WIN GD
Winterthur Gas & Diesel

Technical Information Note

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Remarks:	Light running margin (LRM) for vessels equipped with Wärtsilä 2-stroke engines	Sheet: 1 / 3
Subject: RT-flex and X-engines	Date: June 2015	Our Reference: 21349/CCA029/TCtL 7418

Light running margin (LRM) for Wärtsilä low-speed engines is kept at 4-7%

Wärtsilä low-speed RT-flex and X-engines have proven good service experience including, ship acceleration, maintaining speed in heavy weather and with fouled hull conditions.
The currently recommended light running margin recommendations of 4-7% are sufficient for providing adequate ship acceleration.
Such margin provides sufficient torque reserve for Wärtsilä 2-stroke engines to cope with possible load fluctuations or increases due to adverse sea condition, acceleration or ageing conditions.

1. Introduction

Installed engine power has been systematically reduced over the years. For the new ship designs this has a positive impact on the energy efficiency design index (EEDI) but in contrast it may reduce the available power for acceleration at the same vessel speed. For such a problem, an increase of light running margin may be required.

WinGD requires no change to recommendations regarding light running margins for Wärtsilä 2-stroke engines.

In fact, a further increase of light running margin can have a negative impact on propulsive efficiency.

WinGD supports shipyards with the RT-flex and X-engine which provide high torque performance at any load without changing the current propeller design parameters and therefore without any negative consequences on the propulsion efficiency and EEDI.

2. The Wärtsilä 2-stroke common rail system concept applied to RT-flex and X-engines leads to high torque reserve

Wärtsilä 2-stroke RT-flex and X-engines have been designed with a fully electronically controlled common rail system. Together with the Wärtsilä optimised thermodynamic process and adaptive engine parameter concept, we are able to provide superior engine performance.

The following aspects of the flex concept are relevant for the high power flexibility and torque reserve experienced in standard ship designs:

- **High surplus air amount and scavenge pressure[1]**:
    - With the Wärtsilä common rail engines, exhaust valve timing, thus compression pressure is based on actual engine speed and scavenge air pressure is continuously optimized during engine operation.
    - Further, high auxiliary blower capacity ensures higher scavenge air pressure ratios, even at the lowest engine loads.
    - A surplus of combustion air amount allows increasing fuel quantities to be injected in the combustion chamber and as a consequence more engine torque becomes available.

- **Fuel common rail system and flexibility of engine performance optimisation parameters**

All electronically controlled Wärtsilä common rail engines (RT-flex and X-engines) are offering full flexibility for continuous optimisation of their performance during operation under changing sailing conditions and fuel specifications.

The engine control system measures relevant variables for performance optimisation and instantly reacts to detected disturbances and corrects relevant parameters to the optimum.

This is applied also to the regulation process of:

- Compression and combustion pressures
- Fuel rail pressure and Servo oil rail pressure
- Fuel injection timing and pattern (sequential injection)
- Exhaust valves opening and closing angles which are controlled independently from each other.

Wärtsilä low speed common rail engines, with the automated control of the above parameters, provide an internal turbocharger orifice that ensures the best utilization of the applied turbocharger.
Due to instant optimisation of above mentioned processes, sufficiently high scavenge air pressures and mass flows are always available at constant loads and also at demanding, changing load conditions.

As a consequence, the result is high engine torque margin allowing acceleration also under adverse sailing and manoeuvring conditions.

[1] Compared to similar engines segment available on the market

3. Considerations and conclusion

The shipbuilder has the responsibility to determine there is sufficient light running margin (LRM). WinGD recommendation of 4-7% LRM provides that ship's continuous service and max speed is reached with the nominal propeller curve.

The design has to provide enough power reserve between the nominal propeller characteristic and the engine load limit curve according to the recommendations provided on the relevant WinGD marine installation manual (MIM).

With the above mentioned advantages of the Wärtsilä RT-flex and X- common rail engine design, WinGD offers engine performance with sufficient torque reserve. The ultimate goal is to improve ship propulsion efficiency and lower the CO2 footprint in the spirit of EEDI.

WinGD continuously follows the new ship design demands and provides with the Wärtsilä RT-flex and X-engines a leading power solution.

Winterthur Gas & Diesel Ltd.