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The advanced Technology of DHP Engineering unfolds a  
new future of our Customer and the future of the industry and economy.

**Potential Energy, Creative Synergy**

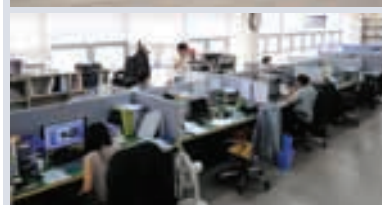


## Main Factory Panoramic view of the Company



### Outline of Company

Name of Company : DHP Engineering Co., Ltd.  
 Established : 1978  
 Representative : Song, Young Ho  
 Yard Area : Land : 30,000m<sup>2</sup>, Factory : 3,200m<sup>2</sup>  
 Warehouse : 1,400m<sup>2</sup>, Office Building : 800m<sup>2</sup>  
 Products : Plate Heat Exchanger / Disk & Shell Type Heat Exchanger  
 Spiral Type Heat Exchanger / Plate Coil / Fresh Water Generator



## Manufacturing Process

Our goal is to have our company firmly established as the best Plate Heat Exchanger business by setting up an integrated system from warehousing of raw materials to the delivery of products.



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**Potential Energy, Creative Synergy**

## History of Company

The advanced Technology of DHP Engineering unfolds a new future of our Customer and the future of the industry and economy.

### 2000

- 2000 Awarded Prize by Ministry of Commerce, Industry and Energy
- 2001 Qualified ASME 'U' Stamp by 'American Society of Mechanical Engineers'
- 2002 Registered Patent Right of 'Disk Type Heat Exchanger' Designated as a prospective company of export  
Awarded Prize by President of Korea, Kim Dae Jung
- 2003 Qualified BS EN ISO 9001:2000 by LR
- 2004 Applied Patent Right of 'Non-welding Disk Type Heat Exchanger'
- 2005 Designated for INNO BIZ
- 2006 Registered international Patent Right of 'Double Seal Gasket System' for 28 countries Qualified ISO 14001
- 2007 Established New Plant of 30,000m<sup>2</sup> in Gimhae and moves  
HQ to Busan Awarded DSME 'Quality Certificate' Installed new 20,000 ton Hydraulic Press in the new plant
- 2008 Designated as 'leading Company' by Busan Metropolitan City
- 2009 Awarded prize by Ministry of SMBA(Small and Medium Business Administration) Qualified "KEPIC-MN" nuclear quality certificate.  
"Q CLASS" Certified by Korea Hydro & Nuclear Power Co., Ltd. Awarded prize by Ministry of Knowledge Economy

### 1970

- 1978 Established DAEWON HEAT PLATE Ind. Co.in Busan Succeeded in developing the foremost Plate Type Heat Exchanger in Korea

### 1980

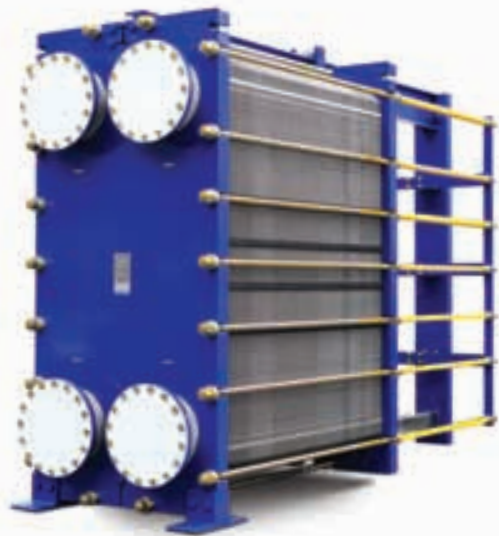
- 1981 Awarded Prize by the Chief Director of "Korea Energy Management Corporation"
- 1982 Awarded 'Excellency Prize' by 'Ministry of Commerce and Industry'
- 1984 Succeeded in developing the foremost Herringbone Type Plate in Korea
- 1986 Installed 5,000 ton Hydraulic Press
- 1988 Succeeded in developing Multi-Use Mold for Heat Plate

### 1990

- 1990 Succeeded in developing Plate Coil
- 1993 Incorporated DHP Engineering Co., Ltd. Succeeded in developing Hydro Ratchet Spanner
- 1994 Succeeded in developing Plate Type Gas Cooler
- 1996 Succeeded in developing Spiral Type Heat Exchanger
- 1998 Obtained ISO9001 Designated as 'Venture Company'
- 1999 Installed 30,000 ton Hydraulic Press for ultra size plate pressing Succeeded in developing Disk Type Heat Exchanger



# PLATE HEAT EXCHANGER



## Principle

Plate heat exchangers have more than 100 years history and its structure is composed of a fixed frame, a movable frame and corrugated plates which are in between the two frames. Hot liquid and cold liquid go through between the corrugated plates in turn. To prevent leaking, gaskets are mounted around the plates and tightening bolts are used to put the plates together. There is heat transfer between the two liquids through the plates. This is the main principle of a plate heat exchanger.

The arrangement of two liquids is that the cold liquid goes upward and hot liquid goes downward in order to increase heat transfer efficiency. There is an advantage to use plate type heat exchangers over Shell & Tube type heat exchangers, that is to say, the corrugations in the plates increase the liquid turbulence to a low Reynolds number and the liquids flow is counter flow so that the heat transfer efficiency is always 3-5 times higher than Shell & Tube type heat exchangers.

## Innovative Plate Technology

### Newly Developed 'Perfect seal' Gasket

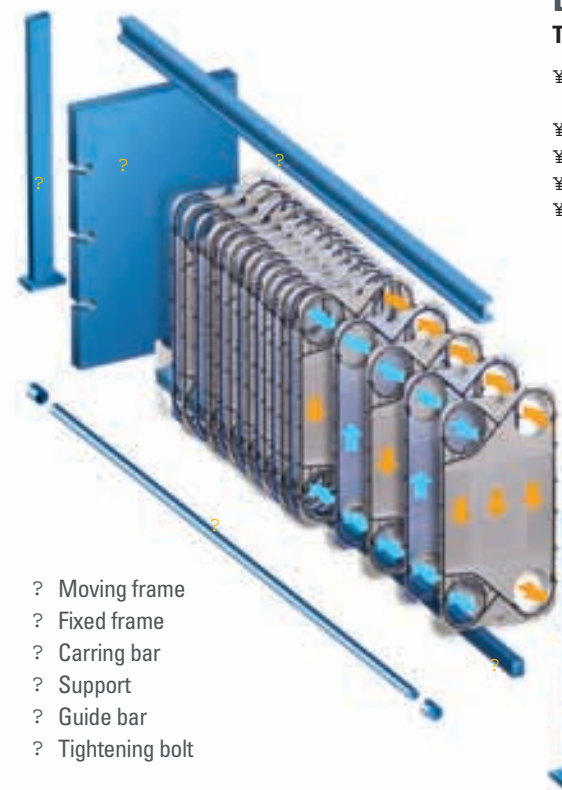
- International Patent Right Registered (28 Countries)
- 3-Dimensional Pressure Dispersion System
- 300% Higher Friction Force (Up to 50 bar)
- Good keeping of Tightened Plate Pack
- Guarantee Longer Life Time of Gaskets



## Design

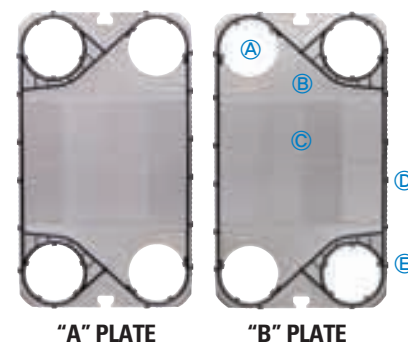
### The main components of the Plate Heat Exchangers ;

- ✚ The plate pack comprises of a number of heat plates, according to the heat transfer surface required.
- ✚ Gaskets on the plates ensure that the fluid channels are securely sealed from each other.
- ✚ The direction of flow within the exchanger is determined by the gasket.
- ✚ The frame enclosing the plate pack is held together with tightening bolts.
- ✚ Connections for incoming and outgoing fluids are usually in the fixed frame of the heat exchanger. In the case of multi pass flow, connections have to be in the fixed frame and the movable frames.



- ? Moving frame
- ? Fixed frame
- ? Carrying bar
- ? Support
- ? Guide bar
- ? Tightening bolt

- Ⓐ Fluid channel
- Ⓑ Fluid division side
- Ⓒ Heat plate
- Ⓓ Gasket
- Ⓔ Air hole



## Plate Heat Exchanger Flow-Chart Constitution

### Single Pass /

As single pass has the counter flow and the nozzle is mounted on the fixed frame, only frame can be moved for maintenance so it is easy for the maintenance and increase or decrease in capacity.

### Single Pass & Multi Pass /

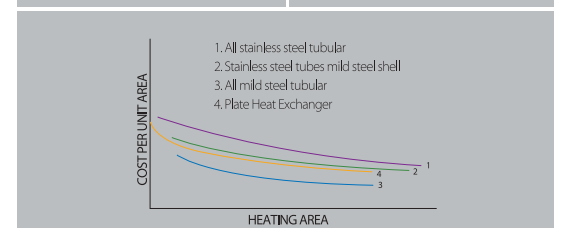
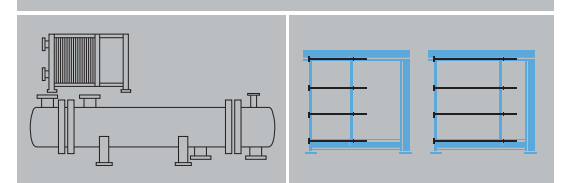
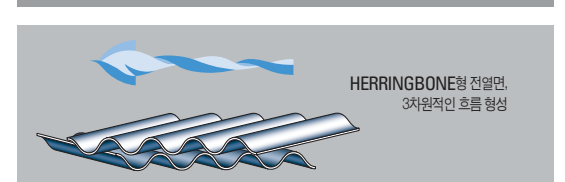
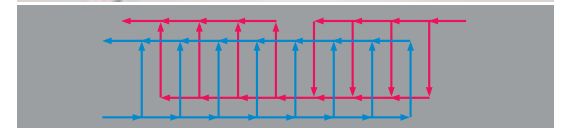
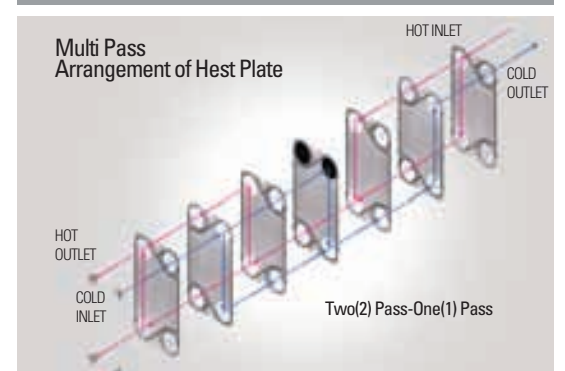
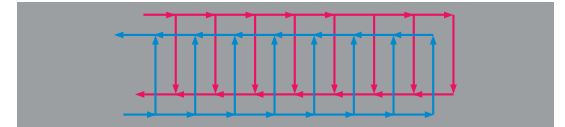
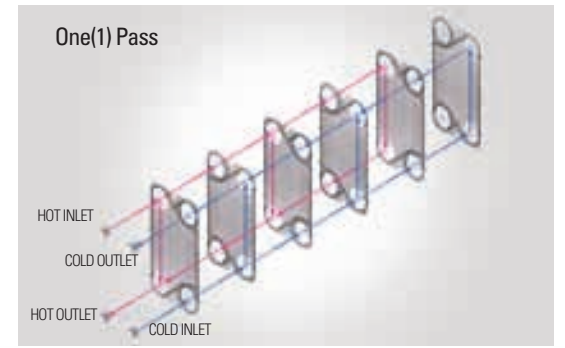
If the temperature is much different between inlet and outlet and the allowable pressure loss between hot side and cold side is much different, the performance can be enhanced by increasing overall heat transfer coefficient, making one side to be 1pass and the other side to be multi pass.

### Multi Pass /

If the flow rate is quite less than heat transfer rate and the pollution level is not much, the advantage is that the heat transfer effect can be increased significantly by designing both hot side and cold side to be multi pass but the disadvantage is that the piping of nozzle part in the movable frame should be corrected when it is necessary to expand the heat exchanger capacity

### Single & Multi-Multi Pass /

This is an efficient heat exchanger that can make possible the heat exchange for more than 3 types of the fluid by one unit of the heat exchanger using a separator frame. It is mainly used for sterilizer in food industry.



## Special Feature

### Cost Savings /

DHP Plate Heat Exchangers save costs, with their high efficiency, low investment, compact installation and simple maintenance.

### High Heat Transfer Coefficients /

DHP Plate Heat Exchangers provide high rates of heat transfer, due to the turbulence inducing shape of the plates. The special gasket configuration of the plates prevents any mixing of the media being processed. In the port area both fluids are separated by double gaskets. Additional safety is ensured by the leakage gap.

### Adhesive-Free Gasket /

DHP developed adhesive-free gaskets. The optimum gasket setting in the gasket groove and the fixing of the gaskets by pressed indentations, allow high resistance against pressure and enable a quick and simple gasket replacement.

### Flexibility /

DHP Plate Heat Exchangers can be adapted to changing process conditions. If process conditions change plates can be added or removed easily. This eliminates the need for costly re-investment.

### Low Product Content /

This small volume of liquid in the Plate Heat Exchangers is the reason for the low weight of the equipment. It enables a faster start up and shut down of the complete plant, than conventional heat exchangers.

### Compact Design /

DHP Plate Heat Exchangers are of compact design. For example, 200m² of heat exchange surface require a Plate Heat Exchanger of only approx. 3m length, 2m height and 1m width. For a shell and tube heat exchanger to achieve the same duty, about 600m² of heat exchange surface would be required.

### Reliable Gasket Structure /

DHP's new development of 'Double Seal' gasket system overcomes the limitation of ordinary plate heat exchanger. (3 times high-pressure endurance).

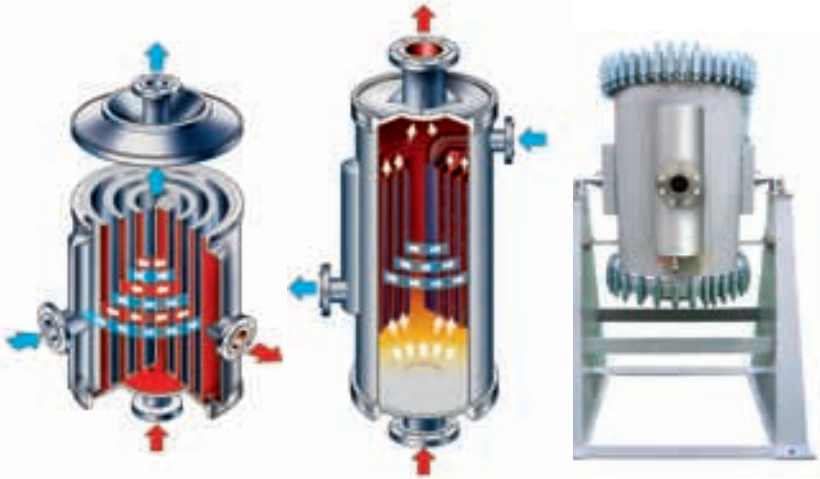
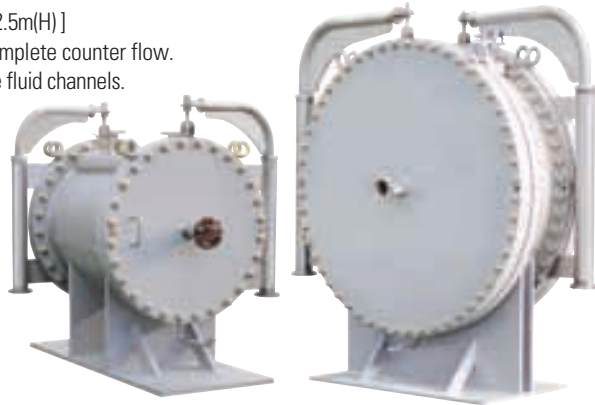
# SPIRAL TYPE HEAT EXCHANGER

## Features and advantage

- ✎ Compact size and high efficiency guaranteed [ Heating area 580m2: 2m(D)X2.5m(H) ]
- ✎ Heat transmission enabled at little temperature difference by means of complete counter flow.
- ✎ Mixing proof between fluids owing to the perfect welding between both side fluid channels.
- ✎ Fully developed spiral flows in both channels make self cleaning effect and this leads very little fouling inside of channels.
- ✎ Easy for chemical cleaning or mechanical cleaning by opening the cover
- ✎ Guaranteed efficiency for maximized heat transmission by highly developed turbulent flow
- ✎ Nearly no maintenance cost required thanks to the minimized fouling and non-use of gasket
- ✎ Heat exchange of fluid containing slurry

## Application

- ✎ Chemical industry : Preheating, cooling and condensing of various of fluids such as dense sulfuric acid in liquid or vapor phase, oleum, nitric acid, acrylic acid, fatty acid, solution, etc.
- ✎ Paper industry : Gas, lye cooler, waste gas, terpentine condenser, heat exchanger of heat recovery plant and surface condenser of evaporation plant, etc.
- ✎ Sugar and food industry : Preheater and surface condenser for raw juice, press water,vegetable oil, waste water, etc.
- ✎ Textile industry : Heat exchanger for heat recovery at dyeing and washing process
- ✎ Gas and coal industry : Condenser for ammonia solution, alkacide lyes, benzene washing fluid,



## Type: (BSFX) Both sides spiral fluid heat exchanger

It enables both side fluids to form perfect counter flow, so the heat transmission is possible at minor difference of temperature and even when the contaminated substance in the fluid stays at wall surface or bottom due to the decrease in flux or stand by during the operation and once the flux is recovered it works as self-cleaning for the contamination due to the speed increase by the sectional decrease in flux passage of the part attached with the contaminated substance.

Application / Liquid : Liquid, condenser or gas cooler, etc.

## Type: (BSFX) Both sides spiral fluid heat exchanger

It has a structure that the heat transmission between fluids occurs vertically and it is used for processing such mixtures or steam, gas or evaporation in large capacity. The fluid passing vertically will go through heat exchanger at high speed with almost no pressure loss as a media for mainly steam or gas but sometimes it can be used for heat exchange of Liquid:Liquid which has much difference in the flux.

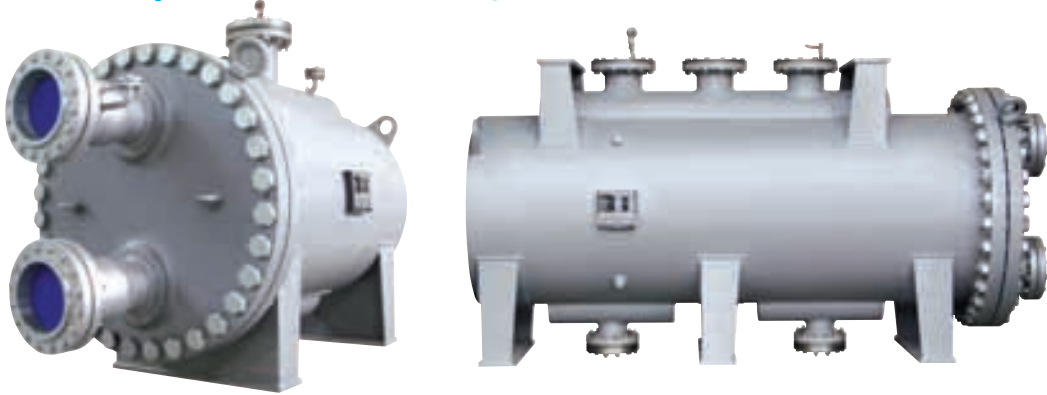
Application / Vaporiser, condenser, reboiler, gas cooler, heater

# DISK & SHELL TYPE HEAT EXCHANGER

## Overview

DHP's new development 'Disk & Shell Heat Exchanger' is a heat exchanger which is composed of the good points of shell & tube heat exchanger and plate heat exchanger. This heat exchanger is welded plate pack in high pressure vessel. The maximum pressure is up to 100bar and the temperature is up to 400 ℃. The main application is condenser, evaporator and the units require high pressure and high temperature but small size.

## Performance comparison of Heat Exchangers



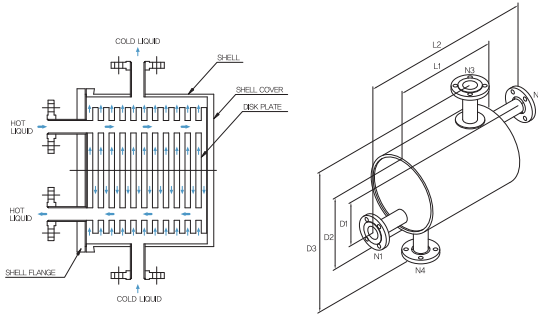
Item	Unit	Shell & Tube Type	Spiral Type	Plate Type	Brazed Type	Disk & Shell Type
Weight	Kg	1000 (Standard)	800	500	300	200
Volume	M³	1.0	0.7	0.4	0.2	0.2
Application		LIQ : LIQ GAS : LIQ GAS : GAS	LIQ : LIQ GAS : LIQ GAS : GAS	LIQ : LIQ STEAM : LIQ	LIQ : LIQ GAS : LIQ (Small amount)	LIQ : LIQ GAS : LIQ GAS : GAS
Max. Oper. Press.	Bar	F.V ~ 1000	F.V ~ 16	16	25	F.V ~ 100
Max. Oper. Temp.	℃	-	300	-40 ~ 180	-40 ~ 230	-196 ~ 400
Shape	-	Tube	Plate	Corrogation Plate	Corrogation Plate	Corrogation Plate
K value	Kcal / m²·hr ℃	200-1500	600-2500	Max 6000	Max 6000	Max 6000
Efficiency of Plate	%	-	100	75	80	100
Maintenance cost	100 (Standard)	100	60	60	Undisassemble	40

## Design information

Plate Type	Shell diameter ?	Plate thickness (up to 40bar) mm	Surface per plate m²	Maximum number of plates	D1 mm	D2 mm	D3	L1(max) mm	L2	N1 ? N2 (A)	N3 ? N4 (A)
DPS20	200	0.7	0.032	200	140	219	Variable	580	Variable	20	20 - 80
DPS35	350	0.7	0.081	330	215	356		1040		50	32 - 250
DPS60	600	0.7	0.27	460	424	610		1700		100	32 - 350
DPS120	1200	0.7	0.85	600	748	1200		2100		200	32 - 700

## TECHNICAL SPECIFICATION

- ✎ Capacity : Max. 100MW/Unit
- ✎ Design Temp : -196℃ ~ 400℃
- ✎ Design Pressure : Max. 100bar
- ✎ Material : Shell / SS 400, SUS 304, SUS 316, Titanium, Nickel, etc.  
Plate / SUS 316, 254 SMO, Titanium, Nickel, etc.





# MECHANICAL VAPOR RECOMPRESSION DISTILLER

## Desalination and Distiller System

### MVR Distiller Application:

- Distillation of sea water, brackish water, infected underground water, malignant waste water through a very effective heat pump system using turbo mechanical vapor recompression method for production of high purity water for drinking and industrial reuse.
- Appropriate for island region with drinking water insufficiency, inland region with underground water contamination and facilities creating malignant waste water.

### Features of Turbo Mechanical Vapor Recompression System:

- Simple design and constituents, only electric power source needed for operation - no heat sources
- World Best Efficiency (Low specific energy consumption, C.O.P > 20)
- Easy maintenance due to a compact MVR system with high speed turbo steam compressor
- Simple and reliable automation system without special crew training for operation
- Easy full access to heat transfer surfaces and steam compressor for after service
- Simple raw water pre-treatment, selectable H/X materials  
(sea water : Titanium, muddy river & underground water : STS316L, STS304)



## Drinking Water Distiller System

### Turbo-MVR Distiller system converting sea /dirty/infected/muddy water into clean drinking water.

- Can be applied to any type of water : sea water, saline water, contaminated & infected ground/underground water, muddy water, etc.
- No level of cleanliness of raw water required
- No need for pre & post treatment
- 100% sterilization with high temperature : Naturally getting "ZERO" Virus water !
- Available for small size/integrated and fixed type/transportable type : Can be installed in any location (suitable size within 20 feet standard high cubic container)
- No Need for Periodic Parts Replacement
- No Chemicals Dosing
- Automated Operation : No need for special operator
- Result : Ministry of Oceans and Fisheries etc.

## DHP Engineering Co.,Ltd.

## Original technologies required for developing Turbo MVR:

- High speed turbo-blower, steam compressor, plate & pipe type heat exchanger : designing/manufacturing/operating technologies
- Automation/control and system integration technologies
- DHP Engineering Co., secured with 100% self-developed technologies

### Turbo MVR Distiller Model & Dimension

#### Basic Model

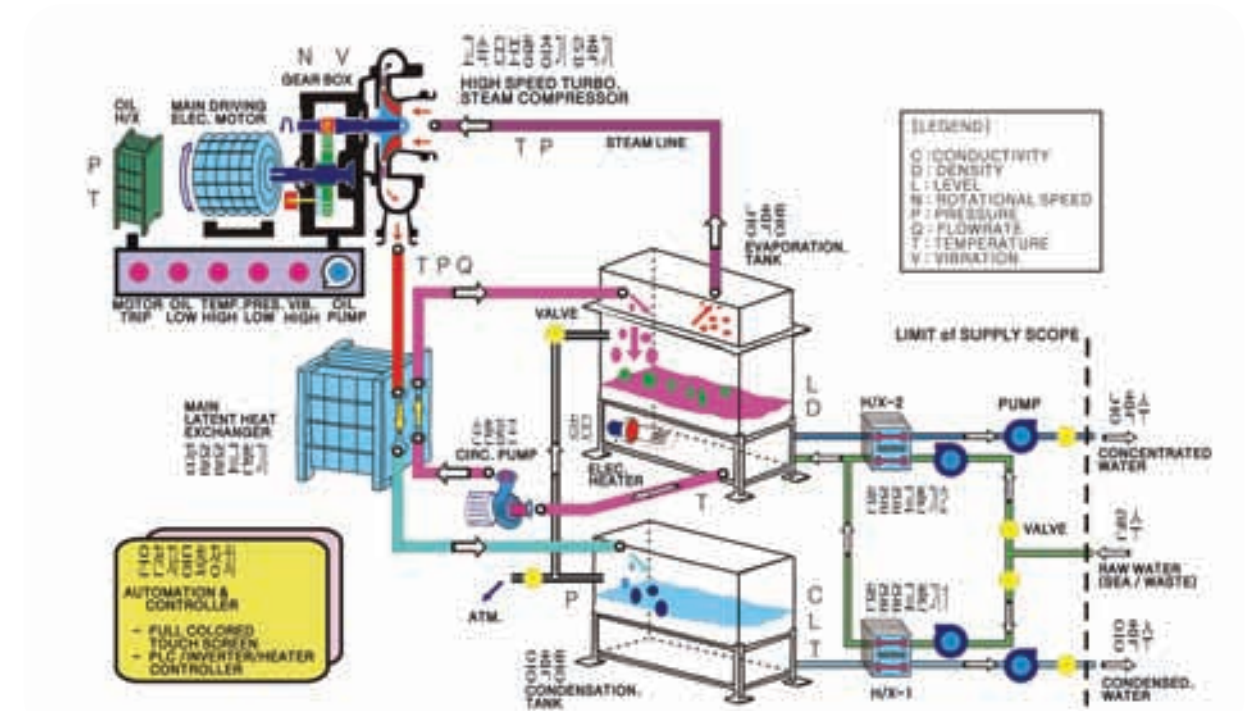
Model	Capacity (m <sup>3</sup> /day)/(ton/day)	Dimension (meter)			Weight (ton)	Delivery (months)On FOB	Test before delivery	Components Installation
		L	W	H				
ADR 25	25	6	2.5	2.9	10	4 - 6	Witness test at factory	"All in One" on 1 bed frame. App.20(ft) High Cubic Container Size
ADR 50	50	6	2.5	2.9	13			
ADR 75	75	6	2.5	2.9	15			
ADR 100	100	6	2.5	2.9	17			
ADR 200	200	8	2.5	2.9	30			

※ 20ft(Container Size)

#### Tiling -up Model

Model	Capacity (m <sup>3</sup> /day)/(ton/day)	Dimension (meter)			Weight (ton)	Delivery (months)On FOB	Test before delivery	Components Installation
		L	W	H				
ADR 300	300	6	2.5*3	2.9	17*3	5 - 8	Witness test at factory per set	"All in One" on 1 bed frame. App.20(ft) High Cubic Container Size
ADR 500	500	6	2.5*5	2.9	17*5			
ADR 1,000	1,000	6	2.5*10	2.9	17*10			

- According to user's requirement, we can meet the requested capacity by tiling-up model thru combining Turbo MVR distiller unit.
- In case of increasing water consumption after installing MVR distiller, it is easily possible to add additional Turbo MVR distiller unit.





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Potential Energy, Creative Synergy

# Worldwide sales network

All DHP's equipment is tested despatch from our works.  
If any product or parts is proved defective in material or work man ship within one year or requested customer's condition of entering service which ever is the shortest, it will be replaced free of charge.

## Main Customer List

### Customer of Marine

- Hyundai Heavy Industries Co., Ltd. (HHI)
- Daewoo Shipbuilding & Marine Engineering Co., Ltd. (DSME)
- Samsung Heavy Industries Co., Ltd. (SHI)
- STX Shipbuilding Co., Ltd (STX)
- Hanjin Heavy Industries & Construction Holdings Co., Ltd.
- SPP Shipbuilding Co., Ltd.
- China Ship Building Corporation (CSBC) Cosco Shipyard Group
- Mawei Shipbuilding Ltd.
- Jiangmen Nanyang Ship Engineering Co., Ltd.
- Tsuneishi Shipbuilding Co., Ltd.
- Saiki Heavy Industries Co., Ltd.
- Jurong Shipyard Pte Ltd.

### Customer of EPC, Plant

- Doosan Heavy Industries & Construction Co., Ltd.
- Hyundai Engineering & Construction.
- Korea Hydro & Nuclear Power Co., Ltd. (KHNP)
- POSCO E & C
- Samsung Engineering Co., Ltd.
- SK Chemicals Co., Ltd.
- Kumho Petrochemical Corporation
- Technimont SPA
- Petro Karan Shafagh Kish (P.K.S.K)
- Nargan Engineers & Constructors
- Nardis Energy Projects.
- Pars Oil & Gas Company
- KNPC



## Research & Development

DHP R&D Center is doing its utmost to produce perfect product with high quality as a core of the production. The R&D Center is mainly with technology and production know-how for the development under the business philosophy that R&D should be prior to the sales, contributing to the perfect quality warranty while playing a fundamental role of every anging from CAD / CAM system to design, processing, assembly and inspection.

Challenge for World Wide!

DHP new vision consist of development of new technique and research.  
The Best Quality and Service They are promise with DHP.



## Approvals

Certificates from classification societies



## Our Company policy is

to satisfy customers' needs with timely delivery and best quality.

