資料 31-4

Regulation on EU Inland Waterways – EU Stage V

CIMAC WG 5 on
20th November 2018
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Todays Agenda:

- Brief review on EU Stage V for IWT (Categories and Scope, Limits and Schedule,..)
- Latest regulatory updates / status ISM
- Overview currently ongoing discussion
  - European standard ES-Trin / work of CESNI committee
  - Introduction of joint FAQ document
  - Spotlight on the discussion regarding the use of alternative engines like Euro VI truck
- Outlook

Introduction on EU Stage V

- EU V (Regulation 2016/1628) and respective delegating and implementing acts apply to a broad range of applications

- Inland Waterway Vessels as well →significant changes due to more stringent limits and new engine categories arise

EU V: Limits and schedule for engines used in inland waterway vessels

(5) 'category IWP':

(a) engines exclusively for use in inland waterway vessels, for their direct or indirect propulsion, or intended for their direct or indirect propulsion, having a reference power that is greater than or equal to 19 kW;

(b) engines used in place of engines of category IWA provided that they comply with Article 24(8);

(6) 'category IWA': auxiliary engines exclusively for use in inland waterway vessels and having a reference power that is greater than or equal to 19 kW;

NOx / THC / CO / PM (g/kWh) / [PM count/kWh] (NOx+THC) / CO / PM (g/kWh) / [PM count/kWh]

Liters per Cylinder	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	A
≤0.9 (>37kW)	(7.5) / 5.0 / 0.40						>>		19-75kW	(4.7) / 5.0 / 0.3					IWP-v-1,IWP-c-1 IWA-v-1,IWA-c-1		6.00
0.9 - 1.2	(7.2) / 5.0 / 0.30						>>										
1.3 - 2.5	(7.2) / 5.0 / 0.20						>>		75-130kW	(5.4) / 5.0 / 0.14					IWP-v-2,IWP-c-2 IWA-v-2,IWA-c-2		6.00
2.6 - 5.0	(7.2) / 5.0 / 0.20						>>										
5.0 - 15	(7.8) / 5.0 / 0.27						>>		130-300kW	2.1 / 1.00 / 3.5 / 0.10					IWP-v-3,IWP-c-3 IWA-v-3,IWA-c-3		6.00
15 - 20, P ≤ 3300 kW	(8.7) / 5.0 / 0.50						>>										
15 - 20, P > 3300 kW	(9.8) / 5.0 / 0.50						>>		>300kW		1.8 / 0.19 / 3.5 / 0.015 / [10^12]				IWP-v-4,IWP-c-4 IWA-v-1,IWA-c-1		6.00
20 ≤ 25	(9.8) / 5.0 / 0.50						>>										
	Stage IIIA									Stage V							

From stage V a stage V non-road engine <560 kW may alternatively be used in this application

A is gaseous fuelled engine hydrocarbon factor.

A-factor limits hydrocarbon (CH4) emissions of gas engines

- **Approximately aligns with US 37-130 kW**
- **Approximately aligns with IMO III NOx and US HC/CO/PM 130-300 kW**
  - **SCR or EGR required**
- **PM count >300 kW**
  - **DPF required > 300 kW**
- **NOx does align with US > 600 kW**

EU V

- EU V is a demanding set of requirements
- Requirement for PN (> 300kW) does not provide a direct alignement with alreday existing regulations like IMO Tier III or EPA Tier 4
- High effort for a relatively small market leads to limited options of products → Industry (shipyards, operators,…) claims „missed chance of alignment“ and demands alternatives

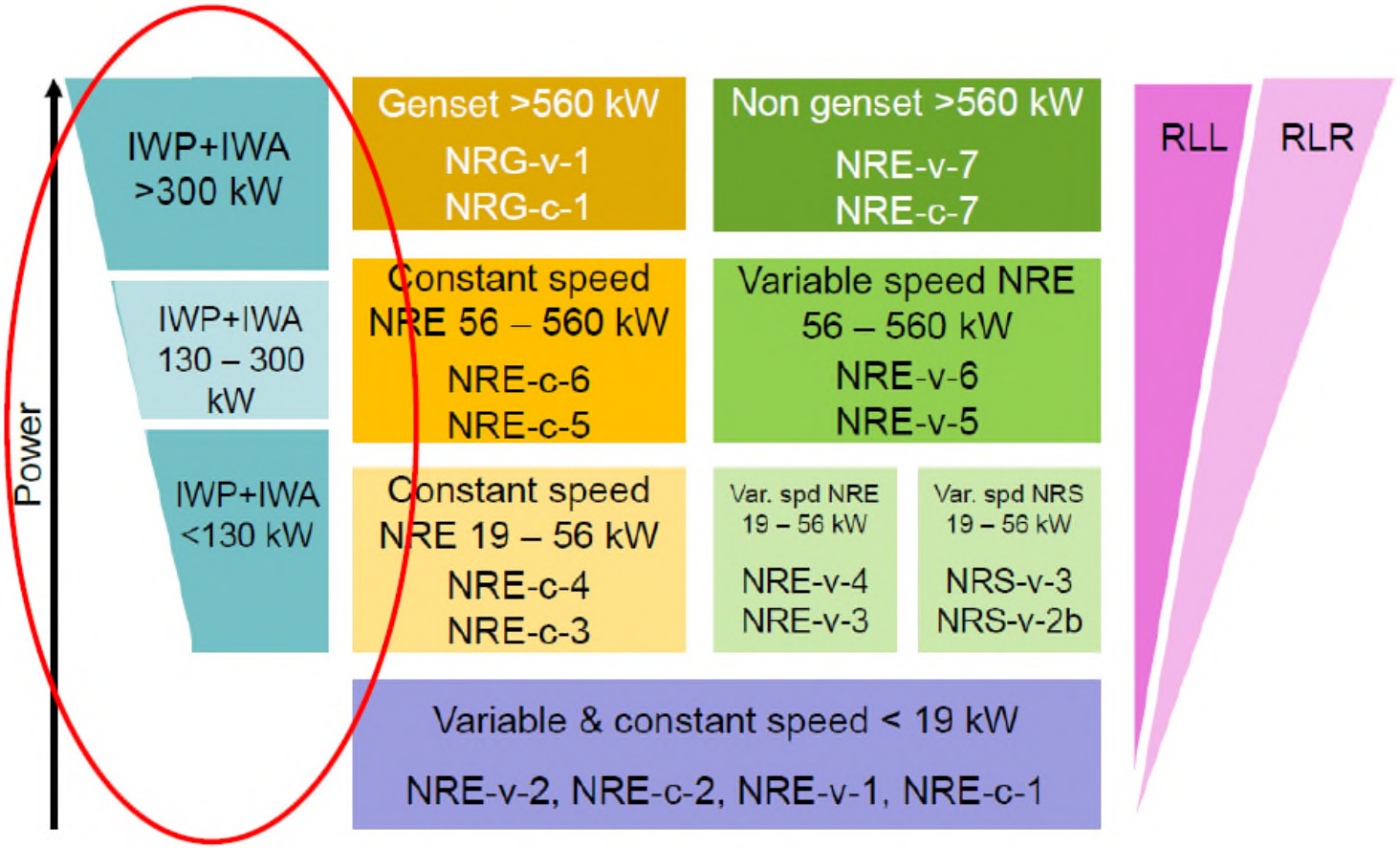
Latest regulatory updates / status ISM

- 2016/1628 Art. 19 requires monitoring of emissions of in-service engines (ISM) for all Stage V engine categories
- The initial Commission Delegated Regulation included only variable speed engines category NRE 56 – 560 kW (NRE-v-5, NRE-v-6)
- For additional engine (sub-) categories further adjustment to the concept for sampling for the purpose of ISM in development
- Amendment to Commission Delegated Regulation (EU) 2017/655 will be prepared – publication of final document planned in June 2019

Latest regulatory updates / status ISM

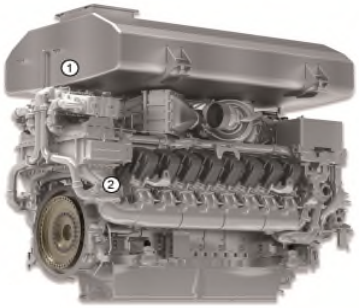
- Engine manufacturers provided proposal for grouping of engines in discussion with EU JRC (Joint Research Center)
- JRC accepted grouping as proposed by industry
- Application of measurement technology due to sector specific constraints (ships / rail / small machinery)

Latest regulatory updates / status ISM proposed grouping of engines



Latest regulatory updates / status ISM

Possible option PEMS

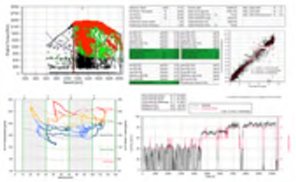


Measurement of NOx, HC, CO required for ISM EU V

Gas PEMS

GPS / Ambients

Concerto Reporting



PM PEMS

System Control

Concerto PEMS

PN PEMS

Measurement of PN (particle number) not required for ISM EU V

Measurement of PM (particle grav.) not required for ISM EU V

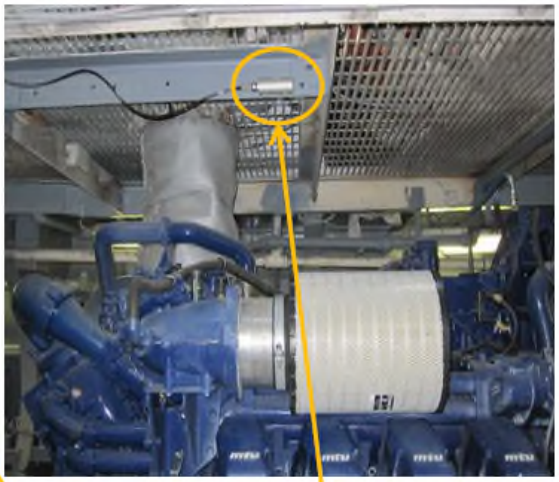
Latest regulatory updates / status ISM practical examples

PEMS:

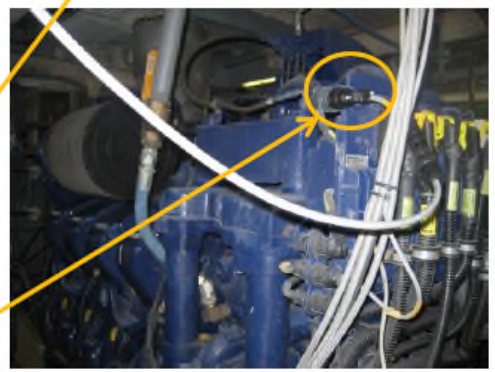
AVL M.O.V.E –System

- GAS-PEMS
  - CO, CO2 (NDIR)
  - THC (FID)
  - NO and NO_2 (NDUV)
- PM-PEMS
  - Soot measurement + gravimetric PM measurement
- System Control (Central data acquisition + amb. cond.)

Latest regulatory updates / status ISM practical examples



- AVL M.O.V.E
- Ambient Conditions
- Calibration gas bottles
- Sampling ports
  Gas + PM + Exhaust temp.
- ECU-Connection



Sampling plan for each group (per manufacturer, excluding variable speed NRE 56 – 560 kW)

- Option 1: x @ < a% EDP by 31 Dec 2022 + x @ > b% EDP by 31 Dec 2024
- Option 2: x per year for 4 years

  •Where: $x = 1$ for $n = 1$, $x = 2$ for $2 \leq n \leq 4$

  •In the case that $n > 4$ and $c > 50$: $x = 3$ for $5 \leq n \leq 6$, $x = 4$ for $n \geq 7$

  •In the case that $n > 4$ and $c \leq 50$: $x = 2$

  •n = total number of EU engine families produced by manufacturer within group

  •c = combined annual production for EU market for the remaining engine families produced by manufacturer within group after discarding the four families with the highest annual production for EU market.

- If group contains both category IWP and IWA engines the selection must include engines of both categories
- Small volume production scheme applies (see next slide) in case that combined annual production across ALL engine families in group does not exceed 50 engines

•Engines ≥ 130 kW	•Engines 56 ≤ P < 130 kW	•Engines < 56 kW
• a = 30, b = 70	• a = 20, b = 55	• a = 10, b = 40

Sampling plan for each group (small volume) (per manufacturer, excluding variable speed NRE 56 – 560 kW)

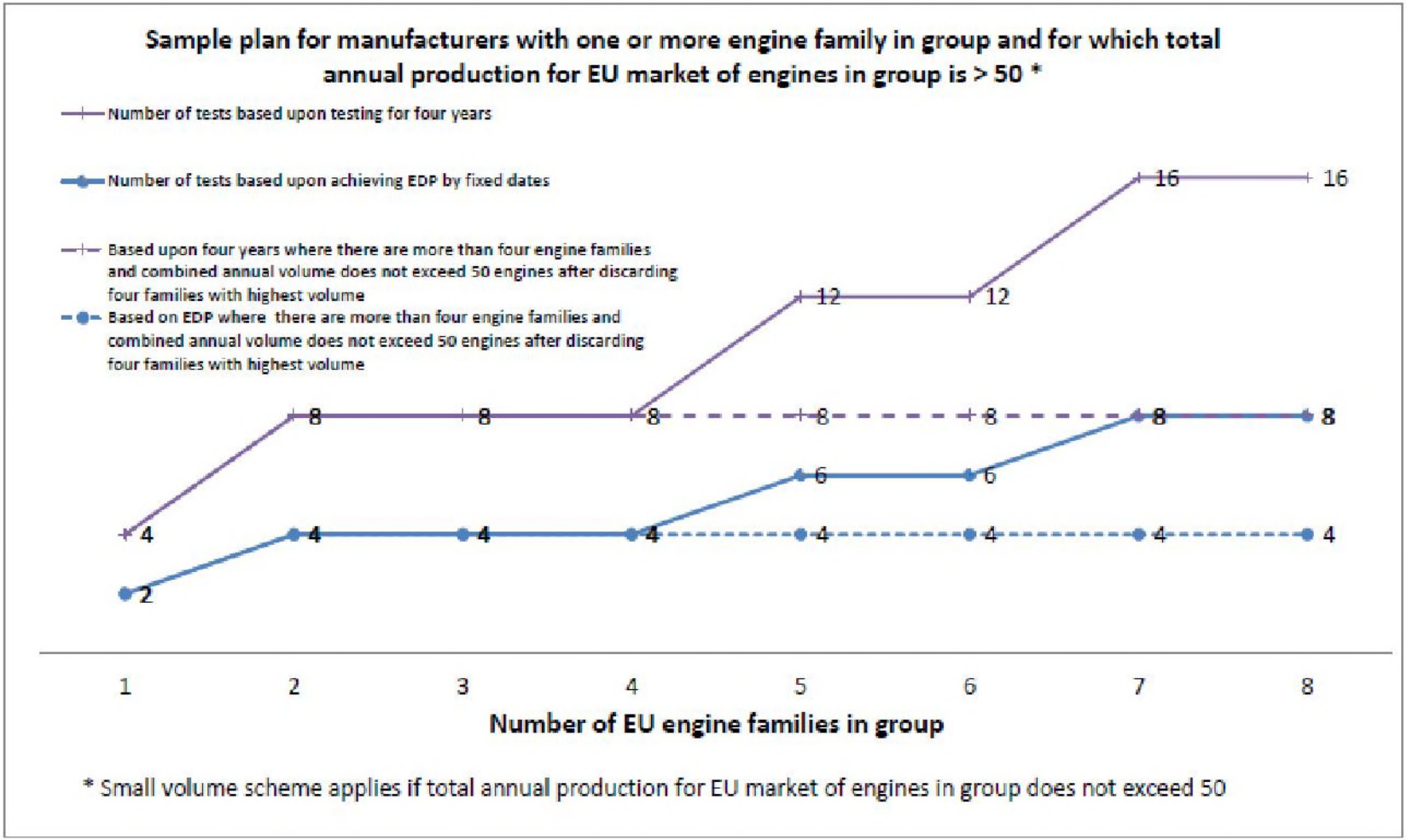
- Small volume production scheme applies in case that combined annual production across ALL engine families in group does not exceed 50 engines

- Manufacturers producing total 25 – 50 engines/year for EU market across all families in a given group:
  - Option 1: 1 engine between a% EDP and b% EDP by 31 Dec 2023
  - Option 2: 1 engine per year for 2 years

- Manufacturers producing total < 25 engines/year for EU market across all families in given group:
  - No testing unless production exceeds 35 engines in a 2 year rolling period in which case the sampling plan is the same as for 25 – 50 engines/year

•Engines ≥ 130 kW • a = 30, b = 70	•Engines 56 ≤ P < 130 kW • a = 20, b = 55	•Engines < 56 kW • a = 10, b = 40

Illustration of proposed sampling plan



Overview currently ongoing discussion

European standard ES-Trin / work of CESNI committee

- **CESNI** (Comité Européen pour l'Élaboration de Standards dans le Domaine de Navigation Intérieure) represents a committee of experts from EU COM, member states, CCNR and international organisations
- One of it's task is the continous update of ES-TRIN (European Standard Technical Requirements for Inland Navigation vessels)
- DIRECTIVE (EU) 2016/1629 refers to the most recent version of ES-TRIN, EU COM can update references via delegated act
- Current version ES-TRIN 2017: https://www.cesni.eu/en/documents/es-trin-2017/

Overview currently ongoing discussion

Introduction of joint FAQ document

- EU V (NRMM regulation 2016/1628) regulates the placing on the market of engines
- In addition, the requirements of 2016/1629 and ES_TRIN need to be fulfilled in order to get the inland navigation certificate
- As per other applications, a FAQ documents adresses sector-specific aspects

EUROMOT
The European Association of Internal Combustion Engine Manufacturers

CESNI
European committee for drawing up Standards in the field of Inland Navigation

Overview currently ongoing discussion

Introduction of joint FAQ document

1. Scope of inland waterways engines – definition of "installed"
2. Type-approval date of engine
3. Placing on market date of an engine
4. Replacement engines
5. Transition engines – definition of production date for the vessel
6. Transition engines – scheme
7. Temporary placing on the market of engines that have not been EU type-approved for the purposes of field testing
8. Engine/vessel types newly in scope
9. Vessels subject to derogation from Directive (EU) 2016/1629
10. Definition of OEM
11. Placing on market date of vessel
12. Production and placing on the market date of a pre-assembled module
13. Previous stage engines that were already placed on the market
14. Categorisation of bow thruster engines
15. Use of propulsion engine for auxiliary power
16. Engines intended for use in the place of IWP/IWA engines
17. Modification of engine
18. Amendment of type-approval
19. Recreational craft

- Final draft of the document is on the agenda of CESNI meeting 20/21.11.2018 for adoption
- Final version expected to be availble in CW 48

Overview currently ongoing discussion
Spotlights - use of alternative engines

- As an alternative to NRMM categories IWP & IWA, EU V engines of category NRE (<560 kW) and on-road Heavy-Duty with an Euro VI certificate can be used under specific provisions

- Variying opinions on degree of necessary / allowed changes on these engines:
  - Inducement strategy vs. storage of events
  - application of marine-engine specific requirements (safety,…)
  - Does marinisation change engine operation in an extent where update or even a new type-approval may become necessary?

Overview currently ongoing discussion

Spotlights - use of alternative engines

Which engines can be used in place of IWP of IWA engines?

1. (Reserved - interpretation on the use of non-road 'NRE' engines to be provided in future update)
2. Engines with a EURO VI heavy duty certification from the EU under Regulation 595/2009 or UN-ECE regulation R49-06 may be used in place of an NRE engine and hence also in place of an IWP or IWA engine of < 560 kW.

The 'inducement strategies' for NOx control that are included in these engine shall be replaced by the requirements set out in Appendix 2 of Annex IV of Regulation (EU) 2017/654 (inland waterways specific, without inducement). This must be confirmed by a technical service.

Note 1: These engines shall also meet the requirements of Directive (EU) 2016/1629 or RVIR and the associated ES-TRIN 2017 relevant for the vessel application (especially the specific requirements concerning exhaust gas after treatment systems in Article 9.09).

Note 2: Marinisation may change the engine so that the type approval may need to be changed or a new one issued. In addition, the company that makes the marinisation could become the manufacturer (see question 17 and question 18).

References:

- *Regulation (EU) 2016/1628 Article 4(1)(b), Article 42*
- *Regulation (EU) 2017/654 Annex IV Article 3.6(b)(i), Annex IV appendix 2*
- *Regulation (EU) 2017/654 Annex XIII*
- *ES-TRIN Article 9.09*

„mandatory specific statement of manufacturer for the use of an NRE engine instead of IWP / IWA or all engines to be used without further requirements?
→ No common position yet!

Outlook / further steps

- Implementation of 2016/1628 approaching soon for categories IWP / IWA
- Directive 2016/1629 and the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) to be considered in connection
- ISM requirements to be followed for IWA/IWP engine categories as well
- Inland waterway industry underlines the importance of suitable engines and pushes for alternatives
- Continuous push for improvement of the existing fleet (“Greening of the fleet”), funding programs,…

Thank you for your attention

Any questions?

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