Engines manufacturers' comments on new emission requirements for inland waterway vessels and NAIADES – II

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EUROMOT is the

European Association of Internal Combustion Engine Manufacturers.

We are a **reference point** for effective communication among the engine and equipment industries and regulators in Europe and worldwide.

Within the society arena we are **focusing on**:

- the **EU institutions** in Brussels,
- the United Nations Economic Commission - **UNECE** in Geneva,
- the International Maritime Organization - **IMO** in London.
- the River Rhine Commission - **CCNR** in Strasbourg,
- and **selected national authorities** in EU27, Eastern Europe, North and South America, Asia and Oceania.

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General Comments (I)

- Euromot fully supports the objectives of the NAIADES II program and “greening the fleet”.
- Euromot has serious concerns about the actions proposed by the Panteia study that have been fed in to the Commission staff working document.

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General Comments (II)

- The outcome of the study has such far reaching consequences for the industry, considerable further validation should be carried out and it should be subject to scientific scrutiny.
- To be effective, actions must:
  - Be affordable by the individual operator, not just show maximum benefit on the macro scale.
  - They must fit in to a viable business model with an acceptable level of risk to allow a functioning market with an appropriate level of competition to be maintained.

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General Comments on Panteia Study (I)

- The boundary conditions of the study were restrictive:
  - Only the external costs for NOx and PM were considered. Green house gases, noise and accidents were ignored.
  - Any option that did not reach Euro VI levels of specific emissions were discounted.

    The highest benefit/cost ratio option was discounted under this constraint

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General Comments on Panteia Study (II)

- The study only used one input source for data and did not validate against other sources:
  - The input data came from the “Marco Polo” external cost calculator which is a top down calculator.
  - The results for NOx and PM comparison with a road vehicle from a bottom up comparison do not seem to match and the reason for this should be investigated.

    It may drive alternative action such as improving the loading factor for IWT.

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Technical Specifics – NOx (I)

- The proposed NOx value of 1.2 g/kWh for engine <981 kW and initially >981 kW is technically feasible due to the good fuel quality in the EU (Diesel and gas) on a new engine.
- However, it is not aligned with any other market which severely questions the economic feasibility, requiring product to be developed for the small EU market only:
  - Even the US with a much larger market set a level which would allow product that could be used with lower quality fuel to enable use in a larger market.
  - Gas quality consistency in the EU may reduce as a result of opening up of the market, making it more challenging.

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Technical Specifics – NOx (II)

- The NOx value of 0.4 g/kWh for a later stage on >981 kW has never been demonstrated on a large marine diesel and may not be technically feasible, requiring many NOx reducing technologies to be used together.
- It would require SCR aftertreatment on an LNG engine.
- The certification process requires performance in series production and over a 10,000 hour useful life. This requires margin to be built in to the new engine limit.

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Technical Specifics – Particle number

- A particulate number count would require a high efficiency wall flow filter.
- The particulate number count proposed (based on Euro VI) has never been demonstrated on a marine diesel engine.
- The particulate filters required for such an engine are on a different scale to those used on heavy duty automotive and require different regeneration techniques.
- A test program would be required to set a suitable limit.
- Would a by-pass be required for marine use?

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Technical Specifics - Methane

- The proposed CH_4 limit (based on Euro VI) is not achievable by the dual fuel engine foreseen for IWT use.
- Dual fuel is the technology of choice for marine necessary to allow operation on diesel and maintain propulsion safety if LNG is not available or is cut off.
- The proposed CH4 limit is similarly not achievable for a high efficiency high power density lean burn single fuel LNG engine
- The proposed CH_4 limit can not to be reached without aftertreatment. Due to the low exhaust temperature methane catalysts for lean burn engines with high conversion rates and an appropriate durability will not be available in the foreseeable future.

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What does a Euro VI truck engine look like? (I)

- Diesel
  - Diesel oxidation catalyst and diesel particulate filter (DPF) fitted relatively close to the engine to maintain good exhaust temperature for passive regeneration.
  - SCR and in many cases cooled exhaust gas recirculation (CEGR) to control NOx, fitted as close as possible to the DPF to maximise temperatures.
  - Clean up catalyst to remove any excess ammonia.
  - Tens of thousands of hours of development, test and calibration amortised over many hundreds of thousands of sales

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What does a Euro VI truck engine look like? (II)

- CNG/LNG: Rich burn spark ignition combustion with 3-way catalyst
  - Due to the consistently high exhaust temperatures and no excess oxygen the 3 way catalyst is effective in reducing NOx, CO and all hydrocarbons including CH_4.
  - However this technology does not achieve the efficiency or power density of a lean burn engine.
  - Dual fuel operation is not possible.

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Placing on the Market

- Euromot strongly believes that the emissions certification of any inland waterways engine should remain in the NRMM (97/68/EC or its replacement).
- An engine receiving such a certification should be able to be placed in to service on a new vessel or as a replacement engine without additional modification or certification.

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Thank you for your attention !

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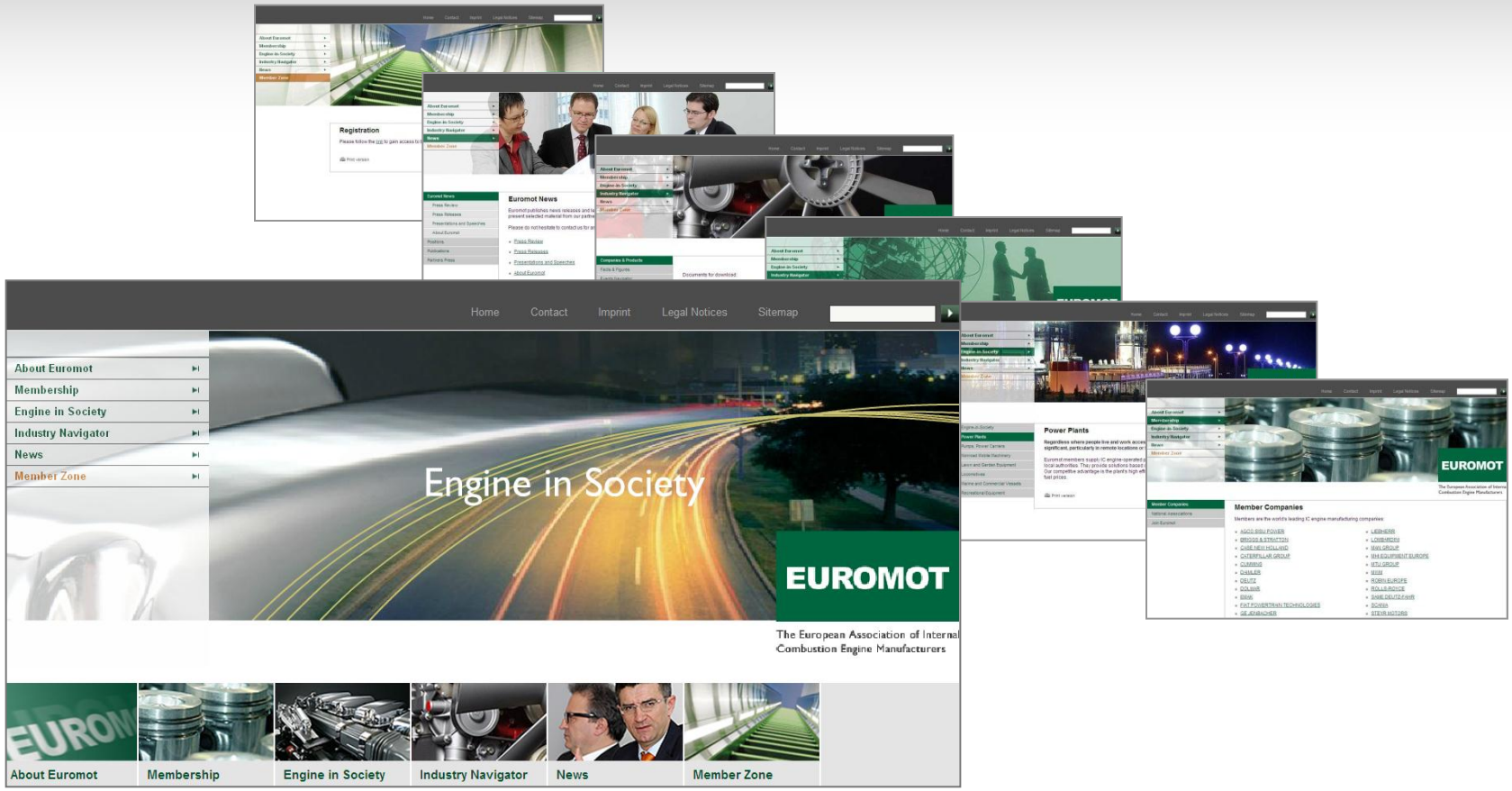

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