"Seiryu-maru" –Trailing Suction Hopper Dredger With Oil Recovery System

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1. Introduction

The Seiryu-maru is a highly advanced multifunctional high-capability trailing suction hopper dredger with oil recovery system unparalleled anywhere in the world. She is equipped with three outstanding functions: dredging capable of environmentally-friendly leveled dredging by thin layers; oil recovery capable of handling low- to high-viscosity oil in the open sea, and accident control capable of prompt response in the event of an accident. This vessel was ordered from Mitsubishi Heavy Industries, Ltd. (MHI) by the Chubu Regional Bureau of the Ministry of Land, Infrastructure and Transport (MLIT) in November 2003, and its building was completed at MHI's Kobe Shipyard & Machinery Works in March 31, 2005. Since then, she has been engaged in dredging work in Nagoya Bay. She has replaced the first-generation Seiryu-maru, a trailing suction hopper dredger with oil recovery system built in 1978. Although she has succeeded to the name of the former Seiryu-maru, which became well known for her operations such as in the oil leakage accident of the Nakhodka, the new Seiryu-maru is an outstanding vessel unparalleled in the world with regard to her basic concept and component systems.

2. General description

(1) Principal particulars

Length (o.a.):	104 m
Length (p.p.):	96.0 m
Breadth (moulded):	17.4 m
Depth (moulded):	7.5 m
Draft (moulded):	5.6 m
Gross tonnage:	4 792 tons
Trial speed (max.):	13.5 knots

(2) New technologies and systems used on this dredger

(a) A dredging system capable of highly accurate leveled dredging and a new type drag head.

(b) An environmentally-friendly land discharging system and a high-grade dredge recycling system which promotes both environment protection and dredging efficiency upgrading.

(c) Oil recovery scoop and oil collection system excelling in rough sea operation.

(d) Oil recovery scoop capable of handling low- to high-viscosity oil.

(e) Capable of functioning as a disaster control center.

(f) Integrated high-grade automated control system for dredging, land discharge, ship steering, oil recovery and engine room.

3. Dredging system and layout

The dredging system is based on adoption of the world's largest-class wide span drag head which permits high-accuracy leveled dredging without left-over, excessive or stripe dredge.

A monobloc type drag head 7.2 m in width was selected to obtain a high leveling effect. With this dredger, the drag head is divided into four sections, making it possible to follow the sea bed undulations, thus preventing water suction caused by such unevenness, which is a shortcoming of the wide span monobloc type drag head. In actual dredging operations, highly accurate dredging with a high mud concentration has been realized. A recycling system that returns the water in top of the mud hold to the drag head has also been adopted to upgrade dredging efficiency.

Adoption of the wide span drag head has resulted in a hull layout that can accommodate the aft center drag system. A side drag dredge normally has two drag arm systems, but this dredger has one system equipped with one dredging pump. In addition, this dredger does not operate the discharging pump and the recycling pump simultaneously, enabling the number of pumps to be reduced as the same pump is used for the two purposes. Accordingly, the numbers of dredging pipes and recycling pipes on the drag ladder have been reduced to half, facilitating maintenance. The aft center drag system also has the advantage that the dredged line is shown exactly by the ship's wake, further improving dredging accuracy.

When the aft center drag system is used, the crew's quarters are often positioned in the fore section in consideration of ship hull trimming and drag ladder maintenance. This dredger, however, is intended to operate in high sea areas for oil recovery and other emergency activities, and accordingly the crew's quarters are located in the aft sections, ensuring comfort for the crews in view of vibration, pitching and rolling of the ship. Additional measures against vibration and noise were also taken to ensure the crew's comfort.

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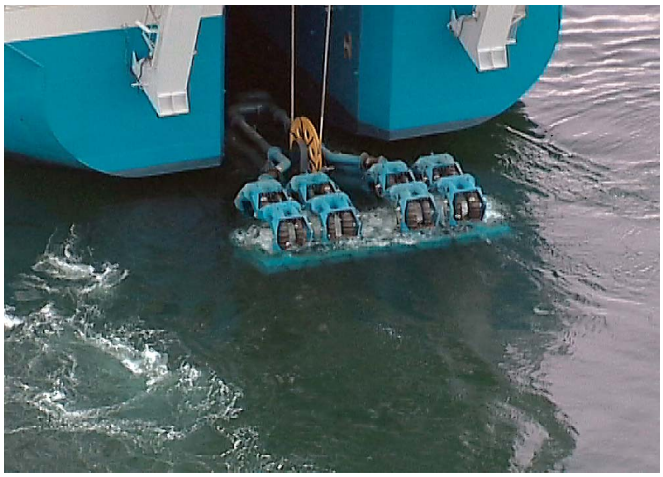

Fig. 1 Wide span drag head
Dredge surface undulations can be reduced, and prevention of excessive dredging effect can also be expected.

Fig. 2 Water jet type oil collection device and oil recovery device
These increase the efficiency of oil recovery in rough sea conditions.

4. Oil recovery system

With regard to the oil recovery system, effective measures were devised and mounted on this dredger to promote efficiency of oil recovery equipment in rough seas, collection of floating oil, recovery of high viscosity oil, and others.

For oil recovery, a device capable of recovery operation in rough seas with wave height of 2.5 m was developed. This device was realized by improving the whirlpool type oil recovery scoop as follows:

(1) Increased height of the suction port.
(2) Increased capacity of the jet water in the lower section of the oil recovery scoop for suction force upgrading.

In order to improve the recovery efficiency, an oil collection system using a water jet was developed and mounted on this ship for the first time in the world. Conventionally, the recovery efficiency declines as the oil after entering the recovery equipment flows away under the effect of retreating waves or as the oil accumulated in front of the recovery equipment runs off. This oil collection system with water jet has drastically improved the oil collection performance as effective oil collection is made possible by optimal combination of jet power and direction. This system is extremely simple to operate compared with the conventional oil boom and similar systems, and it is safe in relation to ship navigation as no structure is in contact with the sea water surface. Also, following the experience of emergency dispatch to the oil spill accident of the Nakhodka, the skipper type high-viscosity oil recovery equipment was developed and is mounted on this dredger, enabling oil to be scooped and recovered by means of a cage.

5. Disaster control system

In addition to the dredging and oil recovery functions, this dredger also has an disaster control function. Built for the MLIT, the vessel is provided for the first time with a helicopter deck for the purpose of transporting disaster control personnel and emergency materials at the time of large-scale disasters. This dredger accommodates TV conference and disaster control rooms provided with the latest information and communication technology equipment having audio-visual support functions such as accident information collection, information distribution and accident prevention documentation.

6. Conclusion

Asia is now believed to be on the brink of miraculous economical development, and the present 21st century has been called the century of Asia. Accordingly, Japan's ports are becoming increasingly important, and the role of this dredger in port and harbor improvement and environmental preservation is likely to be highly significant.

As mentioned above, this dredger is an excellent multifunctional vessel featuring a hitherto unseen combination of dredging capability, oil recovery capability and maritime disaster control capability. She is expected to contribute actively in the future not only to port and harbor improvement and maintenance but also to combating problems such as sea contamination and pollution.

Lastly, MHI wishes to express its deep appreciation to all those who have generously cooperated in the conception and realization of this unique multiplex task boat.


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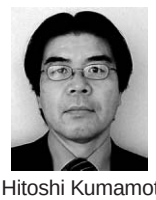
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