





Thinking in EEDI Trial application and verification of CANSI



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MAIN TOPICS

- EEDI Current Status
- Thinking one Wave factor (fw)
- Thinking two Power redundancy factor (fj)
- Thinking three
- Reduction rate of required EEDI for very large ship
- Thinking four IPR in EEDI verification
- Conclusion







EEDI Current Status

Resolution MEPC.203(62)



Inclusion of regulations on energy efficiency for ships in MARPOL Annex VI

Entry into force 2013.1.1







• Wave Factor Concept and Target

Evaluate ship performance

in wind and wave !













Observation 1

The comparisons of added resistance due to waves







• Observation 2

The added resistance due to short waves is of about

50% of the added resistance and has an effect about

3%~5% on the coefficient $f_{\rm w}$.

Table 1 f_w of ship 1 considered with or without short waves

Condition	Speed (kn)	$f_{ m w}$
Calm	13.72	1
Considered with short waves	12.77	0.9308
Considered without short waves	13.23	0.9643





• Observation 3



The curves for coefficient ' f_w ' versus displacement of bulk carriers





• Observation 3



The curves for coefficient ' f_w ' versus displacement of tankers





• Observation 4

ISO 15016 Sea trial Correction at BF4 sea states

	Sea trial speed (kn)	Corrected Speed(kn)
Tanker 1(Original)	13.19	13.43
Tanker 2(Optimized)	13.22	13.46





• Observation 5

Views in Japanese Proposal MEPC62/5/3

- 1. Fw can't be verified at sea trial
- 2. Inclusion of Attain EEDI_{weather} due to the inconsistency of current EEDI verification



Figure 2: The relation between Attained EEDI and Attained EEDI_{weather}





Summary

Maybe Fw is a useful tool to evaluate the ship performance in wind and wave, but it's not strong enough to be put into the EEDI regulations.



• Current Coefficient fj

Only applicable for ice class ship and shuttle tanker $f_j = 0.77$ for shuttle tanker





• Purpose of Coefficient fj

Compensation to those ships with redundant installed power, but it can't be only limited in ice class ships and shuttle tankers.





• Current source of fj

Empirical formula or Statistic data

Ship	£	f _{j,min} Depending on Ice Class			
Туре	ljo	IC	IB	IA	IA Super
Tanker	$\frac{0.516L_{PP}^{1.87}}{nME}$ $\sum_{i=l}^{NMCR_{ME(i)}} MCR_{ME(i)}$	0.72L _{PP} ^{0.06}	0.61L _{PP} ^{0.08}	0.50L _{PP} ^{0.10}	$0.40L_{PP}^{0.12}$
Dry Cargo Carrier	$\frac{2.150L_{PP}}{\frac{nME}{\sum_{i=l}^{NCR_{ME}(i)}}}$	0.89L _{PP} ^{0.02}	$0.78 L_{PP}^{0.04}$	0.68L _{PP} ^{0.06}	0.58L _{PP} ^{0.08}
General Cargo Ship	$\frac{0.045L_{PP}^{2.37}}{{}^{nME}}$ $\sum_{i=1}^{\infty} MCR_{ME(i)}$	$0.85 L_{PP}^{0.03}$	0.70L _{PP} ^{0.06}	$0.54 L_{PP}^{0.10}$	0.39L _{PP} ^{0.15}



• One way to get fj for different type of vessels using same methodology

P₁ → Attained EEDI₁
P₂ → Attained EEDI₂
Attatined EEDI = K *
$$\frac{P}{V}$$

(Ignoring the influence of SFC variation)





Thinking 2. Power Redundancy Factor (fj) $V \approx k' P^{\frac{1}{3}}$ Attatined EEDI \approx K" P^{$\frac{2}{3}$} $\frac{\text{Attatined EEDI}_{1}}{\text{Attatined EEDI}_{2}} \approx \left(\frac{P_{1}}{P_{2}}\right)^{\frac{2}{3}}$

Power Redundancy Factor (fj)







New parameters NCR and SM are very easily to be obtained in Building Specification





Worries on loophole after introducing fj

Fuel price is more and more higher EEOI and MBM





• Which ship is more efficient ?

Of course bigger ship is more efficient







Table 1: Bulk Carriers

Ship Size	Proportion of sample ships located above reference line (%)				
	X=0	X=-3	X=-4	X=-4.21	X=-5
≥180,000DW T	63.3929	56.25	51.7857	50.8929	41.0714
	X=0	X=-10	X=-13	X=-13.7	X=-14
≥220,000DW T	100	71.4286	64.2857	50.00	28.5714





• Chinese proposal in MEPC 62/6/16

Ship Type	Size	Phase 0 [1 Jan 2013 - 31 Dec 2014]	Phase 1 [1 Jan 2015 - 31 Dec 2019]	Phase 2 [1 Jan 2020 - 31 Dec 2024]	Phase 3 [1 Jan 2025 and onwards]
Bulk Carriers	10,000- 20,000 DWT	n/a	0-10*	0-20*	0-30*
	20,000- 180,000 DWT	0	10	20	30
	180,000 DWT and above	-4	6	16	26
Tankers	4,000- 20,000 DWT	n/a	0-10*	0-20*	0-30*
	20,000- 270,000 DWT	0	10	20	30
	270,000 DWT and above	-2	8	18	28





• Another option to encourage larger ships

Keep 0 in phase 0, but reduce the reduction rate of phase 1-3 to a smaller value, e.g. [5]





Thinking 4. IPR in EEDI verification

In order to guarantee smooth EEDI verification, IPR is supposed to be carefully respected and protected.

But what information belongs to IPR should be carefully identified.





Conclusion

Current EEDI regulation is still premature in many aspects, we have to make every efforts to refine it and reduce the risk of application and verification to ship industry !





THANKS FOR YOUR ATTENTION !