HYUNDAI HEAVY INDUSTRIES | ENGINE & MACHINERY

Deep Change 새로운 100년! 미래를 향한 담대한 도전

TECHNICAL CIRCULAR

DOC No.: HHI-TEC-0456
Date : Oct 14, 2022

SUBJECT: THE UPDATE OF ENGINE SPEED AND TELEGRPH ORDER DRAWINGS

TYPE: ALL HYUNDAI-MAN B&W 2-STROKE ENGINES

DISTRIBUTION

☑ Ship yard	☑ Ship owner

Date	TEC No.	Design	Check	Approve	Change	R
20221014	HHI-TEC-0456	DKH	OSH	SSH	First issue.	0
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TECHNICAL CIRCULAR

DOC No.: HHI-TEC-0456

It has been recently released for recommendation setting of engine speed according to practice used by navigators, under consideration of the derated engines.
Therefore, this Technical Circular replaces the previous Technical Information HHI-TI-0374.

Basically, the engine can be operated from the practical determined minimum revolution to maximum revolution. The settings in the telegraph can be freely selected within this range to suit to manoeuvring of the actual vessel.
The telegraph order for the engine speed for the ship delivery condition should be finally set according to the discussion to be made between the ship-owner and the shipyard.
This guideline is solely valid for plants with fixed pitch propellers and the document, “Eng. Speed telegraph order”, can be used as guidance only.

The detailed information is explained in the attached document on the next page

Attachment: 1. MAN-ES 6063384-1 document

We hope the information will do you a valuable service.

[The end]

Yours sincerely,

S. H. Shin

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Head of Engine System Technical Sales Dep’t

Attachment 1

MAN Energy Solutions

Info. No.:	Item Name:	Item Id.:
384609	ENG.SPEED, TELEGR.ORDER	6063384-1

Scale:	Size:	Product Type:	Projection:	Page No.:
	A4	All engine type		1 (6)

Date	Des.	Chk.	A.C.	Revision Change	Chg. Not.	Rev.
20210115	PHHO	KRHA				00
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						02
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Recommended setting of engine speed telegraph orders

Introduction

The present guidelines replaces the previous 0793674-0 "*Manoeuvring speed according to practice used by navigators*" for recommendation on setting of engine speed telegraph orders.

The present guideline represents MAN-ES recommendation to engine speed telegraph settings according to practice used by navigators, under consideration of the trend towards larger propeller diameters in combination with speed- and mean effective pressure, mep,-derated engines.

This guideline represents *recommendations* only. The engine can be operated from the minimum speed determined at sea trail to maximum speed. Individual rpm settings are always to be adjusted for the individual plant under consideration of water inflow conditions to the propeller, axial vibration modes, location of a barred speed range, etc. and are to be determined finally during sea trial. The telegraph speed setting can be freely selected outside barred speed ranges to suit the desires and requirements of the specific plant.

The guideline is solely valid for plants with fixed pitch propellers.

Recommended rpm settings for plants with fixed pitch propellers

In general, the recommended rpm settings are determined based on the location of the specified maximum continuous rating, SMCR, of the engine while the minimum speed is determined based on the Nominal Maximum Continuous Rating, NMCR also described as L1 in the layout area of a specific engine design.

Any handle setting within a barred speed range, BSR, is to be avoided. For wide BSRs, handle settings can preferably be set around the BSR in order to ensure convenient acceleration of the engine and vessel to an rpm just below the BSR and thereafter accelerate to an rpm just above the BSR.

Continuous operation below 10% of SMCR-power is not recommended. Therefore, minimum speed, dead slow, and slow according to below recommendations is not to be considered for continuous operation.

L1 / NMCR determined speed:
Minimum speed guiding value: 20 to 25% of NMCR-speed. Actual value for the individual plant to be determined at sea trail.

Info. No.:	Item Name:	Item Id.:
384609	ENG.SPEED, TELEGR.ORDER	6063384-1

Scale:	Size:	Product Type:	Projection:	Page No.:
	A4	All engine type		2 (6)

Date	Des.	Chk.	A.C.	Revision Change	Chg. Not.	Rev.
20210115	PHHO	KRHA				00

SMCR-speed determined speeds:

[% of SMCR-speed]	Ahead	Astern
Dead slow[1]	30%	30%
Slow	45%	45%
Half	60%	60%
Harbour full[2]	70%	70%
Navigational full[3,4]	100%	70% (= Harbour full)

Table 1: Recommended values of engine speeds relative to SMCR for various telegraph settings.

1: But not less than the minimum speed determined by the NMCR of the engine.

2: If the bollard pull propeller curve crosses the load limits of the engine at a speed below 70% rpm, “Harbour full” can be set to the intersection between the bollard pull propeller curve and the engine limits. This in order to ensure quick acceleration of the engine and shafting along the bollard pull curve until the telegraph setting is reached, see the section on propeller curves below.

3: Individual setting under consideration of the maximum speed of the engine and propeller light running margin. Can be set higher than 100% of SMCR-speed, see the section on maximum speed below.

4: ECS standard load-up program is active from 80% to 100% speed. MAN-ES recommends to apply additional speed modifier from actual “Harbour full” setting up to initialisation of the standard load-up program.

Maximum speed for continuous operation ahead and astern:
For engines with SMCR on the line L1-L2 in the layout diagram up to 105% of L1-rpm can be utilised for continuous operation. During sea trail 107% of L1-rpm is permitted.

If the SMCR is sufficiently speed derated, i.e. to the left of the L1-L2 line of the engine layout diagram, up to 110% of SMCR-rpm, but no more than 105% of L1-rpm, can be utilised, if permitted by the torsional vibration conditions of the individual plant.

Maximum astern speed of ME-B engines is 70% of SMCR speed whereas maximum astern speed for ME-C engines can be up to 80% of SMCR speed.

MAN Energy Solutions

Info. No.:	Item Name:	Item Id.:
384609	ENG.SPEED, TELEGR.ORDER	6063384-1

Scale:	Size:	Product Type:	Projection:	Page No.:
	A4	All engine type		3 (6)

Date	Des.	Chk.	A.C.	Revision Change	Chg. Not.	Rev.
20210115	PHHO	KRHA				00

Engine and vessel acceleration under influence of propeller curves and intersections with engine load limits

The light propeller curve describes the propeller curve along which the vessel operates with a clean hull in calm waters in design condition. The margin between the engine speed at which the light propeller curve reaches 100% of SMCR-power and the SMCR-speed is the light running margin.

The bollard pull propeller curve describes the curve along which the propeller and directly coupled main engine is loaded at an advance number (J) equal to zero, i.e. at zero speed through water. The propeller, shafting, and engine can always be accelerated quickly, i.e. within approx. one minute, along the part of the bollard pull curve that lies within the engine load diagram.

The exact value of heavy running in bollard pull condition is difficult to predict at the ship design stage. In general, a heavy running factor of 15-20% of the bollard pull curve relative to the light propeller curve has been experienced for single screw vessels, i.e. an rpm reduction of 15-20% for the same power.

As the bollard pull propeller curve crosses the engine load diagram, the acceleration rate of the propeller and directly coupled engine will be reduced: The water inflow to the propeller must be increased by acceleration of the vessel itself, in order to increase the advance number and thereby decrease the degree of propeller heavy running in order to permit a higher engine rpm.

As the vessel speed through water increases, the engine will accelerate along the load limit curve of the engine, however at a slower rate than along the part of the bollard pull propeller curve which is below the engine load limit.

In the case, that the bollard pull propeller curve crosses the load limits of the engine below the set point of e.g. Harbour full, the engine acceleration rate towards the telegraph setting will after the intersection reduce compared to the initial acceleration rates along the bollard pull curve.

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MAN Energy Solutions

Info. No.:	Item Name:	Item Id.:
384609	ENG.SPEED, TELEGR.ORDER	6063384-1

Scale:	Size:	Product Type:	Projection:	Page No.:
	A4	All engine type		4 (6)

Date	Des.	Chk.	A.C.	Revision Change	Chg. Not.	Rev.
20210115	PHHO	KRHA				00

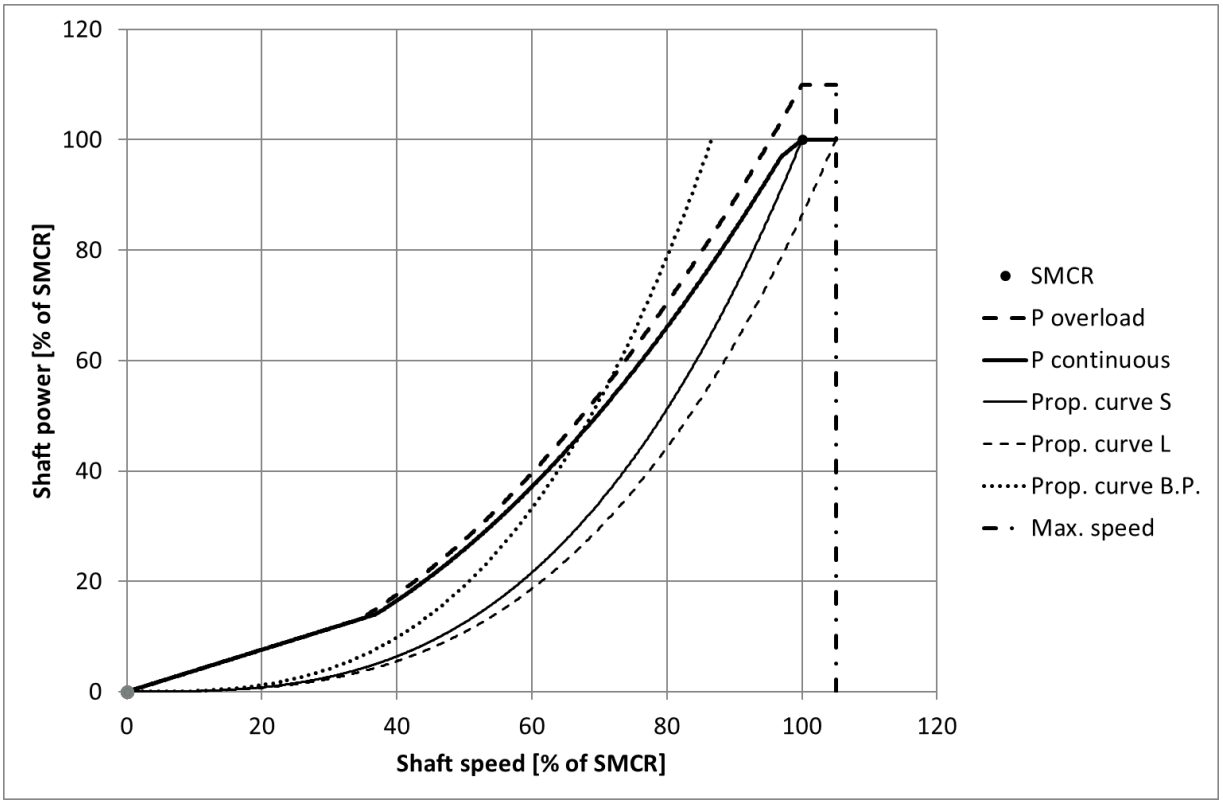

Figure 1: Light propeller curve, engine layout curve and bollard pull propeller curve within the engine load diagram.

Info. No.:	Item Name:	Item Id.:
384609	ENG.SPEED, TELEGR.ORDER	6063384-1

Scale:	Size:	Product Type:	Projection:	Page No.:
	A4	All engine type		5 (6)

Date	Des.	Chk.	A.C.	Revision Change	Chg. Not.	Rev.
20210115	PHHO	KRHA				00

Numeric example of telegraph settings

Consider an example of an SMCR of 7800 kW @ 84 rpm, with 7% propeller light running margin and a bollard pull curve 17.5% heavy relative to the light propeller curve as illustrated below.

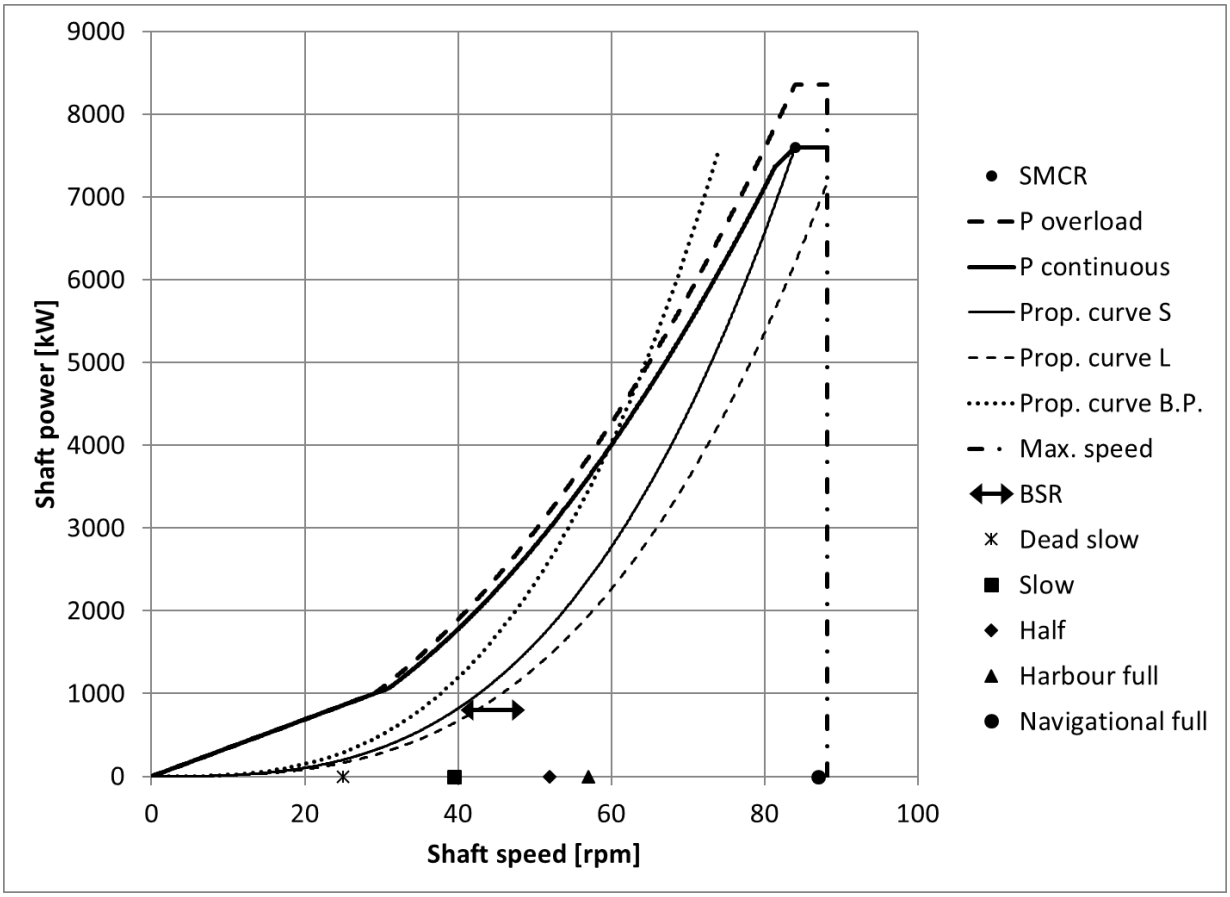

Figure 2: Example values, 7% propeller light running margin.

Assuming a barred speed range is present at a relatively high range of 48-58% speed, “Slow” is set to 47% speed and not 45% as proposed by the general table 1, in order to ease reaching an engine speed just below the BSR and wait for a corresponding vessel speed through water before passing the BSR.

In example the bollard pull curve crosses the engine load limits of continuous operation at 68% of SMCR-speed. In this example, setting Harbour full to the value of the intersection will ensure quick acceleration of the propeller, shafting and engine along the bollard pull curve to the set point.

For this propeller curve of 7% light running margin, 100% of SMCR-speed corresponds to 82% power on the light propeller curve in calm waters. If a higher power percentage is intended for “Navigational full” the rpm setting can be increased beyond the SMCR-rpm, under consideration of the maximum speed limits described above.

Info. No.:	Item Name:	Item Id.:
384609	ENG.SPEED, TELEGR.ORDER	6063384-1

Scale:	Size:	Product Type:	Projection:	Page No.:
	A4	All engine type		6 (6)

Date	Des.	Chk.	A.C.	Revision Change	Chg. Not.	Rev.
20210115	PHHO	KRHA				00

If it, for example, is desired that “Navigational full” corresponds to 90% of the SMCR-power along the light propeller curve, “navigational full” is set to 103.5% of SMCR-speed.

Fulfilling these desires will lead to tabulated values as in table 2. The minimum speed is to be set at sea trail and may affect the position of dead slow depending on the engine type and the characteristics of the individual plant.

Resulting SMCR-speed determined settings for example:

[% of SMCR-speed]	Ahead	Ahead	Astern	Astern
Dead slow[1]	30%	25 rpm	30%	25 rpm
Slow	47%	39.5 rpm	47%	39.5 rpm
Half	60%	50 rpm	60%	50 rpm
Harbour full[2]	68%	57 rpm	68%	57 rpm
Navigational full[3,4]	103.5%	87 rpm	= Harbour full	57 rpm

Table 2: Example values.

The light running margin of 7% implies that the engine must operate at 107% of SMCR-speed in order to deliver 100% power on calm waters with clean hull in the design condition.

If the SMCR of the specific engine is sufficiently speed derated from the NMCR of the engine design, it may be possible to operate at 107% of SMCR-speed, provided that torsional vibration conditions permits, see the separate section on maximum speed for continuous operation above.