Technical issues of EEDI regulation to be clarified by ship builders - hydrodynamics point of view -

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Discussion items

1. Outcome of MEPC64 and remained issues
   - Procedure for Analysis of Speed Trial
   - Procedure for Conduct of Speed Trial
   - Minimum power requirement

2. Present activities by Japan

3. Future Scope
Outcome of MEPC64 and remained issues

Procedure for Analysis of Speed Trial

➢ **Background**

➢ Norway requested to revise the present ISO15016 analysis method referring STA method (2011.4 MEPC62)

➢ Japan and ITTC proposed to review the analysis method and special committee : PSS started their study (2011.12)

➢ PSS established two drafts (2012.5)
  • Analysis method -> Include both ISO15016 and STA method
  • Conduct procedure -> STA method could not reach the agreement

➢ ITTC AC submitted final draft to IMO (2012.6)
  • Only STA method remained by AC person, although Japan and Korea strongly objected
    • Conduct procedure was also submitted without PSS’s agreement

➢ IMO supported the ITTC draft without technical discussion (MEPC64)

Major part consider only STA method to be included in final document
Outcome of MEPC64 and remained issues
Procedure for Analysis of Speed Trial

 Issue-1

**ITTC (STA*) analysis procedure**

* MARIN JIP

What is the difference of procedure between ISO15016 and ITTC(STA) method?
Basic Concept of ISO 15016

Measurement

Wind & Wave: External Force
Current: Only Shift of speed

1st Step: Vacuum Condition
Remove the Resistance by relative wind and wave
Calculate the power and speed in vacuum condition based on Prop. Load change

Vs-vacuum (1st run)
Vs-vacuum (2nd run)

2nd Step: Current Correction
Difference of Vs is current
Correction by current curve

3rd Step: No Wind Condition
Vs in Vacuum Condition Without current effect
Add the Air Resistance by own speed
Calculate the power and speed in No Wind condition

1st run
2nd run

1 mile

Correction to No Wind, Wave, Current Condition
Basic Concept of ITTC(STA) Method

Direct Power Method

Calculate the resistance by relative wind and own speed: \( R_{AA} \)
Calculate the resistance increase in wave: \( R_{AW} \)

\[
\Delta R = R_{AA} + R_{AW}
\]

\[
\Delta R_{AA} = \Delta R(V_s) - \Delta R(V \text{-relative})
\]

Calculate the change of power due to \( \Delta R \) using propulsive efficiency (\( \eta_D \)), transmission efficiency (\( \eta_s \)) and ship speed

\[
\Delta P = \frac{\Delta R V_s}{\eta_s \eta_D}
\]

Correct the power directly using \( \Delta P \)
Ship speed is identical to measured value

\[
P_{SC} = P_{SM} + \Delta P
\]

Issues to be clarified

- Sole method suddenly set. Still black box and accuracy is not evaluated in ITTC
  Details are not explained in the latest ITTC procedure
- Direct power correction without current correction
  Because current effect can be eliminated by multiple double run
  Is it correct ?
- Influence by difference of propeller load for each run taken into account ?
  Vs still includes the effect of disturbance
Outcome of MEPC64 and remained issues

Procedure for Conduct of Speed Trial

- Issue-2

Procedure for conduct of Speed trial

- Two double runs to eliminate the effect of current
  Re-trial should be done when strong current exists

- Over 10 minutes measurement is required

- Absolute wind velocity and direction should be averaged using two opposite runs

What happens if the above items are adopted ??
Outcome of MEPC64 and remained issues

Procedure for Conduct of Speed Trial

**Issues to be clarified**

**Two double run**

- Again, current effect can be eliminated?
- In case of VLCC trial with 4 set of M/E output, trial time would be 24 hours

**Re-trial should be done when strong current exists**

- Strong current exist in any place
- Who can know the current speed during trial though STA method does not conduct current correction?

**10 minutes measurement**

- Trial site will be a coastal area or inside the bay to avoid the strong disturbance
- Many vessel, e.g., Fishery boat exists.
  - Keeping the heading for long time is dangerous
- Running distance is not sufficient

**Average of Absolute wind data using two opposite runs**

- What is the physical meaning?
- Korea and Japan strongly insisted that the wind speed and direction changes depending on time as common sense. However this comment was neglected.

Common Trial Site: Suruga Bay

- Out side the bay
  - Traffic is congested
  - Strong current exists (e.g. spring tide)
Outcome of MEPC64 and remained issues
Minimum Power requirement

Back ground

- IACS established the guideline for minimum power requirement to prevent the excessively low powered vessel from safety point of view.

- Draft was submitted to MEPC64 and comments from CG (Corresponding group) are requested now.

- Two Levels are established for the evaluation during the term of phase-0. If level-1 is not satisfied, Level-2 shall be confirmed.
Basic Concept of Minimum Power Requirement

**Level-1:** Minimum power line based on existing ship’s data

**Requirement**
- M/E power should be larger than exemption line

- Level-1 is already severe for some existing vessel especially large BC and will be very tough target for all type of vessel in phase-2 and phase-3.

**Contradict** to the future reduction of EEDI by technical progress. This requirement should be revised, otherwise we can not construct a vessel.

**Level-2:** Simplified assessment

**Beaufort 8**
- Wave Height : 6 m
- Wave Period = 8 to 15 sec
- Wind velocity = 19 m/sec

**Head Wave and Wind**

**Requirement**
- Certain advance speed should be kept within M/E torque Limit

- All the small vessel e.g. PMX B/C can not fulfill this requirement because the same wave height as a large vessel is used.

- In case of large vessel, Level-2 is a tough target when entered phase-2 and 3.

- Present vessel could not satisfy although they are all safely operated
- This requirement prevent our future effort to attain EEDI in phase 2 and 3
Level-2 : Simplified assessment

- The Effect of wave is large!
- Adverse condition should be re-considered!
- Again fact is that this vessel is safely operated for long time

<table>
<thead>
<tr>
<th>Peak Period</th>
<th>Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Sec</td>
<td>50.8 ton</td>
</tr>
<tr>
<td>15 Sec</td>
<td>80.5 ton</td>
</tr>
<tr>
<td>19 Sec</td>
<td>63.2 ton</td>
</tr>
</tbody>
</table>

Wave Height is 6 m

![Load diagram](chart)

- Resistance in Wind
- Resistance in Wave

Propeller thrusting force:

- 4.8 ton
- 13.1 ton

Required Advance Speed = 4 Knots

Type of Vessel: 56K B/C

Resistance in Still water

Resistance in Wind

Resistance in Wave
Present activities by Japan

Procedure for Analysis and Conduct of Speed Trial

- Japan started to revise the ISO15016 as a convener and 1st international expert meeting was held on this September.
  - Korea: Dr. Myung-Soo Shin (MOERI)
  - China: Mr. Zhao Xiaoming (TNIRI) -> absence
  - Another participant country: USA and Portugal
- SAJ collected the trial data to clarify the problematic point and submitted to ITTC PSS.
- Evaluation for STA Procedure is started based on the trial data.
  -> Korean shipyards are also carrying out the examination

Minimum Power Requirement

- SAJ evaluated the present method and replied as CG1 comments
- Further evaluation are undertaken now to make further comment to CG2
Present activities by Japan

- Example 1 -

- Applied ISO and STA method to 2 sister ships (VLCC)

○ Measured Value for Ship-A and Ship-B

Correction by STA scatters, The effect of current ?

・Correction to Vacuum ?

Examination is necessary!

STA METHOD
Present activities by Japan
- Example 2 -

- 10 minutes measurement is necessary?

Average speed during 3 mile run
(10 minutes)

Average speed during 1 mile run
(around 3min)

Difference

Difference of Speed is very small!
0.05 kts for over 95%
Future Scope

- Procedures for analysis and conduct of speed trial, minimum power requirement seems to be problematic from practical point of view.

- We ASEF members construct an enormous proportion of vessels allover the world. Accumulated our experience should be reflected to amend the present procedures more realistic. Otherwise, the member of ASEF would face great difficulties by these problems.

- We should keep in mind that ASEF shipbuilders are now standing on a destructive position for remained issues.

- Present procedures would be automatically certified by the initiative of EU community as it is if any actions are not executed by Asian side.

- Please submit any comments and data to breakthrough the present situation at IMO, ISO and ITTC. Time is quite limited until next May.

Close ties between us is necessary !!!
Thank you for your attention!

고맙습니다

真谢谢你了

有難うございました