A new solution for reducing carbon emissions from RTGs

Introducing Mitsui's MESecoTT Transtainer® crane

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Introduction

To cope with the global demand for the reduction of greenhouse-gas emissions, Mitsui Engineering & Shipbuilding Co. Ltd. (MES) provides the advanced solutions for environmentally friendly container terminal operation.

According to the Tokyo metropolitan government, in the case of a model terminal (with a 680m quay and area of 275,000m^2) 31.1 percent of carbon dioxide is emitted from RTGs; 37.0 percent from reefer containers, 13.5 percent from top lifter/chassis and 8.8 percent from STS cranes [1].

MES is currently developing carbon reduction technologies for implementation in all these machines and eventually across the entire container terminal. This article introduces the MESecoTT Transtainer® crane, an environmentally friendly solution that contains engine variable speed control (EVSC), regenerated power storage (Hybrid model shown in Figure 1) and shore power electrification (eRTG) technologies.

Fuel-saving Transtainer

The MESHybrid Transtainer crane has been developed to reduce 50 percent of diesel fuel as well as toxic exhaust gas, including carbon dioxide. MES has delivered 17 of these cranes worldwide since 2007.

The technology consists of MES's self-developed EVSC logic and energy storage system for regenerated power during lowering, as shown in Figure 2. The energy storage system boosts the performance of EVSC by using stored energy to assist power, which increases the diesel engine's rate of acceleration. Although performance is dependent on handling productivity, fuel consumption data from actual operation achieves almost the designed level.

To reduce initial investment, the EVSC Transtainer is available without an energy storage system pre-installed. Especially, it shows a good return of investment (ROI) for retrofit, and two retrofitted cranes have been delivered in Japan so far. Four new EVSC Trainstainers have been delivered to date.

Figure 1. MESHybrid Transtainer crane at work in Malaysia.

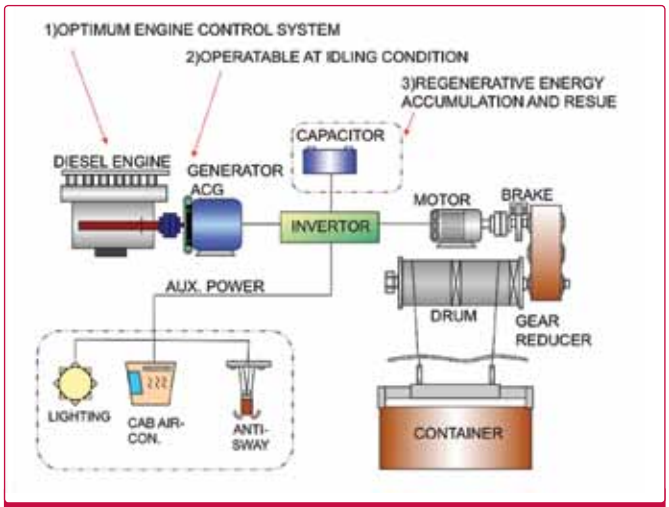

Figure 2. Configuration of MESHybrid Transtainer

Alternatively, to increase fuel-saving performance, the new generation MESHybrid has recently been developed. It has a larger capacity for the energy storage system and smaller capacity for the diesel engine generator set, compared with the conventional Transtainer. For the development of the new generation MESHybrid, the addition of a Li-ion battery was tested on the prototype crane at the MES factory in Japan. A 60 percent fuel reduction is expected, in comparison with conventional cranes.

For future development, MES looks to develop a no-diesel, no-shore cable Transtainer equipped with the Full Battery Drive, as shown in Figure 3. The Battery Drive may be applied using a sophisticated charging system, like a non-contact system, cartridge system, plug-in cable system or others.

Electrified Transtainer

MES delivered two cable reel type Transtainers in 2008, as shown in Figure 4. These cranes have a non-tension reel control system to prevent cables twisting. These cranes were retrofitted with high voltage cable reel and a transformer on board.

The company also received an order for the bus-bar type Transtainer from the Japanese Ministry of Land, Infrastructure and Transport in 2009. This is the first Japanese eRTG terminal with a bus-bar system, and adopted automatic system for connecting and disconnecting. The contract contains retrofit work for the existing cranes and new cranes. Especially, the new crane is equipped with a battery for cross-travelling, which the crane can shift to in a busy stacking operation, instead of the diesel engine.

In the meantime, PACECO® Corporation (a subsidiary company of MES in the U.S.A.) will deliver the first cable reel carrier Transtainer, shown in Figure 5. The high voltage cable reel and transformer are equipped on the carrier, and the cable runs

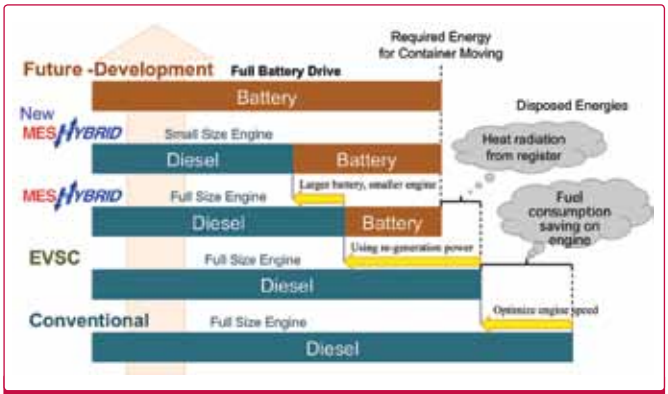

Figure 3. Development of fuel-saving Transtainer.

beside the Transtainer. No certified worker is required to connect or disconnect the shore power cable because the transformer drops to low voltage on the carrier.

The largest advantage of RTG cranes is easy cross-travelling, to optimize the quantity of yard cranes. Therefore, easy connecting and disconnecting is an important requirement. Also, space to install the power feeding system is major factor for eRTG cranes, especially for retrofitting. Therefore, MES lines up several types of shore power feeding system to cope with each terminal situation as well as regional regulation.

Conclusion

Through the Transtainer, MES provides multi-layer solutions for reducing greenhouse gas emissions, as well as saving fuel, to cope with each situation and requirement of a terminal. MES is also developing carbon reduction technologies for STS cranes, reefer facilities, chassis-tractors and so on, to provide a complete container terminal solution.

REFERENCE

1) http://www.metro.tokyo.jp/INET/CHOUSA/2004/04/60e4s102.htm

Figure 4. Cable reel onboard a Trainstainer at Kaohsiung, Taiwan.

Figure 5. Cable reel carrier type.

ABOUT THE AUTHOR

Mr. Kinya Ichimura is Assistant Manager, Marketing & Sales, (Crane & Systems) at MES, with over 20 years of experience as a crane engineer and material handling systems researcher. Previously, Mr. Ichimura managed the Research & Development group at PACECO CORP. and developed the cable reel carrier concept. Mr. Ichimura holds a Master's Degree in Mechanical Engineering awarded by the Nagaoka University of Technology in 1992.

ABOUT THE COMPANY

Mitsui Engineering & Shipbuilding Co. Ltd., a licensee of the container crane pioneer PACECO CORP., has designed and manufactured approximately 250 Portainer® STS cranes, and 1,000 Transtainer® RTG cranes for container terminals around the world.

ENQUIRIES

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