



Press Release

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## **CIMAC Circle at SMM 2008 takes on emissions issue**

**The 2008 CIMAC Circle took on the hotly discussed issue of maritime emissions at its traditional Thursday afternoon event during SMM 2008, the world's premier shipbuilding exhibition in Hamburg. Experts drawn from the maritime industry presented a range of company views on the options and looked at where the trends were heading.**

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The CIMAC Circle is a regular feature of the SMM, Shipbuilding, Machinery & Marine Technology trade fair held every two years in Hamburg, and with the chosen theme of "Efficient & Clean Ship Transportation – What are the Technical Solutions?", this year's event promised to be another crowd-puller. Panel Chairman F. Deichmann from Columbus Shipmanagement GmbH was able to welcome some 300 interested visitors to the September 25 event.

After a short introductory speech by the CIMAC President, Mr. Karl Wojik of AVL List GmbH, Austria, Mr. Deichmann kicked off the meeting by introducing the panellists: on behalf of the engine builders, Dr. S. Spindler, MAN Diesel; Mr. K. Heim, Wärtsilä, and Mr. K. Wirth, Caterpillar; representing the operators, Mr. C. Tantzen, E.R. Schiffahrt; as well as ABB Turbo Systems president D. Arnet and H.-J. Götze of Germanischer Lloyd.

### **IMO Tier II and III**

The tone for the afternoon was set by the first three speakers, Dr. S. Spindler, Mr. K. Heim and Mr. K. Wirth, with brief explanations of the IMO Tier II and Tier III requirements, and a reminder that newbuildings *and* retrofits are affected by the new regulations. Referring to NOx, it was noted that Tier III, which is to be introduced in 2016, will require a very significant reduction of 80% compared with today's level. The challenge is how to make sure there are solutions that allow compliance with the different limits in coastal areas and on the open sea. Engine technology



packages have been developed that enable the 20% NO<sub>x</sub> reduction in IMO Tier II to be met, but it was stressed that fuel flexibility must remain, and that IMO Tier II can be fulfilled without aftertreatment.

The measures for reducing NO<sub>x</sub> – combustion process optimization, in which variable valve timing (Miller process) can play a role, electronically controlled high-pressure fuel injection (common rail), and the turbocharging options of a 2-stage arrangement and variable turbine area – were looked at, as were their relevance to IMO Tier II and Tier III.

It was agreed that 80% NO<sub>x</sub> reduction is a challenging target to meet with internal measures only, and that there is no final answer right now, although operators are saying they do not want to install expensive aftertreatment systems (humidifying and catalytic measures and gas recirculation). Another future possibility is gaseous fuels, with dual-fuel engines an attractive alternative since switching from diesel to gas mode reduces the NO<sub>x</sub> alone by 90%, while there are also important improvements in CO<sub>2</sub> and other emissions. A combination of measures is also possible. Retrofit packages are available today for the existing engines, and new packages will be offered in due course. It must, however, be ensured that there is no negative impact on reliability.

To enable compliance with IMO sulphur and SO<sub>x</sub> requirements, IMO has also worked out a 3-step approach for reducing the sulphur content of fuel used on ocean-going ships from 4.5% today to 3.5% in 2012 and to 0.5% in 2020. It was explained to the audience that Special Emission Controlled Areas (SECAs) like the Baltic Sea and the English Channel have an SO<sub>x</sub> limit of 0.15% already in place today, but that this will go down to 0.1% in 2015. It is up to the ship operator whether to use HFO or distillate fuel as long as the sulphur content meets the requirements, or alternatively to use exhaust-gas cleaning providing this ensures the same SO<sub>2</sub> level. It's important, the audience was told, to remember that these limits are valid for all vessels, regardless of their age. Since, with regard to the engine combustion process, the simple principle of "sulphur in, sulphur out" applies, ship operators have the option of continuous operation on low-sulphur HFO or distillate fuel, having two different fuel qualities on board and switching over when entering SECAs, or running



on high-sulphur HFO in combination with exhaust-gas aftertreatment such as a scrubber. This makes the installation of a scrubber look quite attractive, especially considering that distillate fuel is currently around 500 \$ per ton more expensive than HFO. A look at the different scrubber technologies was followed by a more detailed description of the closed-loop caustic soda scrubber, which is the most suitable type for vessels, together with the problem of end-product (wastewater) storage on board and of its environmentally friendly disposal in the port. It was stated that work to reduce the size of the scrubbers and improve their efficiency is ongoing, as are efforts to better integrate the scrubber in the design of the ships.

### **Turbocharging's special role**

Following on the heels of these presentations, D. Arnet, in his presentation, looked at the influence of turbocharging on reducing engine emissions. The audience was treated to an interesting talk in which it was explained that the trend is to use the turbocharger pressure ratios today not just to increase the specific engine power, but also, through Miller timing, to reduce NOx emissions. To exploit the NOx reduction potential of the Miller cycle, significantly higher pressure ratios are needed, and it was explained how a new generation of turbochargers that has been developed allows full load pressure ratios that can be used in low-speed applications either to increase the power by 20% or to reduce NOx emissions via the Miller cycle without fuel consumption penalties. Its higher efficiency also allows the use of heat recovery systems with power turbines for lower sfoc and CO2 emissions.

The presenter then went on to show how, by pushing the Miller cycle further with the help of 2-stage turbocharging, NOx emissions can be reduced by more than 50%, followed by a closer look at where this technology currently stands.

### **Operational and regulatory considerations**

Reminding the audience that the environmental impact of shipping was not restricted to the engines and the turbocharger, the Panel Chairman



introduced the next presenter, C. Tanzen, who spoke on the subject of energy-saving in modern ships. Opening with the statement that “shipping is one of the most environmentally friendly means of transportation”, the presenter countered that shipping was nevertheless a contributor to the problem, and so the issue has to be taken seriously. Topics subsequently taken up were the key issue of fuel consumption, schedule and cargo optimization, constructional issues involving the hull and engine, and technical solutions that included fuel and engine parameters, maintenance and the crew’s environmental awareness.

The presentations wound up with a talk by H. Götze from Germanischer Lloyd, who looked at the issues that had been presented from the regulator’s viewpoint and provided a new and interesting perspective for the visitors to the CIMAC Circle. A good example, and one which most of the visitors were unaware of, is the CO2 Index, a transport-efficiency indicator which shows the ratio between environmental impact and economic benefit. It was also noted that engine efficiency has continuously increased without regulation, and that modern tools and technologies are available today which can be used to achieve new emissions goals. After reviewing some of the available means for optimizing propulsion and propeller efficiency, Mr. Götze concluded by reminding the audience that safety was also an important issue and should not be forgotten among all the other topics considered.

### **A lively discussion**

Questions taken from the floor focused on the very topical subjects of fuel quality and fuel consumption. Asked what is meant by “low-sulphur fuel” when talking about exhaust-gas aftertreatment, the panel answered that the SCR’s operating window becomes more restricted the higher the sulphur content is, but that there is not a “hard” figure and no specific optimum.

In reply to one concern from the floor, it was also stated that technology like common rail is proven in tests with very poor quality fuel. Answering a member of the audience concerned about the problem of how to dispose of the sludge left over from scrubbing, the panel referred to the



need for a suitable port infrastructure to be developed in addition to the technical issues around the scrubber itself. It was also said that local and harbour authorities have to be involved in building up a logistics chain to deal with this. As to the costs for operators, a panellist stated that there would be many different payback calculations, depending on the actual circumstances.

In reply to the suggestion that high-pressure gas turbines would be a viable “environmental” option, the panel countered that in its opinion diesel engines would remain the predominant source of power on marine vessels for many years, stating that for the time being it sees nothing replacing it. However, in some special areas of shipping the panel does expect to see alternative power sources – sails, gas turbines, possibly even nuclear plants – being used at some time in the future when fossil fuels start to run out. It was, however, pointed out that combined cycle solutions with a diesel engine and gas turbine are on the market that can get 10% to 12% additional power out of an existing engine installation.

### **Invitation to attend 26<sup>th</sup> CIMAC Congress in Bergen**

The event showed again that current-day issues are also concerns going forward. Bringing the discussion to an end, Mr. Deichmann thanked the panellists and visitors for their lively contributions, concluding with an invitation to attend the 26<sup>th</sup> CIMAC World Congress, which is being held in Bergen, Norway, June 14-17, 2010.

### **About CIMAC**

*The International Council on Combustion Engines (CIMAC) is a non-profit association with members in 24 countries worldwide. Its aims are to bring together and improve understanding between manufacturers of diesel engines and gas turbines, users such as shipowners, utilities and rail operators, and also suppliers, oil companies, classification societies and scientists, to promote the exchange of scientific and technical information via its Congresses and other CIMAC events, to promote Working Group activities, to issue publications and support work in the area of standardization, and to collaborate with other international associations.*



For further information about CIMAC please contact the Central Secretariat at [cimac@vdma.org](mailto:cimac@vdma.org) or visit the CIMAC website at [www.cimac.com](http://www.cimac.com) .

A handwritten signature in black ink, which appears to read 'H. Zingg'. The signature is fluid and cursive, with a long horizontal stroke at the end.

Hanspeter Zingg  
CIMAC Vice-President Communication