

Hitachi Plant Technologies, Ltd.

Mitsubishi Heavy Industries, Ltd.

## Coagulation and Magnetic Separation Technology “Hitachi Ballast Water Purification System” Obtained Basic Approval from IMO and Will Start Shipboard Testing

Tokyo, Japan, April 7, 2008 --- Hitachi Plant Technologies, Ltd. and Mitsubishi Heavy Industries, Ltd. announced that their jointly developed “Hitachi Ballast Water Purification System” obtained basic approval from IMO (\*1) in accordance with the “Procedure for Approval of Ballast Water Management Systems That Make Use of Active Substances” (\*2) on April 2, 2008.

Hitachi Plant Technologies recently started shipboard testing on a LPG tanker (Tank Capacity: 78,500 cubic meters) built by Nagasaki Shipyard and Machinery Works of Mitsubishi Heavy Industries, Ltd. and owned by Yuyo Steamship Co., Ltd. from this April. The shipboard test equipment’s treatment capacity is 50 cubic meters per hour and testing will be conducted over one year ending in March, 2009. The testing includes verification for Type Approval (\*3) by the Ministry of Land, Infrastructure, Transport and Tourism of Japan and practical evaluations for low maintenance and durability against vibration and corrosion.

In parallel with the shipboard testing, Hitachi Plant Technologies will conduct land-based tests of an actual sized system with a treatment capacity of 200 cubic meters per hour, near Tokyo Bay, attempting to obtain IMO’s final approval in July, 2009, and thereafter, Type Approval by the Ministry of Land, Infrastructure, Transport and Tourism.

Hitachi Plant Technologies is aggressively expanding our sales activities to obtain annual orders of 10 billion Yen by FY2012.

(\*1) IMO : International Maritime Organization

(\*2) Procedure for Approval of Ballast Water Management Systems That Make Use of Active Substances (G9): to determine the safety of active substances in Ballast Water Management Systems concerning environmental safety. IMO reviews and gives a basic approval for use of active substances and environmental assessment of treated water from prototype equipment and a final approval for environmental assessment of treated water from actual equipment.

(\*3) Type Approval: The administration of each country gives approval for equipment performances in accordance with the Guidelines stipulated in the convention, on the condition that land-based and shipboard testing fulfilled the requirements and after G9 final approval.

■View of Shipboard Testing Equipment



■The LPG Tanker loaded with Onboard Testing Equipment



■Outline of “Hitachi Ballast Water Purification System”

Ballast water is sea water used as ballast for stabilizing hull balance. It usually contains unique plankton, viruses, mud and sand of the port where it is drawn from. During loading at another port, most of the ballast water is discharged along with the foreign organisms. This causes serious environmental damage to the local ecosystem.

In response to this problem, “The International Convention for the Control and Management of Ships’ Ballast Water and Sediments” (Ballast Water Convention) was adopted at a Diplomatic Conference at IMO in February, 2004. It stipulates to gradually enforce “IMO Performance Standards” (\*4), depending on when the ship was built and its ballast tank capacity for ships engaged in international navigation, with all ships adopting the standard by 2017.

Hitachi Plant Technologies’ originally developed system utilizes coagulation technology generally used to remove plankton and organisms at water purification plants and magnetic separation technology which has been developed to remove algae in lakes or rivers. The coagulation method differs from the sterilizing method as it doesn’t use chlorine, ultraviolet rays, or any disinfectants. Therefore, no secondary contamination by residual chlorine occurs.

Coagulating microorganisms into small flocs enables the use of coarse filters, resulting in high speed treatment and a compact design.

Hitachi Plant Technologies conducted a verification test using a scale model (treatment capacity: 50 cubic meters per hour) from September to December, 2006 and confirmed its performance.

The need to improve shipboard functionality and knowledge of advanced ship outfitting design is required for shipboard purification equipment. The joint development between Hitachi Plant Technologies, Ltd. and Mitsubishi Heavy Industries, Ltd. enabled the inter-business fusion to refine “Hitachi Ballast Water Purification System”

(\*4)IMO Performance Standard :

Organisms	Requirements
Viable organisms greater than or equal to 50µm <sup>(*)</sup>	Less than 10 organisms/1 cubic meter
Viable organisms less than 50µm and greater than or equal to 10µm <sup>(*)</sup>	Less than 10 organisms/1ml
Toxicogenic <i>Vibrio cholerae</i> (O1, O139)	Less than 1 cfu <sup>(**)</sup> /100ml
<i>Escherichia coli</i>	Less than 250 cfu <sup>(**)</sup> /100ml
Intestinal Enterococci	Less than 100 cfu <sup>(**)</sup> /100ml

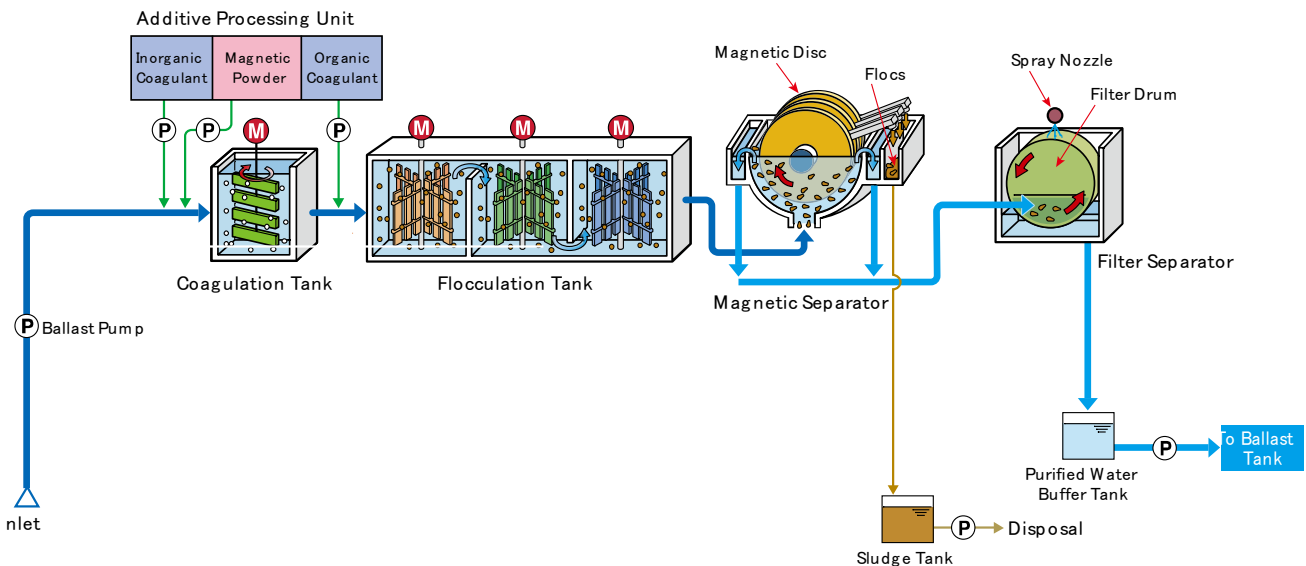
(\*1)Minimum Dimension      (\*2)cfu : Colony Forming Unit

■ Features

- (1) Can remove plankton, viruses and mud (including eggs of organisms and mold spores in mud) quickly and efficiently;
- (2) As no disinfectants are used, there is no marine ecocide due to residual disinfectants;
- (3) Greatly reduces mud accumulation in Ballast Tanks (seabed mud, sand and dead organisms), prolonging the life of the Ballast Tank’ s internal paint, and also contributing to reduced mud disposal costs;
- (4) Can remove phosphorus which is an essential nutrient of organism growth;
- (5) Flexible design and varied product range is suitable for a wide range of capacities and can be modeled to fit into available spaces.

■ System Flow

- (1) Intake sea water is treated, by adding a coagulant and magnetic powder to sea water in Coagulation and Flocculation Tanks and then agitating it causes the plankton, viruses and mud to coagulate into small 1 millimeter magnetic flocs.
- (2) Flocs can then be collected with Magnetic Discs in a Magnetic Separator. Treated water is filtrated through a Filter Separator and injected into Ballast Tanks.



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