

GREEN / MinPower



Software for Assessment of Minimum Propulsion Power



Key Features

- ◆ Easy to assess the minimum propulsion power to maintain the manoeuvrability in adverse conditions according to the “minimum propulsion power guidelines”
- ◆ Stand-alone software base on Microsoft Excel
- ◆ User-friendly interface
- ◆ Auto-generation of output results and figures for class approval

This software is intended to conduct assessments of required minimum propulsion power in adverse conditions for bulk carriers, tankers and combination carriers with the size of equal or more than 20,000DWT by means of methods defined in MEPC.1/Circ.850/Rev.3 of IMO “GUIDELINES FOR DETERMINING MINIMUM PROPULSION POWER TO MAINTAIN THE MANOEUVRABILITY OF SHIP IN ADVERSE CONDITIONS”.

ClassNK PrimeShip-GREEN/MinPower

Ver. 2.0

Ship holder's Name	NIK Shipbuilding
Ship Number	221
Ship Name	FUE
Type of Ship	Bulk Carrier
Design Conditions	Full/SESD design
Date of Print	2021/10/26 10:06
NIK ID	

Analysis option	Skin friction coefficient C_f	Added resistance due to wind	Added resistance due to waves
Form factor k	<input type="checkbox"/> ITTC 1957	<input checked="" type="checkbox"/> Results from wind tunnel test	<input checked="" type="checkbox"/> Tank test results
Self propulsion factors	<input checked="" type="checkbox"/> Schoenher	<input checked="" type="checkbox"/> Eimann's formula (ITTC 7.5-06-01-01.1.F.4)	<input type="checkbox"/> Streiffl formula
<input type="checkbox"/> Tank test results	<input type="checkbox"/> Huseas	<input type="checkbox"/> Data set (ITTC 7.5-06-01-01.1.F.3)	
<input checked="" type="checkbox"/> Empirical formula			

Input parameter	
Length	220.00
Beam	32.34
Depth	14.00
S	11700.0
A_{wp}	500.0
A_{cl}	2000.0
A_{cl2}	500.0
H_{cl}	10.00
H_{cl2}	40.00
C_{wl}	8.00
k	0.300
Propeller D_p	7.00
η_p	0.970
Efficiency η_{cl}	1.020
η_{cl}	0.950
Maximum P_{max}	9500
Minimum N_{min}	88.50

Propeller open-water characteristics (POC)						
J	0.075	0.100	0.200	0.300	0.400	0.500
η_p	0.970	0.970	0.970	0.970	0.970	0.970

J - 10K_Q, K_V, η_D

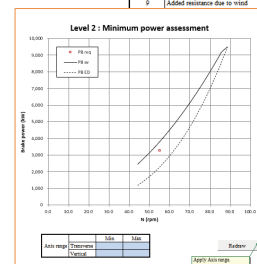
Main Functions

- ◆ Assessment Level2 in the guidelines is available.
- ◆ This assessment procedure is based on the assumption that, if the ship has sufficient installed power to move with a certain advance speed in head waves and wind, the ship will also be able to keep course in waves and wind from any other direction. It is necessary to input self-propulsion factors, aerodynamic resistance, added resistance, etc. for the assessment.
- ◆ Easy to confirm the level of achievement since the assessment is conducted just at the point where the added resistance due to wind and waves is at maximum.

Ship holder's Name	NIK Shipbuilding
Ship Number	221
Ship Name	FUE
Type of Ship	Bulk Carrier
Design Conditions	Full/SESD design
Date of Print	2021/10/26 10:11
NIK ID	

Level 2 : Minimum power assessment

Adverse conditions	Significant wave height	(m)	h_s	5.30
2	Peak wave period	(s)	T_p	7.5
3	Wave direction	(deg)	θ	0.0
4	Mean wind speed	(m/s) <th>V_m</th> <td>20.44</td>	V_m	20.44
5	Required ship advance speed through the water in wind and wave direction from head to 30 degree offbow	(knot) <th>V_A</th> <td>1.03</td>	V_A	1.03
6	Relative wind speed	(knot) <th>V_{rel}</th> <td>2.00</td>	V_{rel}	2.00
Resistance in adverse conditions				
7	Cable-water resistance	(kN) <th>R_{cw}</th> <td>13.66</td>	R_{cw}	13.66
8	Added rudder resistance	(kN) <th>R_{ru}</th> <td>16.74</td>	R_{ru}	16.74
9	Added resistance due to wind	(kN) <th>R_{aw}</th> <td>133.55</td>	R_{aw}	133.55
		(kN) <th>R_{aw}</th> <td>377.18</td>	R_{aw}	377.18
Resistance in adverse conditions				
		(kN) <th>T</th> <td>481.61</td>	T	481.61
		(kN) <th>$R_{w,p}$</th> <td>13.66</td>	$R_{w,p}$	13.66
		(kN) <th>J</th> <td>0.094</td>	J	0.094
		(kN) <th>N</th> <td>14.44</td>	N	14.44
		(kN) <th>K_1</th> <td>0.0394</td>	K_1	0.0394
		(kN) <th>$P_{w,w}$</th> <td>3291</td>	$P_{w,w}$	3291
		(kN) <th>$Q_{w,w}$</th> <td>573.94</td>	$Q_{w,w}$	573.94
		(kN) <th>$P_{w,w}$</th> <td>3773</td>	$P_{w,w}$	3773
		(kN) <th>$Q_{w,w}$</th> <td>658.93</td>	$Q_{w,w}$	658.93
		(kN) <th>$P_{w,w}$</th> <td></td>	$P_{w,w}$	
		(kN) <th>$Q_{w,w}$</th> <td></td>	$Q_{w,w}$	



Structure of the system

The screenshot shows the software interface with various input fields for ship particulars, analysis options, and resistance factors. A diagram of a ship hull is shown below the input fields, with arrows indicating the flow of data from the input fields to the analysis process.

Input

- ◇ Ship's principal particulars
- ◇ Self-propulsion factors
- ◇ Frontal and side windage area of hull and superstructure
- ◇ Propeller open water characteristics
- ◇ Torque-speed limitation curve of the engine provided by the engine manufacturer
- ◇ Added resistance in short-crested irregular waves, etc.

Level 2 : Minimum power assessment

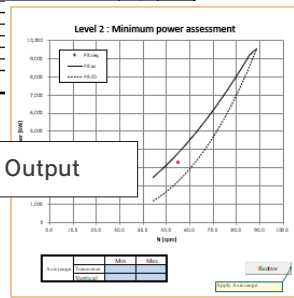
Adverse conditions				
1	Significant wave height	(m)	H _s	5.70
2	Peak wave period	(s)	T _p	9.7
3	Wave direction	(deg)	α	0.0
4	Mean wind speed	(m/s)	V _m	20.0
5	Required ship advance speed through the water in wind and wave direction stem head to 30 degree off-bow	(m/s)	V ₀	1.07
6	Relative wind speed	(m/s)	V _{rel}	21.47
Resistance in adverse conditions				
7	Calculated resistance	(kN)	R _c	15.06
8	Added rudder resistance	(kN)	R _r	19.79
9	Added resistance due to wind	(kN)	R _w	132.70
10	Added resistance due to waves	(kN)	R _{wv}	277.18
Calculation of required brake power and torque in adverse conditions				
11	Required propeller thrust	(kN)	T	882.83
12	Load factor		K _{prop}	1.050
13	Advanced coefficient		K _{adv}	0.990
14	Propeller revolution	(rpm)	N	58.84
15	Frangep coefficient		K _f	0.9294
16	Required brake power		P _{brk}	
17	Required torque		Q _{brk}	
Load diagram corresponding to propeller revolution				
18	Available brake power		P _{brk}	
19	Required on load diagram (Minimum torque)		Q _{brk}	
Adjustment				
20	Adjustment			
21				

Analysis options

There are selectable options below.

- ◇ The self-propulsion factors
 - ① Tank test results
 - ② Empirical formula
- ◇ For the added resistance due to wind
 - ① Results from wind tunnel test
 - ② Fujiwara's formula
(ITTC 7.5-04-01-01.1:F.4)
 - ③ ITTC data sets
(ITTC 7.5-04-01-01.1:F.3)
- ◇ For the added resistance due to waves
 - ① Tank test results
 - ② Simplified formula

Output



Output

- ◇ Results of the assessment for submission

The screenshot shows the software interface with the 'Print for submission' button highlighted. The interface displays the software name and version (Ver. 2.0) and the date and time (2021/07/13:56).

PrimeShip-GREEN/MinPower system requirements

Hardware requirement	Software requirements
Print function of Microsoft Windows	OS : Windows 10 (64bit) Office : Microsoft Excel 2016, 2019 (64bit, 32bit)

Contact address : EEDI Section of Marine GHG Certification Department
ClassNK Administration Center

4-7 Kioi-cho, Chiyoda-ku, Tokyo 102-8567, Japan
E-mail: eedi@classnk.or.jp Tel: +81-3-5226-3025 Fax: +81-3-5226-3026