Partload-Optimizing – Holeby Gensets

Superintendent Day,
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New Tuning Method for Optimized Fuel Oil Consumption in Part Load Operation

Disclaimer
All data provided on the following slides is for information purposes only, explicitly non-binding and subject to changes without further notice.
**Power Range**
MAN Holeby Marine GenSets

**COMPACT DESIGN**

- **L16/24** 450 - 990 kW
- **L21/31** 1,000 - 1,980 kW
- **L27/38** 1,500 - 3,150 kW

**CLASSIC DESIGN**

- **L23/30DF** 625 - 1,200 kW
- **L23/30H** 535 - 1,400 kW
- **L28/32DF** 1,000 - 1,800 kW
- **L28/32H** 1,050 - 1,980 kW
- **L32/40** 3,000 - 4,500 kW
- **L32/44K** 3,180 - 5,300 kW
New Tuning Method Applies to All
Four-Stroke Medium Speed Small Bore Aux. Engines (Holeby)

Marine Engine
IMO Tier II and Tier III
Programme 2016

MAN Four-Stroke Marine GenSets

Fuel oil savings for small bore GenSet (part load optimised)
GenSets can be delivered with improved fuel oil consumption at low load and part load. The penalty will be a higher SFoC at high load. The part load optimised engine complies with the IMO Tier II limit.

The new tuning method, referred to as part load optimisation, optimises the engine performance at approx. 60-86% MCR, as this is often the load range in which the GenSet is operating, but it can also be customised to other specific operating conditions.

With part load optimisation, fuel oil savings of up to 12 g/kWh can be obtained, depending on the engine type/model and load point.

Traditionally, GenSets are optimised at 85% MCR because the power management system will engage additional GenSets when more power is needed.

With part load optimisation there is a fuel oil penalty when the load exceeds approx. 86% MCR, but this has no practical consequence as the GenSet rarely exceeds 85% MCR.

This is illustrated in the figure below. For further information please contact MAN Diesel & Turbo.

Based on project guide figures for IMO Tier II engines - 65% LEC.
ISO reference conditions, HPON/MDO, without pumps, tolerance &% not included.
Part Load Optimisation (PLO) is recommended for GenSets which often runs below 75% MCR

- Engine Performance Optimized at 65%MCR

- Part load area covers the power range from approx. 40% - 65% MCR

- PLO with Charge Air Blow-Off Valve is the preferred tuning method

- PLO is an option

- Available for All MAN Holeby GenSets
Part Load Optimized / Fuel Saving Principle

SFOC [g/kWh]

Based on Project Guide figures for IMO Tier II engines - 60Hz:
ISO reference condition, HFO/MDO, without pumps, tolerance +5% (not included)

SFOC is reduced at low/part load at the expense of a higher SFOC in the high load range without exceeding the IMO NOx limit.
Stena Line – 50,000 DWT MR–Tanker
Test Results 6L23/30H Mk2 900rpm – April-June 2014

Based on Project Guide figures for IMO Tier II engines - 60Hz:
ISO reference condition, HFO/MDO, without pumps, tolerance +5% (not included)
Estimated Fuel Oil Saving

MAN Holeby GenSets

**In part load operation mode**

- **L16/24**
  - Power range: 450 – 990 kW
  - SFOC: 188 g/kWh

- **L21/31**
  - Power range: 1000 – 1980 kW
  - SFOC: 193 g/kWh

- **L27/38**
  - Power range: 1500 – 3150 kW
  - SFOC: 184 g/kWh

- **L23/30H**
  - Power range: 650 – 1400 kW
  - SFOC: 191 g/kWh

- **28/32H**
  - Power range: 1050 – 1980 kW
  - SFOC: 190 g/kWh

All available for pre-sale for new buildings as well as retrofit kits.
Part Load Optimisation

Expected Design Changes

- **New TurboCharger Arrangement**
  - Optimized for 65% load (ECR operation)
  - Higher air flow in part load, lower SFOC

- **Change of Timing**
  - Delayed injection optimization of SFOC vs. NOx emissions

- **New Valve Cam**
  - For optimized valve overlap for SFOC optimization
  - Earlier closing of inlet valve, lower NOx

- **Blow-Off Arrangement on Charge Air Receiver**
  - Prevent “over-boosting” of engine in MCR operation

- **Higher Compression Ratio**
  - Increased Thermodynamic Efficiency, lower NOx

**Final Engine Configuration to be Determined after Finalized Test**
Part Load Optimised
Function and location of charge air blow-off valve

- **Function**
  The blow-off arrangement serves to limit the charge air pressure and the ignition pressure; preventing over-boost of the engine.

[Image of L23/30H Monocoque and Charge Air Blow-Off Valve]

Charge Air Blow-Off Valve
Part Load Optimised
Function and location of charge air blow-off valve
References of Tuning Methods
Part Load Optimisation – PLO

Stena Line
6 + 6 x 50,000 DWT MR-Tankers
Yard: GSI/China
Aux. Engine Maker: CMP
Shipset: 3 x 6L23/30H Mk2 – 900rpm.
Tuning Method: PLO with Waste Gate
PLO@65% MCR
SFOC savings: 4 – 6 g/kWh

APMM – Delivery End 2016
9 x 50,000 DWT MR-Tankers
Yard: Samsung Heavy Industry – Ningbo/China
Aux. Engine Maker: STX Engine
Shipset: 3 x 6L23/30H Mk2 – 720rpm.
Tuning Method: PLO with Charge Air Blow-off Valve
PLO@65% MCR
SFOC savings: 4 – 6 g/kWh
References of Tuning Methods
Part Load Optimisation – PLO

Stena Line – Delivery End 2016
3 + 2 x 50,000 DWT MR-Tankers
Yard: GSI/China
Aux. Engine Maker: CMP
Shipset: 2 x 5L23/30H Mk2 – 720rpm. + 2 x 6L23/30H Mk2 – 900rpm.
Tuning Method: PLO with Charge Air Blow-off Valve
PLO@65% MCR
SFOC savings: 4 – 6 g/kWh

ZhoungGu Shipping – Delivery 2017 + 2018
8 + 2 x 2500TEU Container Vessels
Yard: 4 + 2 at Shanghai Shipyard/China
Yard: 4 at Jinling Shipyard/China
Aux. Engine Maker: CMP
Shipset: 2 x 6L23/30H Mk 2 + 1 x 7L23/30H Mk 2
Tuning Method: PLO with Charge Air Blow-off Valve
PLO@65% MCR
Retrofit Packages
Available from PrimeServ Holeby

- Tailor-made Retrofit Kit incl.
  - Engine Components
  - Qualified Service Fitters
  - Performance Measurement/Adjustment
  - Classification Papers (amendment to technical file)

- Implement during Major Overhauls

- Calculation of Cost Benefit

Benefits

- Efficiency Improvement
- High reliability & availability
- Emission reduction
- Latest technology updates
- Reduction of operating cost

Contact

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Fuel Oil Savings typically up to 5 g/kWh, depending on engine type/model and load point

Improved Conditions of Key Engine Parts due better Combustion Process

Retrofit packages of PLO tuning method is also available for GenSets in service

Same relative SFOC-savings when applied in combination with SCR-system for IMO Tier III compliance
Thank you for your attention

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