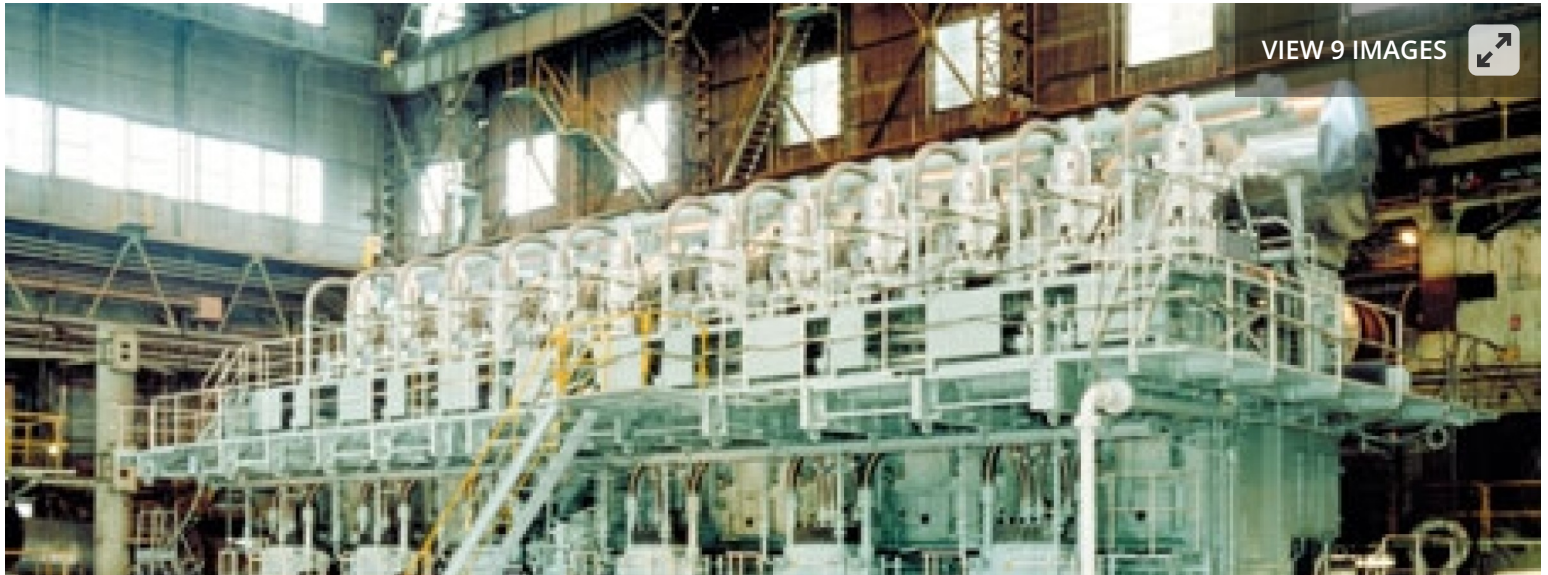




MARINE

Most powerful diesel engine in the world

By Mike Hanlon
October 02, 2004



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If the Seven Wonders of the World was updated for the 21st century, the Wartsila-Sulzer RTA96-C turbocharged two-stroke diesel engine could be a contender. If you are a student of the internal combustion engine in all its wondrous configurations, then feast your eyes on this set of numbers which outline the truly astounding engineering feat. It is the most powerful and most efficient engine in the world today.

Designed to provide the motive force for a variety of supertankers and container ships, it comes in 6 cylinder in-line through to a whopping 14 cylinder version. The cylinder bore is 38 inches and the stroke is just over 98 inches. Each cylinder displaces 111,143 cubic inches (1820 litres) and produces 7780 horsepower. Total displacement comes out to 1,556,002 cubic inches (25,480 litres) for the 14-cylinder version.

At a length of 89 feet and a height of 44 feet, the total engine weight is 2300 tons - the crankshaft alone weighs 300 tons.

The RTA96C-14 can achieve a maximum power output of 108,920 hp at 102 rpm and astonishingly, at maximum economy the engine exceeds 50% thermal efficiency. That means, more than 50% of the energy in the fuel is converted to motion. Its Brake Specific Fuel Consumption (BSFC) at maximum power is 0.278 lbs/hp/hr.

Ship owners like a single engine/single propeller design and the new generation of larger container ships needed a bigger engine to propel them. While engine cylinder configurations for large-scale container liners have been discussed in the magnitude of 14, 16 and 18 cylinders, the 14-cylinder in-line low-speed engine is the first to be offered by any engine designer.

Ship owners prefer single engine/single propeller designs and the new generation of larger container ships (or post-Panamax) called for a bigger engine to propel them.

The RTA96C-14 turbocharged two-stroke diesel engine is produced by Swiss company

Wartsila-Sulzer and is the largest and most powerful diesel engine in the world today.

The peak capabilities of the 14-cylinder RTA96C engine now exceed 80 MW, making it adequate for a single-screw Post-Panamax container liner, which is as large as container liners will get considering their greater cost-effectiveness.

Sulzer have also managed to increase cylinder output since they began first operation in 1997, due to the maintenance experience accumulated with the large number of RTA96C engines currently in service. The new kW rating of the new engine achieves a power output of 68,640 kW, a four percent increase on the initial RTA96C.

Despite the large amounts of power produced by these engines, surprisingly low wear rates have been achieved. Diametral cylinder liner wear is in the order of only about 0.03 mm/1000 hours.

This low cylinder wear is possibly attributed to a connecting rod that attaches to a "crosshead" which rides in guide channels, a fundamental difference to most automotive engines where the top of the connecting rod is attached directly to the piston. Instead, in this engine the top of the connecting rod attaches to a "crosshead" and a long piston rod then connects the crosshead to the piston. This lowers the sideways forces produced by the connecting rod and is absorbed by the crosshead and not by the piston. Sideways forces are what makes the cylinders in an auto engine become oval-shaped over time.

Fuel consumption at maximum economy is 0.260 lbs/hp/hour. Comparatively, most automotive and small aircraft engines can only achieve BSFC figures in the 0.40-0.60 lbs/hp/hr range and 25-30% thermal efficiency range.

The design and development of the RTA96C was close collaboration with the companies involved in the early stages of the first commercial project: the owner and operator P&O Nedlloyd BV, the ship designer and builder Ishikawajima Harima Heavy Industries Co Ltd

(IHI), and the enginebuilder Diesel United Ltd.

The project began in March 1997 when the first engine, an 11-cylinder unit, was started on the test bed of Diesel United Ltd, Aioi.

Since then a total of 86 RT96C engines with eight, nine, ten, 11 and 12 cylinders in-line are in service or on order, 25 of these currently in service.

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Mike Hanlon

As a photojournalist, Mike's work was published in a dozen languages across 20+ countries. He went on to edit or manage over 50 different print publications, each with a different target audience: sports, automotive, advertising, marketing, design, ad infinitum. Mike has been working in the internet for more than 20 years and was the veteran of five internet start-ups before founding New Atlas in 2002.

5 COMMENTS

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Crankie Fahrt MARCH 1, 2011 03:00 PM

But...but...that won't fit into my Oldsmobile!

Hilary Albutt JUNE 12, 2011 10:34 AM

with heat scavenging systems this efficiency could go higher, but run it as a electric generator and then run a more efficient electric motor system and the savings would be far higher. Combined with solar and wind, with towed generators and this engine would only need to run in emergencies.

derbyod DECEMBER 18, 2011 05:36 AM

Why aren't modern sails used for freighters and tankers? Massive free energy proven just since about 6000 years ago.

Mark Richardson JANUARY 20, 2012 10:01 AM

one in particular does but its really should be more widely used.

<http://www.bigsiteofamazingfacts.com/what-japanese-oil-tanker-has-sails-to-save-fuel>

Matt Puterio JANUARY 5, 2020 12:05 AM

Hilary Albutt -- From the Wartsila press release on this engine

(<https://www.wartsila.com/media/news/12-09-2006-the-world's-most-powerful-engine-enters-service>), the first installation does use an exhaust heat exchanger to create steam which heats the ship as well as drives an electrical generator. They say the exhaust recovery generator can produce 12% of the power of the main engine which is pretty incredible.

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