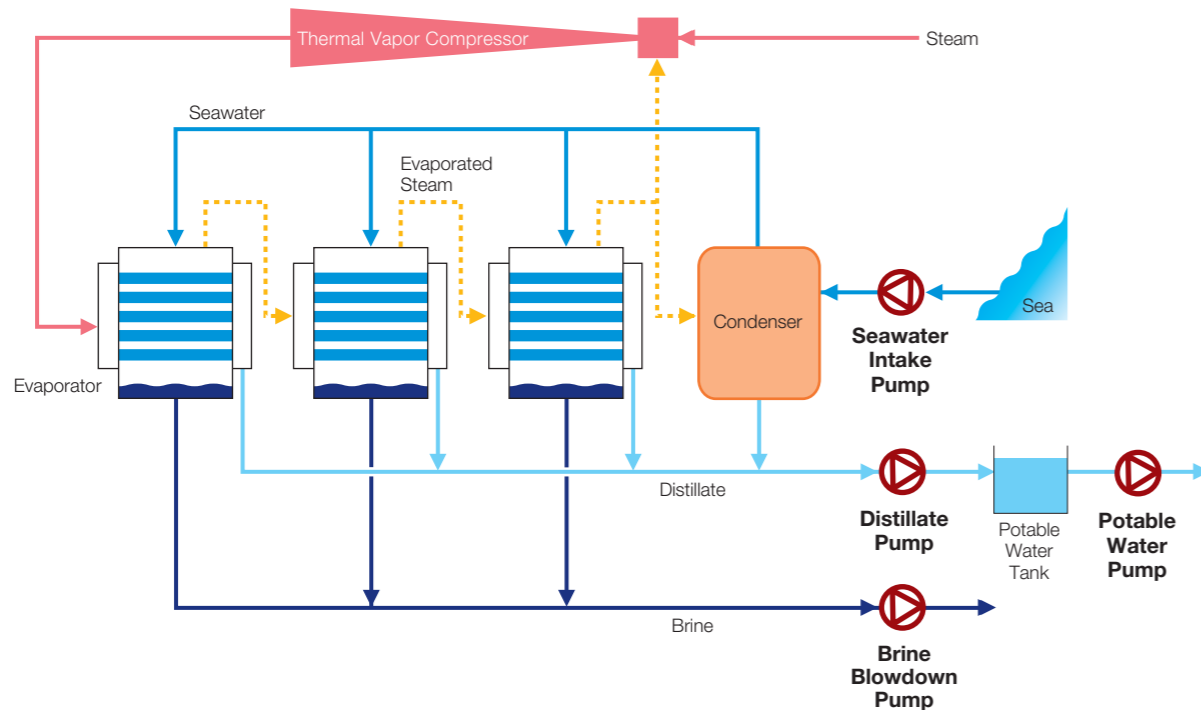
Torishima has met the challenge of those demands, and has supplied pumps for a wide range from low to high pressure applications for all desalination processes, MSF, MED and RO, for 40 years. There are now over 2,100 pumps operating in desalination plants in over 18 countries around the world. Our global desalination projects include some of the largest desalination plants currently in operation.

>> Pumps for Thermo Desalination System

Flowchart of Multi-stage Flash System



Flowchart of Multi-effect Distillation System



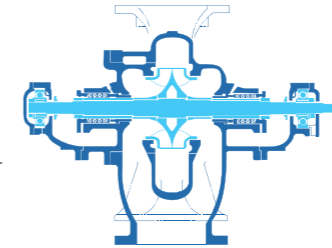
MSF / MED Application Chart

	CDKS	CDKTV	CDM	CPC	MMTV	SPSY	SPTV	SPV
Seawater Intake Pumps			●					●
Brine Recirculation Pumps		●					●	
Brine Blowdown & Distillate Pumps				●			●	
Brine Heater Condensate Pumps	●				●			
Seawater Recirculation Pumps			●			●		
Potable Water Pumps			●					●

CDKS

Horizontal radially split double-suction pump

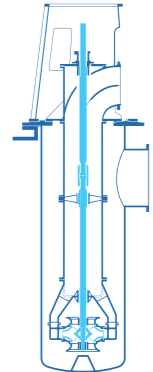
Capacity : up to 3,000m³/hr
Total head : up to 300m
Size : 200 to 500mm



CDKTV

Vertical double-suction pump with canister

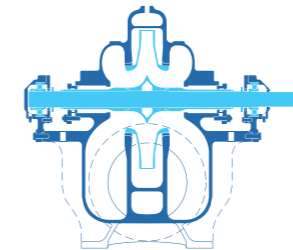
Capacity : up to 20,000m³/hr
Total head : up to 100m
Size : 500 to 1,500mm



CDM

Horizontal axially split double-suction pump

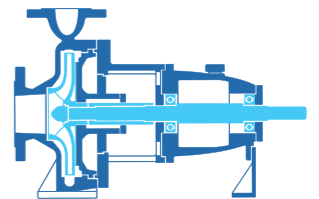
Capacity : 90 to 33,000m³/hr
Total head : 3 to 300m
Size : 150 to 2,000mm



CPC

End-suction volute pump

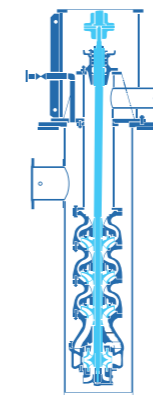
Capacity : up to 1,500m³/hr
Total head : up to 220m
Size : 32 to 250mm



MMTV

Vertical mixed-flow multistage pump with canister

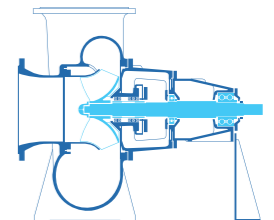
Capacity : up to 2,900m³/hr
Total head : up to 490m
Discharge pressure : up to 4MPa (39.2bar)
Size : 40 to 500mm



SPSY

Horizontal mixed-flow volute pump

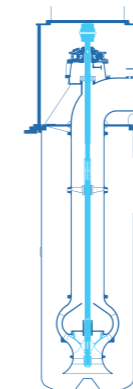
Capacity : up to 20,000m³/hr
Total head : up to 50m
Size : 350 to 1,200mm



SPTV

Vertical mixed-flow pump with canister

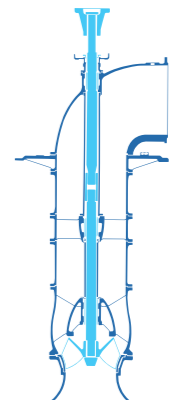
Capacity : 600 to 81,600m³/hr
Total head : 3 to 100m
Size : 300 to 3,000mm



SPV

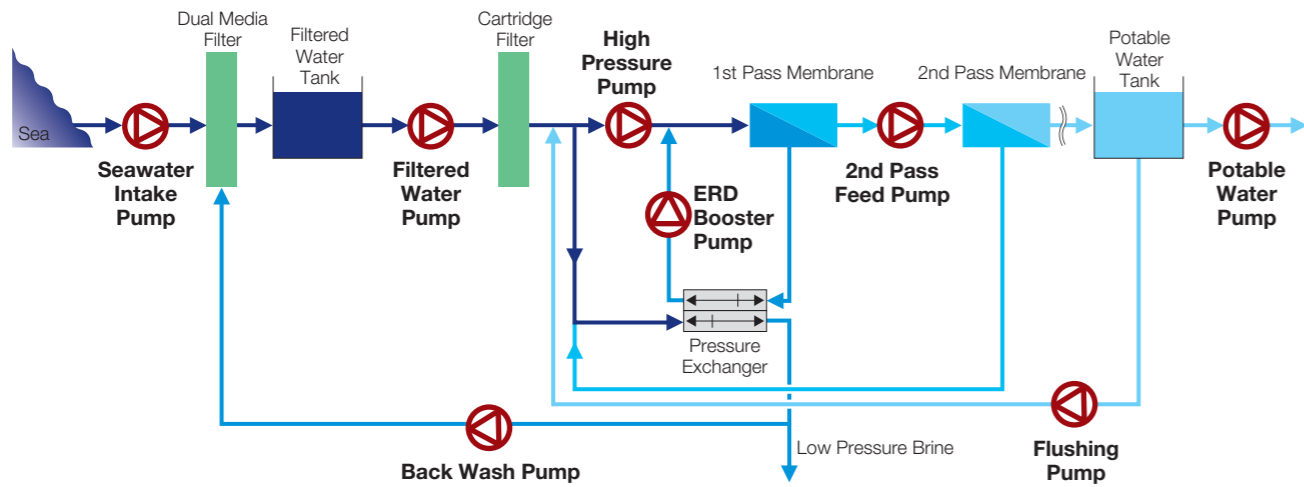
Vertical mixed-flow pump

Capacity : 600 to 81,600m³/hr
Total head : 3 to 100m
Size : 300 to 3,000mm



>> Pumps for Reverse Osmosis System

Flowchart of Reverse Osmosis System (With Pressure Exchanger System)

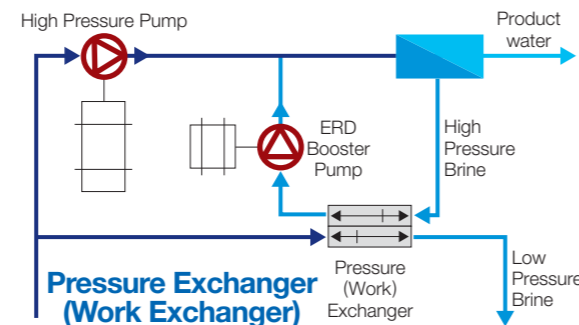
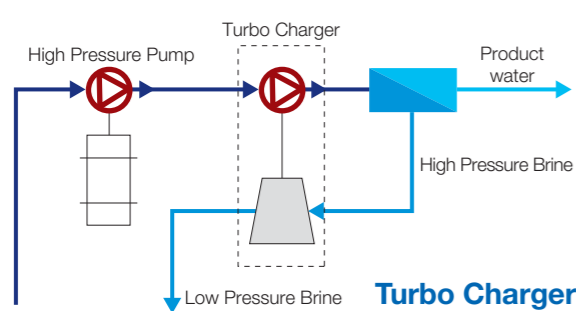
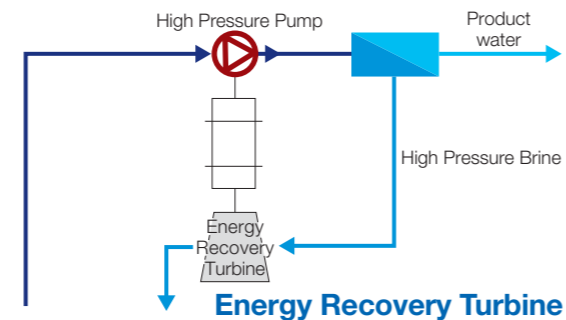


Energy Recovery System

In the reverse osmosis seawater desalination system, high pressure enriched seawater is produced simultaneously with product water.

The running cost of the plant can be reduced significantly by recovering energy of the enriched seawater utilizing an energy recovery system.

We can provide pumps for all types of energy recovery systems.



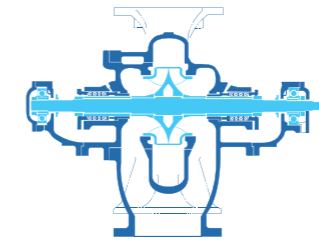
• RO Application Chart

	CDKS	CDM	CFHV	CPC	CPW	MHA	MHH	MML	MSH	MSH-T	SPV
Seawater Intake & Filtered Water Pumps		•									•
High Pressure Pumps		•				•	•	•	•	•	
ERD Booster Pumps	•		•		•						
2nd Pass Feed & Back Wash & Flushing Pumps		•		•							
Potable Water Pumps		•									•

CDKS

Horizontal radially split double-suction pump

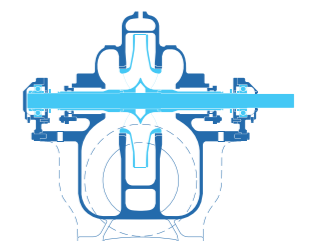
Capacity : up to 3,000m³/hr
Total head : up to 300m
Size : 200 to 500mm



CDM

Horizontal axially split double-suction pump

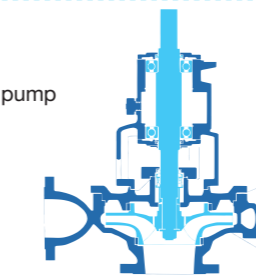
Capacity : 90 to 33,000m³/hr
Total head : 3 to 300m
Size : 150 to 2,000mm



CFHV

Vertical centrifugal volute pump

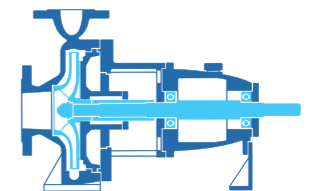
Capacity : up to 1,940m³/hr
Total head : up to 125m
Discharge pressure : up to 10.78MPa (110bar)
Size : 40 to 500mm



CPC

End-suction volute pump

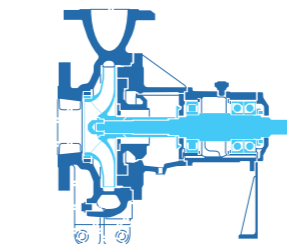
Capacity : up to 1,500m³/hr
Total head : up to 220m
Size : 32 to 250mm



CPW

End-suction volute pump

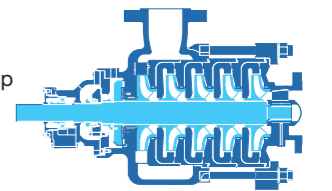
Capacity : up to 1,440m³/hr
Total head : up to 200m
Size : 50 to 250mm



MHA

Horizontal end-suction multistage ring section pump

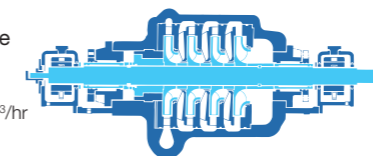
Capacity : 200 to 800m³/hr
Total head : up to 800m
Size : 125 to 200mm



MHH

Axially split multistage pump

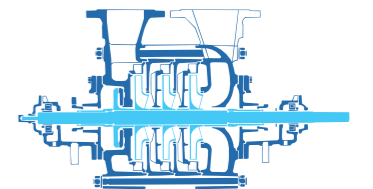
Capacity : 200 to 800m³/hr
Total head : up to 800m
Size : 100 to 300mm



MML

Horizontal multistage ring section pump

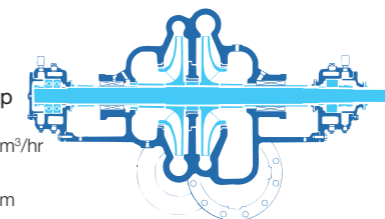
Capacity : up to 500m³/hr
Total head : up to 500m
Size : 40 to 200mm



MSH

Horizontal axially split multistage volute pump

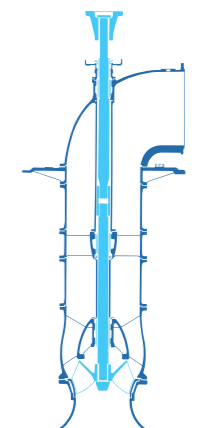
Capacity : 150 to 1,500m³/hr
Total head : 100 to 750m
Size : 100 to 300mm



SPV

Vertical mixed-flow pump

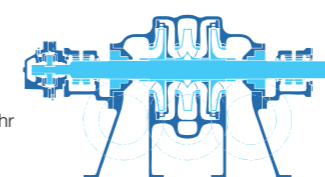
Capacity : 600 to 81,600m³/hr
Total head : 3 to 100m
Size : 300 to 3,000mm



MSH-T

Horizontal twin-suction axially split multistage pump

Capacity : up to 3,000m³/hr
Total head : up to 750m
Size : 200 to 350mm



>> For Customers' Satisfaction

Torishima engages in our best efforts to improve pump performance through test, R&D and aftermarket service.

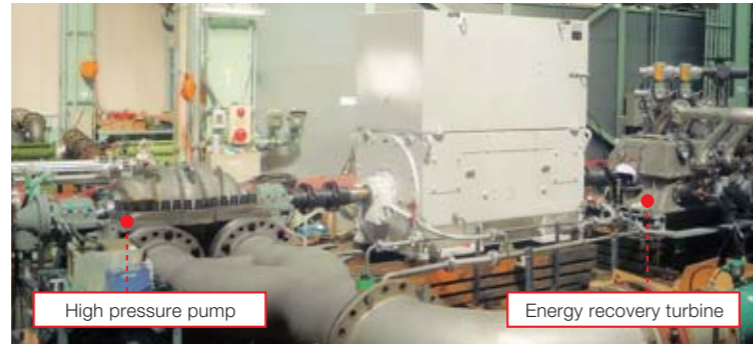
Materials

Torishima can meet the customers' needs and suggest the most appropriate materials for each seawater desalination plant.

- Super Duplex Stainless Steel
- Duplex Stainless Steel
- Austenitic Stainless Steel
- Ni-Resist
- Any others on customers' request

Testing

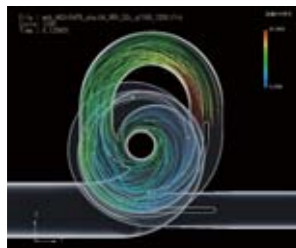
Torishima has the full test facilities for pumps for seawater desalination and always conducts a performance test before delivery. Our quality procedures and continual testing ensures the high quality standards.



String test of high pressure pump with energy recovery turbine for RO desalination system

Research & Development

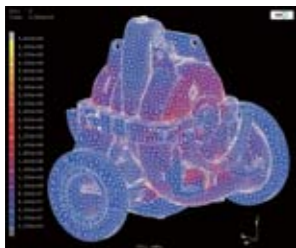
Torishima is fully committed not only to providing innovative designs for future applications but the continual improvement of existing designs to maximize efficiency and increase the reliability of pumps for seawater desalination.



CFD (Computational Fluid Dynamics) analysis of volute shapes



PIV (Particle Image Velocimetry) measurement



FEM (Finite Element Method) analysis of structure



Hydraulic pressure test

Service Solutions

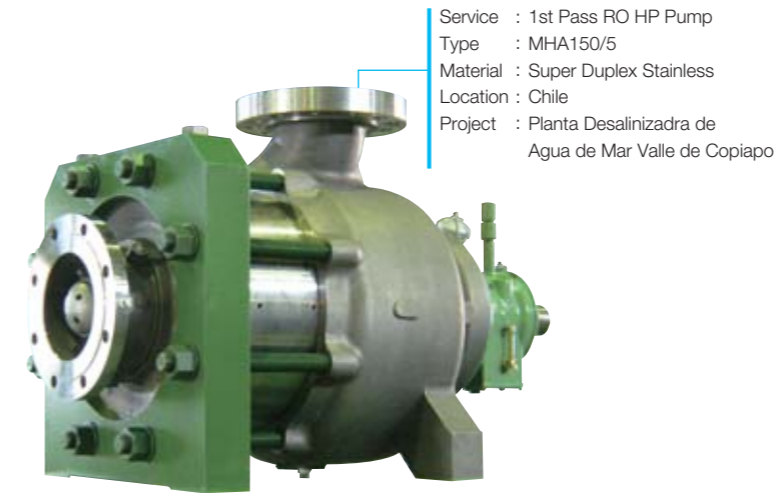
Torishima continues to develop its global network of service solutions to deal with customers' needs all around the world. Our innovative solutions can enhance performance and increase the life span of pumps. This allows operators to maximize efficiency, reduce maintenance costs and conserve energy.

Covering the whole Middle East area

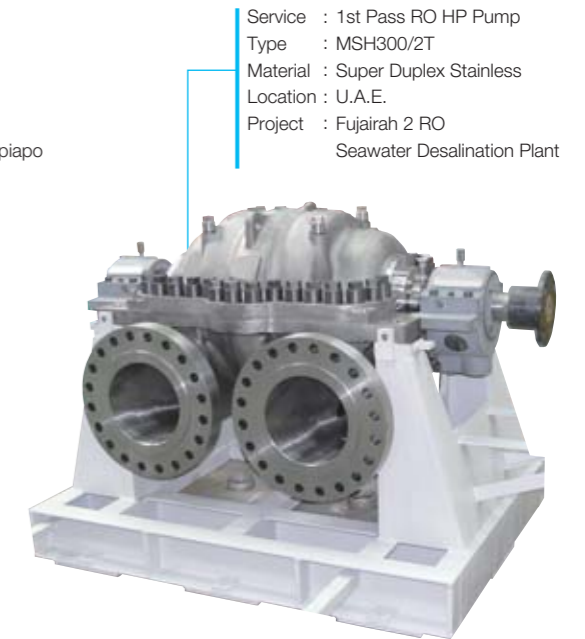


Covering Europe, America, Africa, Russia

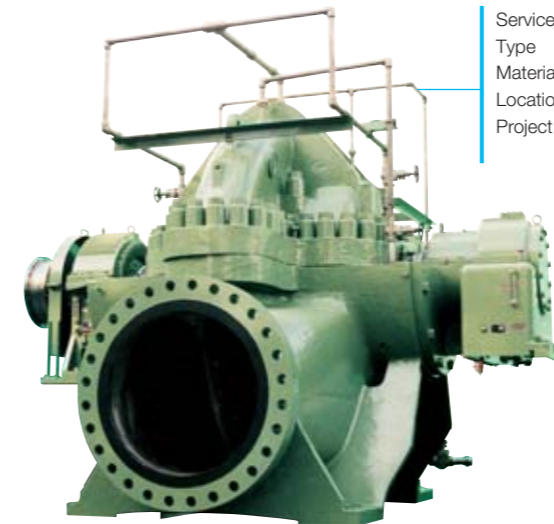
>> Typical Applications



Service : 1st Pass RO HP Pump
Type : MHA150/5
Material : Super Duplex Stainless
Location : Chile
Project : Planta Desalinizadora de Agua de Mar Valle de Copiapo



Service : 1st Pass RO HP Pump
Type : MSH300/2T
Material : Super Duplex Stainless
Location : U.A.E.
Project : Fujairah 2 RO Seawater Desalination Plant



Service : Main Pump
Type : CDM 800 x 500
Material : Duplex Stainless
Location : U.A.E.
Project : Schuweihat Water Transmission Scheme



Service : Seawater Recirculation Pump (MSF)
Type : SPSYX700
Material : SCS16
Location : Kuwait
Project : Az-Zour South Distillation Plants Stage III



Service : Brine Recirculation Pump (MSF)
Type : CDKTV1200
Material : Duplex Stainless
Location : U.A.E.
Project : Jebel Ali M



Service : Seawater Intake Pump (MED)
Type : SPV900
Material : Duplex Stainless
Location : Libya
Project : Zaiwa desalination Plant

You may not know our name, but now you know where our pumps are!

Africa & Middle East

ALGERIA

- Tahiyat Myah Magtaa Spa (2011) **RO** 500,000m³/day
- Hamma Water Desalination Spa (2006) **RO** 200,000m³/day
- Kahrama SpA / Arzew Desalination and Power Complex (2004) **MSF** 88,887m³/day
- Complex Matieres Plastiques Skikda (1974) **MSF**

Ghana

- Nugua SWRO Desalination Plant (2013) **RO** 60,000m³/day

LIBYA

- Khoms Desalination Plant (2012) **MSF** 43,000m³/day
- Zawia Desalination Plant (2008) **MED** 80,000m³/day
- Soussa Desalination Plant (2008) **MED** 26,000m³/day
- Derna Desalination Plant (2008) **MED** 40,000m³/day
- Abu Taraba (2005) **MED** 40,000m³/day
- Zuara Desalination Plant (2004) **MED** 40,000m³/day
- Municipality of Zliten, Libyan Arab Jamahiriya (1989) **MSF**
- Misurata Iron Works (1982) **MSF**

IRAQ

- SEF (1985) **RO**

IRAN

- Hormozgan Water Authority (1987) **MSF**
- I.J.P.C. (1984) **RO**
- SES (1982) **RO**

KUWAIT

- Az-Zour South (2012) **RO** 136,000m³/day
- Shuaiba North (2010) **MSF** 204,500m³/day
- Shuwaikh RO Project (2010) **RO** 136,260m³/day
- Sabiya Desalination Plant Phase III (2007) **MSF** 227,100m³/day
- Sabiya Desalination Plants Phase I & II (2007) **MSF** 227,100m³/day
- Shuaiba South Power and Water Distillation Plant (2006) **MSF**
- Az-Zour South, Stage III (2000) **MSF** 130,920m³/day
- Sabiya RO Desalination Plant (1998) **RO**
- Az-Zour South, Stage II (1997) **MSF** 109,100m³/day
- Az-Zour South, Stage I (1986) **MSF** 261,600m³/day
- Doha West II (1982) **MSF** 392,400m³/day
- Shuwaikh C (1979) **MSF** 81,900m³/day

BAHRAIN

- RAJ RO Plant, Expansion Project (2005) **RO** 14,400m³/day
- Bahrain Caltex (1993) **MSF**
- Arab Iron & Steel Company (1982) **MSF**
- Caltex Petroleum Corp., (1972) **MSF** 450,000m³/day

QATAR

- Ras Laffan C (2009) **MED** 286,400m³/day
- Ras Laffan B IWPP (2008) **MSF** 272,760m³/day
- Ras Abu Fontas (2007) **MSF** 465,000m³/day

SAUDI ARABIA

- Ras Al Kair Power and Desalination Plant P1 (2012) **RO** 300,000m³/day
- Ras Azzour (2012) **RO** 256,250m³/day
- Jeddah Phase III (2011) **RO** 239,818m³/day
- Shuaibah RO Expansion (2008) **RO** 150,000m³/day
- Shuaibah IWPP Project (2008) **MSF** 880,000m³/day
- Desalination Plant (MED-9000T/P) (2007) **MED** Rabigh Arabian Water and Electricity Company (2006) **RO** 192,000m³/day
- R/C Yanbu Desalination Unit9 (1999) **MSF**
- S.W.C.C.SWRO-II (1998) **RO**
- Al-Shoaba II (1996) **MSF**
- Medina / Yanbu (1994) **RO**
- R/C Yanbu Desalination Unit 7&8 (1994) **MSF**
- Jeddah I, Phase 2 (1993) **RO** 56,800m³/day
- Jeddah I, Phase 1 (1988) **RO** 56,800m³/day
- New Dahrhan Airport (1986) **RO**
- Al-Jubail Stage-II (1981) **MSF** 38,400m³/day
- Jeddah Oil Refinery Co. (1981) **MSF**
- Medina / Yanbu (1979) **MSF**
- Aramco Overseas Company (1978) **MSF**
- Yanbu Industrial Complex (1977) **MSF**

U.A.E.

- Shuweihat S2 IWPP (2009) **MSF** 500,000m³/day
- Fujairah 2 (2009) **RO** 128,000m³/day
- Jebel Ali M (2009) **MSF** 637,000m³/day
- Kohor Fakkan (2007) **RO** 45,000m³/day
- Layyah & Khor Fakkan Power Plants (2007) **RO** 46,000m³/day
- New Al-Taweelah B Extention Plant (2007) **MSF**
- Arabian Power Company / Umm Al-Nar Independent Water and Power (2005) **MSF**
- Al-Taweelah A2 (2001) **MSF** 227,000m³/day
- Umm Al-Nar Station B (2000) **MSF** 284,125m³/day
- Abu Dhabi National Oil Company (1995) **MSF**

OMAN

- Salalah IWPP, Oman (2012) **RO** 68,200m³/day
- Oman Sur (2008) **RO** 80,200m³/day
- Barka Desalination Plant (2007) **RO** 120,000m³/day
- Ghubrah V (1995) **MSF** 27,240m³/day
- Ghubrah III (1991) **MSF** 54,720m³/day
- Ghubrah II (1985) **MSF** 27,360m³/day

Central & South America

MEXICO

- CT Manzanillo II (1991) **MSF**
- Comision Federal de Electricidad (1982) **MSF**

CHILE

- Copiapo (2012) **RO** 52,000m³/day

CHINA

- Qingdao Desalination (2011) **RO** 100,000m³/day
- Shougang Jingtang Desalination (2008) **RO** 10,000m³/day
- Yang Shu Electric P/S (1984) **RO**

THAILAND

- Desalination Plant in Rayong SWRO-1 (2006) **RO**

JAPAN

- National LPG Stockpiling, Namikata Terminal (2004) **RO**
- Shikoku Electric Power Co., Inc. Ikata Nuclear P/S (1992) **RO**
- Huis Ten Bosch (1991) **RO**
- Kansai Electric Power Co., Ltd. Ohi Nuclear P/S (1988) **RO**
- Kyushu Electric Power Co., Inc. Genkai Nuclear P/S (1987) **RO**
- SONY Nagasaki Corp. (1986) **RO**
- Dainippon Screen Mfg. Co. Ltd (1986) **RO**
- Toshiba Ceramics Co., Ltd. (1984) **RO**
- Fukushima-cho Nagasaki Pref. (1978) **RO**
- Fukui Joint Electric Power Co., Inc. (1977) **RO**
- Oki Electric Industry Co., Kashima (1976) **RO**
- Kaneka Corporation (1974) **RO**
- Kansai Electric Power Co., Inc. Tanagawa P/S **MSF**
- Kashima Joint Electric Power Co., Inc. (1974) **RO**
- Showa Sangyo Co., Kashima (1973) **RO**
- Sumitomo Metal Industries Ltd. k Kashima (1972) **RO** 10,000m³/day

Asia & Oceania

SINGAPORE

- Tuas II (2012) **RO** 318,000m³/day
- Ulu Pandan NEWATER Plant (2006) **RO**
- Purau Seraya P/S (1985) **RO**
- National Iron Steel Mills Ltd. (1984) **RO**

INDONESIA

- Muara Tawar CCPP PLN (1996) **MSF**
- Tambok Lorok CCPP Block 1 x 2 (1996) **MSF**
- Muara Karang CCPP (1994) **MSF**
- Janjung Priok (1992) **MSF**
- P.T. Bakrie Corp. (1991) **MSF**
- Pertamina Balikpapan (1989) **MSF**
- KSL-KALTIM II (1983) **MSF**

AUSTRALIA

- Victorian Desalination Plant (2011) **RO** 450,000m³/day
- Sydney Desalination Plant (2010) **RO** 250,000m³/day
- Gibson Island (2008) **RO** 45,000m³/day
- Gold Coast Desalination Plant (2007) **RO** 133,000m³/day