NEW TECHNOLOGY

Genoil's Crystal Sea Bilgewater Separator

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WITH MATERIALS AND IMAGES FROM GENOIL

With ever-tightening environmental regulations in a competitive shipping market, vessel owners need effective and economical bilgewater treatment systems to ensure their vessels remain compliant with the law in a cost-effective manner. A new entry into the bilgewater treatment market is the Crystal Sea system from Genoil, an Alberta-based technology development and engineering company.

Using proprietary technology developed through significant research and testing in the oil and gas markets, the Crystal Sea meets the requirements of the International Maritime Organization MEPC 107 (49) resolution and the standards of the United States Coast Guard. In addition, this bilge water separator meets the upcoming environmental standards for bilge water processing that will be required for large ships.

The Crystal Sea oily water separator is an efficient, compact design that meets IMO MEPC 107 (49) standards.

A Simple System

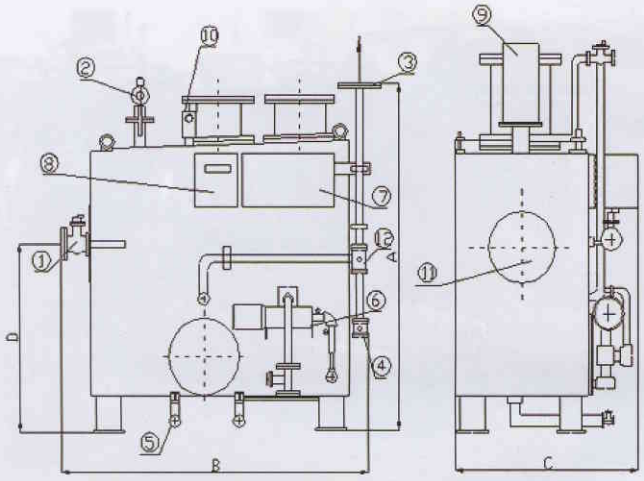
According to Genoil, the Crystal Sea is more effective and efficient than competing models because it has a very simple operating system and a footprint that is three to six times smaller than other technologies. The system does not require back washing or flushing with fresh water or sea water, and the oil removed is dry enough and of a quality that it can be reused by other utilities aboard. Additionally, the system requires no chemicals, uses very little power, has no moving parts with the exception of a pump.

In operation, the oil-water mixture is admitted into the first stage of the separator, which is a rectangular gravity separation chamber divided into three spaces by baffles which impart a circular motion to enhance separation efficiency. Most of the oil retained in the first section rises towards a primary oil collector where it accumulates prior to evacuation, while sludge and other contaminants denser than water are deposited at the lower portion of the first stage. A steam line surrounding the sludge collector is provided to fluidize the fines for retrieval.

The liquid flows over a weir into the second stage for further gravity separation and then reaches an oleophilic (oil attracting) basket. The basket is designed to allow free movement of the oleophilic beads, and agitation of the liquid coalesces oil droplets on individual beads into larger oil drops while also releasing contaminants from the beads in a self-cleaning process. The basket also provides an arrangement designed to form a self-regulating oil layer that absorbs small hydrocarbon particles resulting from mechanical emulsification.

The liquid undergoes gravitational separation during its upward movement toward the third stage. Here, the velocity of the fluid is reduced to allow the oil drops to break away from the stream and travel to the oil collector. The liquid then reverses its motion prior to entering the third stage where separation is repeated in a similar fashion.

From here, a pump draws the liquid into the fourth stage for additional separation by a vortex-generating device. Centripetal forces created within the vortex agglomerate the oil particles and force them to coalesce, forming larger globules. A conduit retrieves the globules that migrate



1.Oily water inlet, 2. Oil outlet, 3. Effluent outlet, 4. Back-flushing line
5. Drain, 6. Pump, 7. Control panel, 8. Oil content meter,
9. Oil probe, 1st stage, 10. Oil probe, 2nd stage, 11. Lid, 12. 3-way valve

towards the eye of the vortex and transfers them above a plate attached to the generator. The liquid exits the vortex generator through an annular space and reaches a quiet zone for further separation by gravity. A plate separates the flow of liquid from the oil particles which gather around a funnel and migrate towards an oil collector by pressure differential created between the stages.

Further separation of minute oil particles occurs in the fifth stage where the flow is given a sinusoidal (wave-like) path through an oleophilic basket equipped with an oil collector. In most cases, the separation is completed prior to the last stage as tests conducted in accordance with IMO requirements showed less than 5 ppm without any need for filters.

For oils of higher density the polishing chamber retains the remaining particles by means of a specially designed filter. Minute particles are forced to coalesce on the surface of the filter media, while enhanced buoyancy and the sweeping effect of the liquid motion take away the oil particles which are then retrieved by the oil collector through a pressure differential. Oil accumulated in the collectors is evacuated automatically by means of oil sensing probes that detect the position of the oil/water interface. Where continual operation is required, a positive displacement pump removes oil while the separation process is maintained.

Tested and Approved

Tests of the Crystal Sea separator were conducted at Testing Service, Inc. in Salt Lake City, Utah, and have successfully met IMO MEPC 107 (49) resolution and the United States Coast Guard standards, allowing Genoil to enter the US market immediately. As new regulations are implemented globally over the next five to ten years, ships operating under these regulations are expected to be required to convert to and implement bilge water treatment technologies of the type contained in the Crystal Sea.

Crystal Sea Features and Benefits

Innovative Design

- Unique six-stage design for enhanced efficiency and performance
- Operable at sea and on inter-coastal waterways
- Available in Single or Multi-Unit Modules for Field Installation, Maritime Platforms, Industrial Wastewater Treatment or Refineries

No Chemicals Required

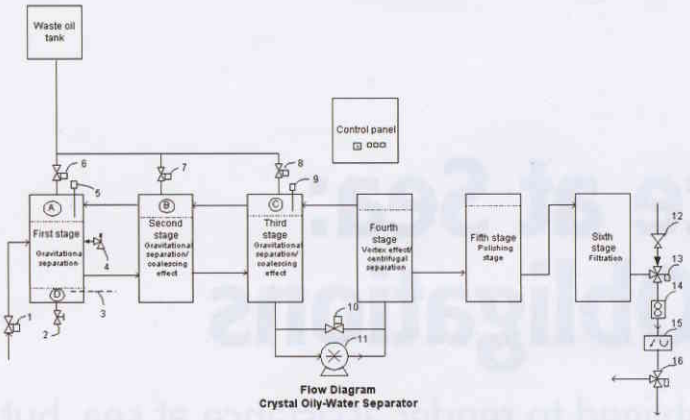
- Separation performed without chemical additives
- No requirement for back washing or flushing with fresh water or sea water
- No limitations on oil particle size
- Handles emulsions and oils with very high densities

Compact

- No moving parts
- Small diameter pressure vessel
- Minimal footprint that is three to six times smaller than other technologies

Field Tested & Proven

- Successfully met or exceeded the highest guidelines and standards of the United States Coast Guard and the International Maritime Organization's Resolution MEPC 107 (49) for pollution prevention equipment for ship bilges.
- Successfully tested at a 22.5 degree incline.



Flow Diagram
Crystal Oily-Water Separator

A- oil collection zone (primary)
B- secondary oil collection zone
C- tertiary oil collection zone
D- sludge collector
1- oil-water mixture inlet valve
2- drain valve
3- steam line
4- pressure relief valve
5- oil probe
6, 7, 8- oil outlet valve
9- reference probe
10- by-pass valve
11- pump
12- pressure regulating valve
13- backflushing valve
14- flow meter (optional)
15- oil content meter (optional)
16- effluent re-circulation valve

Genoil tested two different size units during the certification testing period. The smallest unit, designed for bilge water treatment, has a flow rate of two gallons per minute and the largest such unit is designed for a flow rate of 20 gallons per minute. The Genoil Crystal Sea Separator achieved below 15 ppm effluent in discharge water before the last stage of separation and below 5 ppm effluent after the last stage of separation. The lower level of effluent in the discharge water after the last stage of separation allows ships traveling in inland waterways in Canada to treat and discharge bilge water in an area designated for 5 ppm or below effluent in the discharge water. Genoil also has designs for three additional sizes rated at 5, 10 and 15 gallons per minute.

It should be noted that the Crystal Sea is not a "black box technology," but rather represents a significant improvement in Genoil's existing, patented, land-based Crystal separator technology (for more details see the Genoil website at www.genoil.net).

On the Market

Genoil is a technology development and engineering company that provides environmentally sound solutions to the oil and gas industry through the use of proprietary technologies. Its core business is the Genoil Hydroconversion Upgrader (GHU), which is designed to economically convert heavy crude oil into more valuable light upgraded crude, high in yields of transport fuels, while reducing sulfur, nitrogen and other contaminants.

Sales of Genoil's existing technologies has been through commission-based agency relationships around the world, and sales of the Crystal Sea system are expected to be made through these presently existing agencies. For more information visit www.genoil.net.