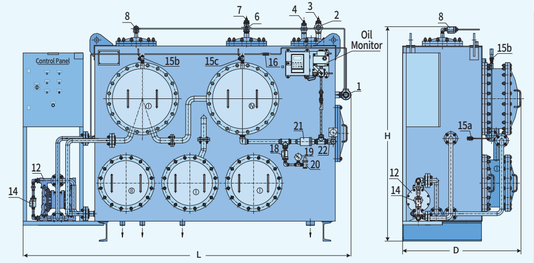
DongHwa Entec

Main Feature



1.	Oily water inlet
2.	Oil outlet 1st stage
3.	High Probe
4.	Low Probe
6.	Oil outlet 2nd stage
7.	Reference probe
8.	Oil outlet 3rd stage
12.	Air Diaphragm Pump
14.	By-pass valve
15a.	Vent cocks
15b.	Vent cocks
15c.	Vent cocks
16.	Flowmeter
18.	Back-flush valve
19.	Pressure gauge P3
20.	Pressure reducer PR2
21.	Effluent outlet valve
22.	Diverter valve

Figure 2

Specification

Model	Max. Capacity [liters per hour]	H Height [mm]	L Length [mm]	D Depth [mm]	Inlet Line [inch]	Effluent Line [inch]	Oil Outlet [inch]	Power [kw]	Weight [kg]
MU-2	250	550	600	230	3/8	3/8	3/8	0.5	150
MU-5	500	945	1215	485	3/4	3/4	1	0.75	365
MU- 10	1000	1200	1500	660	1	3/4	3/4	1	450
MU- 15	2000	1415	1700	780	1	3/4	1	1.5	900
MU- 20	3000	1730	2200	955	1	1	1	2.5	1250
MU- 30	5000	1730	2200	955	1	1	1	3.5	1350
MU- 40	10000	2200	2800	1200	2	1 1/2	1 1/2	5	2200

Advantages

* Unique six-stage design for high-efficiency and performance
* Low downtime, maintenanc ns where space is at a premium (20% downsize)
* Simple, unattended operation
* Versatility for a wide range of applications

Applications

* Bilge water separation for sea-going vessels
* Off-shore oil platforms
* Wastewater treatment plants
* Refineries
* Gasoline/Diesel service stations

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Head Office and Factory (Land Area: 15,574 m^2 / Building Area: 13,845 m^2)


Hwajeon Office and Factory (Land Area: 20,127 m^2 / Building Area: 20,087 m^2)


Energy. Environmental Tec. Lab. (Land Area: 4,465 m^2 / Building Area: 3,365 m^2)


DongHwa Entec (Shanghai) Co., Ltd. (Land Area: 33,350 m^2 / Building Area: 18,457 m^2)

DongHwa Entec

Donghwa Entec Co.,Ltd

Noksan Office and Factory
7, Noksansandan 261-ro, Gangseo-gu, Busan, Korea
T. +82-51-970-1000 F. +82-51-970-1001

Hwajeon Office and Factory
20, Hwajeonsandan 1-ro 63beon-gil, Gangseo-gu, Busan, Korea
T. +82-51-970-1100 F. +82-51-970-0710

Energy·Environmental Technology Laboratory
7, Gwahaksandan-ro 305beon-gil, Gangseo-gu, Busan, Korea
T. +82-51-970-0711 F. +82-51-970-0730

DongHwa Entec (Shanghai) Co., Ltd.
No.2508 Jiangshan Road Lingang New City Shanghai China 201308
TEL : +86 (0)21-5197-5001 FAX : +86 (0)21-5197-5005

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▸▸ Cryogenic Heat Exchanger and System Engineering Global Leader

Crystal Oily Water Separator

Clear Solutions for Crystal Clear Environment
A product of our endless quest for perfection

* Interested in adopting the most advanced oil-water separation technology?

Donghwa Entec is leading the trend with its patented, state-of-the-art Crystal separator.
Environmentally friendly for a friendly environment.

DongHwa Entec GenOIL

Crystal Oily Water Separator

Introduction

DongHwa Entec Crystal oily water separators utilize a patented, unique process for multi-stage separation of immiscible phases with different densities such as mineral oils and water. An innovative separation process combines gravitational and centrifugal forces with surface tension and vortex effect prior to the polishing stage. A highly effective polishing stage enhances performance and minimizes maintenance costs and downtime. Crystal separators are designed for ships and have been certified by the US Coast Guard in accordance with IMO Resolution MEPC. 107(49).

The separator components meet or exceed the rigorous specifications of classification societies and all Crystal MU models are ABS certified.

Due to their high efficiency the separators are compact and need access only from the front side. They can also be placed against the wall, even in corners and do not require any extra head room.

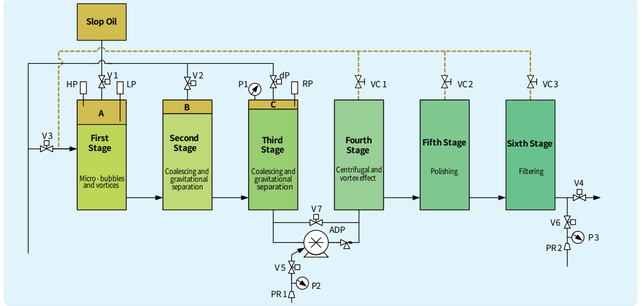
The automation system ensures unattended operation and features PLC units, self-cleaning oil sensors and fail-safe components.

- Crystal Oily Water Separator는 광물성, 식물성오일과 물 같은 다른 밀도를 가진 혼합되지 않는 물질의 다중 단계 분리를 위한 특허 받은 유일한 프로세스를 이용함
- 혁신적인 분리법(중력,원심력,표면장력,구심력,소용돌이효과) → 소형화, 성능향상, 유지비용 절감, 정비시간감소
- IMO협약안 MEPC107(49)에 따른 USCG 승인, ABS 승인
- 자동화시스템(무인운전가능) : PLC Unit, Auto Cleaning of Sensor, Auto Stop Function
- 내부구조 : 폭풍우속 22.5도의 경사에서도 효과적으로 분리가능

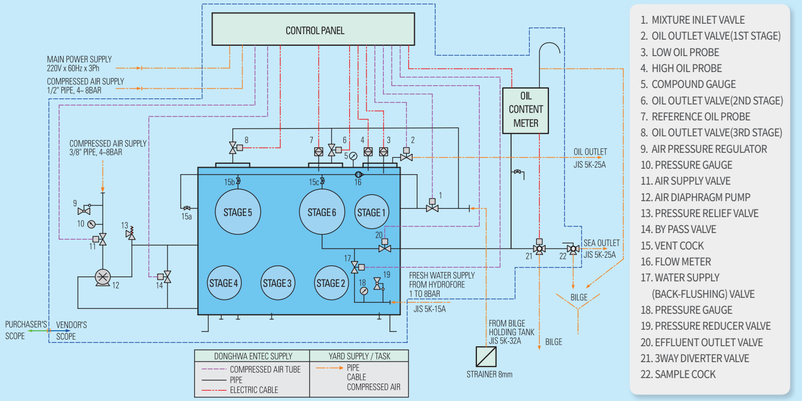
Description Process Flow Diagram

The separation process occurs in six stages in fluid communication with each other as shown below.
Oil is gradually removed in each stage and collected in oil zones A, B and C respectively.

Periodically, a preset amount of oil is detected by oil sensors, which initiate an oil discharge sequence. The liquid flow through the stages is reversed and oil accumulated in the collection zones then discharged into a waste oil tank.



Installation sketch



1. MIXTURE INLET VAVLE
2. OIL OUTLET VALVE(1ST STAGE)
3. LOW OIL PROBE
4. HIGH OIL PROBE
5. COMPOUND GAUGE
6. OIL OUTLET VALVE(2ND STAGE)
7. REFERENCE OIL PROBE
8. OIL OUTLET VALVE(3RD STAGE)
9. AIR PRESSURE REGULATOR
10. PRESSURE GAUGE
11. AIR SUPPLY VALVE
12. AIR DIAPHRAGM PUMP
13. PRESSURE RELIEF VALVE
14. BY PASS VALVE
15. VENT COCK
16. FLOW METER
17. WATER SUPPLY (BACK-FLUSHING) VALVE
18. PRESSURE GAUGE
19. PRESSURE REDUCER VALVE
20. EFFLUENT OUTLET VALVE
21. 3WAY DIVERTER VALVE
22. SAMPLE COCK

Separation Process

The Crystal oily water treatment units are designed to separate the liquid phases in six stages located within a single vessel. Each stage is devised to remove oil particles of a certain size and renders the liquid cleaner for the next stage. This ensures greater effectiveness and manageable loads for each stage. Furthermore, it also precludes undue contamination and clogging of various stages by oil, resulting in trouble free-operation.

Minute gas bubbles resulting from controlled vacuum conditions enhance the removal of oil droplets from the water stream. Vacuum is created in the stages operating prior to the circulation pump. Oil is retained at the upper portion of the stages and is gradually accumulated in collection zones.

Downstream from the pump the stages are slightly pressurized. Oil extracted in these stages is transferred continually into the collection zones through specially designed conduits. The transfer of oil occurs due to the pressure differential existing between the stages located upstream and downstream from the pump respectively. Continual oil extraction ensures outstanding cleanliness of the polishing stages and prevents accidental contamination of the effluent.

Oil accumulation in the collection zones is monitored by a probe that initiates periodic oil discharge sequences.

The separator is isolated from the effluent discharge line and connected to a pressurized line. Clean water back-flushes the stages and displaces the oil from the collection zones. The oil probe resumes the separation process after a preset amount of oil is evacuated.

- Crystal Oily Water Separator는 총 6단계의 분리 프로세스를 이용한다.
- 각 단계에서는 적정 크기의 Oil Particle을 제거하도록 설계(효율성, 조정성, 자동세척) → Trouble Free Operation
- 3단계와 4단계 사이의 순환펌프(Air Diaphragm Pump)는 1,2,3단계에서 진공을 생성 → 미세한 가스 거품 발생 → Oil Droplet방지, Collection Zone이동 → 효율증대
- 4단계와 6단계 사이는 순환펌프로 가압된 후 특별히 설계된 홈통에 포집된 후 1단계로 재순환한다.
- 이러한 유체의 흐름은 펌프에서 나오는 각 단계의 상향류, 하향류 사이의 차압에 의해 발생한다.
- Collection Zone에 축적된 Oil은 센서에 의해 감지된 후, 주기적으로 배출됨과 동시에 역방향으로 Cleaning이 되도록 설계되었다.

STAGE 1 ▶

The first stage achieves oil-water separation through gravity, enhanced through a flotation effect by minute gas bubbles. A specially designed device imparts a rapid circular motion to the liquid. Oil migrates to the center of the device and then ascends, accumulating progressively in a collection zone (A). Solids and sludge are deposited at the bottom of the stage for removal. Most of the oil droplets are removed in this stage.

- 물과 기름의 비중차 및 Air Diaphragm Pump에 의해 생성된 미세한 가스거품의 부양효과를 이용한다.
- Oil은 윗부분의 포집지역(A)으로 이동, 퇴적물과 침전물은 아래로 이동한다.
- 대부분이 분리수행 된다. (About 99%)

STAGE 2 ▶

The flow is reversed prior to the liquid entering the second stage which contains oleophilic material. Small particles of oil adhere to the surface of the oleophilic beads and are attracted to them by a surface tension effect. As they get together, the oil droplets form larger globules whose enhanced buoyancy overcomes the force of attraction exerted by the beads. The oil globules then detach themselves from the beads, move upwardly with the liquid and remain in the secondary collection zone (B) for removal.
This stage is designed to allow continual agitation of the beads in order to accelerate the coalescing process and facilitate the self-cleaning of the beads. The flow is reversed through a circular motion at the upper part of the second stage and oil remains in the secondary collection zone (B).

- 유체흐름은 역전되어 친유성 Beads가 들어있는 2단계로 들어간다.
- 친유성 Beads에 의한 유착효과, 즉 표면장력을 이용해 기름방울들을 뭉치게 한다.
- Oil은 두 번째 포집지역(B)으로 이동, 유체는 파이프를 통해 다음단계로 이동한다.

STAGE 3 ▶

The liquid is further processed in the third stage entering the core of a circular basket and moving radially outwards through the coalescing material. Liquid velocity decreases towards the periphery of the basket thus allowing minute oil particles to coalesce effectively. The resulting oil globules are retained in a collection zone (C) as the liquid reverses its motion and descends towards the fourth stage.

- 친유성 Beads가 들어있는 원형 기구로 들어간 유체는 원형기구 주위에서 속도가 감소하여, 효과적인 기름방울 유착효과가 발생한다.
- 유체가 다시 역전된 후 Oil은 포집지역(C)로 이동하고 나머지 유체는 4단계로 진입한다.

STAGE 4 ▶

A positive displacement pump delivers the liquid to the fourth stage for further separation by means of a vortex-generating device. Centripetal forces within the vortex agglomerate the oil particles and force them to coalesce in order to form larger globules. Furthermore, an effect similar to one created by a cyclone also agglomerates the oil particles thus enhancing the coalescing process. A perforated conduit retrieves the globules from the eye of the vortex and directs them to a dispersion plate placed above the vortex generator.
Oil particles then travel through suitably sized perforations in the dispersion plate, gather around a funnel and migrate toward the oil collector of the first stage.
Spinning liquid rapidly exits the vortex generator being deflected downwards by the dispersion plate.

- 양압의 이송펌프에 의해 이송된 유체는 구심력을 일으키는 기구로 진입한다.
- Oil은 특별히 설계된 기구의 구심력으로 뭉쳐져 Air Venting Line을 통해 1단계로 이동하고, 유체는 다음단계로 이동한다.

STAGE 5 ▶

Further separation of minute oil particles occurs in the fifth stage by means of surface tension within a specially designed device. The liquid flows radially though the device and the oil particles are forced to form clusters of larger globules. The liquid is then directed around a circular baffle devised to create a quiet zone above the device. Oil is readily left behind and then drawn into the first stage as the flow is reversed and cleaner liquid is transferred to the final filtration stage.
In most cases the separation is completed prior to this stage.

원형기구의 중심에 설치된 친유성 Beads에 의해 미세한 Oil은 뭉쳐져 1단계로 이송되고, 역전된 유체는 마지막 단계인 6단계로 이동해 대부분의 분리단계가 완료된다.

STAGE 6

However, for oils of unusually high density, the sixth stage retains the remaining particles by means of filters. The filters are designed to retain temporarily minute particles of oil on their surface. The particles coalesce and detach themselves from the filter media through their enhanced buoyancy and the sweeping effect of the liquid.
Thus filter media lifespan can be prolonged to significant periods of time. This is due to minimizing the amount of oil particles reaching the filter media and effective oil removal from the surface of the media.

Oil의 밀도가 비정상적으로 높은 경우 이 단계의 필터를 이용하여 제거하게 되며 Oil은 유체의 쏠림효과와 부양력을 이용해 걸러지게 된다.