

Joint Development of 350/400 mm Bore Size Engines with WÄRTSILÄ



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The Marine Diesel Business Unit of Kobe Shipyard & Machinery Works of Mitsubishi Heavy Industries, Ltd. (MHI) together with Wärtsilä developed new small marine low-speed diesel engines with bore sizes of 350 and 400 mm.

1. Features of these engines

The outputs of the new engines are between 3,500 and 9,000 kW. The engines were developed in order to offer optimal outputs and speeds for various small and intermediate-size commercial ships below 30,000 DWT class, such as small bulk carriers, tankers, freezing/refrigerator vessels, and feeder container ships. These ships are expected to be in high demand, not only in East Asia, where the market for new ships is growing rapidly, especially in China, Korea, Japan, and Vietnam, but also in other countries throughout the world.

The development took advantage of the expertise of both companies. MHI is responsible for the development of various optimal structures for the small engines. They must be superior to the products of competing companies, and MHI will develop them by using its experience and database for small UE engines. MHI will market the mechanically controlled UEC-LSE, while Wärtsilä develops the electronically controlled RT-flex and the mechanically controlled RTA. The first unit with a bore size of 350 mm is scheduled to be launched in the first half of 2011, and the unit with the first 400-mm-bore engine will be launched one year later. During the development process, we will use a standardized modular design that considers the use of parts in common, and promotes the common use and standardization of parts in existing small UE engines and 350/400-mm-bore engines.

The biggest advantages of the new engines are their lower fuel consumption, lower consumption of cylinder oil, higher reliability, and longer overhaul interval. In addition, these engines meet secondary regulations for air pollutant emissions (Tier II) of the International Maritime Organization (IMO). We will improve our competitive strength by reducing manufacturing costs, and, simultaneously offer optimal diesel engines for ships from the viewpoint of output, propeller speed, size, weight, and electricity consumption.

2. Principle details of the engines

The specifications of the engines are listed in **Table 1**. The UEC35LSE by MHI and the RT-flex 35 and RTA35 by Wärtsilä have a bore size of 350 mm and a piston stroke of 1,550 mm at 167 min⁻¹, with a maximum continuous output per cylinder of 870 kW. The UEC40LSE and the RT-flex 40 and RTA40 have a bore size of 400 mm and a piston stroke of 1,770 mm at 146 min⁻¹, with a maximum continuous output per cylinder of 1,135 kW. Engines with between five and eight cylinders are planned for both products. The UEC-LSE will be manufactured by MHI and its licensees, while the RT-flex and RTA will be manufactured by licensees of Wärtsilä.

Table 1 Engine specifications

| Type | UEC35LSE | RT-flex35/RTA35 | UEC40LSE | RT-flex40/RTA40 |
|--|----------|-----------------|----------|-----------------|
| Bore size (mm) | | 350 | | 400 |
| Piston stroke (mm) | | 1550 | | 1770 |
| Output (kW/cyl.) | | 870 | | 1135 |
| Number of revolutions (min ⁻¹) | | 167 – 142 | | 146 – 124 |
| Mean effective pressure (MPa) | | 21.0 | | 21.0 |
| Mean piston speed (m/s) | | 8.6 | | 8.6 |
| Number of cylinders | | 5 – 8 | | 5 – 8 |
| Output range (kW) | | 3475 – 6960 | | 4550 – 9080 |