BY ROBERTA PRANDI

Here Comes IMO Tier 3

***D&GTW* spoke with Georg Diderich, president of Euromot (European Association of Internal Combustion Engine Manufacturers) and senior vice president – corporate management at Deutz, and Peter Scherm, Euromot's general manager, about the recently adopted IMO Tier 3 limits for NO_x emissions**

Georg Diderich, president of Euromot (left), and Peter Scherm, Euromot's general manager.

D&GTW: *What are the limits, provisions and implementation date of the adopted IMO Tier 3 NO_x standards?*

Euromot: In April 2014, the IMO (International Maritime Organization) Marine Environment Protection Committee (MEPC) adopted an amendment to MARPOL Annex 6 (International Convention for the Prevention of Pollution from Ships) implementing NO_x Tier 3 standards to the existing NO_x emissions control areas (NECAs) as from January 2016.

MARPOL Annex 6 was first adopted in 1997 and limits the main air pollutants contained in ships' exhaust gas, including sulfur oxides (SO_x) and nitrous oxides (NO_x). The provisions have been progressively tightened, a process that is still ongoing. Under the revised MARPOL Annex 6, the global sulfur cap (Regulation 14) was reduced initially from 4.5 to 3.5%, effective from January 2012. It will be progressively lowered to 0.5%, effective from January 2020, subject to a feasibility review to be completed no later than 2018. The limits applicable in ECAs for SO_x and particulate matter (PM) were reduced to 1.0%, beginning in July 2010 (from the original 1.5%); and will be further reduced to 0.1%, effective January 2015.

Progressive reductions in NO_x emissions were carried out until the introduction of a more stringent Tier 3 emissions limit for engines installed on ships constructed on or after January 2016 operating in the then existing NECAs.

Principally, NO_x control requirements apply to installed marine diesel engines of over 130 kW output power; the actual limit value within any particular emissions stage is determined from the engine's rated speed (Table 1).

The new Tier 3 NO_x requirements will not apply to super yachts (less than 454 gross tonnes, of more than 24 m in length, specifically designed and used solely for recreational purposes) in operation in designated sea areas prior to January 2021.

However, the new Tier 3 NO_x requirements would also apply to marine diesel engines installed on ships when operated in ECAs that might be designated in the future. The effective dates for future NECAs will be based either on the date of adoption of such a new emissions control area by the MEPC or on a later date as specified by the legislator.

In adopting the Tier 3 NO_x implementation date and enabling a 75 to 80% reduction in NO_x emissions from new engines onboard ships, the IMO MEPC agreed on measures that are expected to have a significant beneficial impact on the atmospheric environment and on human health, particularly for those people living in port cities and coastal communities.

D&GTW: *How was the result of the meeting achieved? Did all parties get actively involved in the discussion?*

Euromot: Clarity and certainty in implementation timelines for their regulatory activity have been one of the IMO's greatest assets for decades. Operating and managing a fleet on the basis of internationally aligned legislation, with reasonable and effective lead times for the implementation of new technologies, is of crucial importance for the global maritime sector. All parties involved in the discussions knew the IMO's reputation and credibility in this respect was at stake.

The chairman of the IMO's MEPC, Arsenio Dominguez (Panama), listened to all arguments brought for-

Tier	Ship Construction Date (On Or After)	Total Weighted Cycle Emissions Limit (g/kWh) n = engine's rated speed (r/min)		
		n < 130	n = 130 – 1999	n ≥2000
1	1 January 2000	17.0	$45.n^{-0.2}$ e.g., 720 r/min – 12.1	9.8
2	1 January 2011	14.4	$44.n^{-0.2}3$ e.g., 720 r/min – 9.7	7.7
3	1 January 2016	3.4	$9.n^{-0.2}$ e.g., 720 r/min – 2.4	2.0

Table 1. The IMO Tier 3 emissions will apply to engines installed on ships constructed on or after January 2016, operating in the then-existing NECAs.

ward by the national delegations. He lead the parties involved to a compromise that balances the concerns related to the Tier 3 NO_x standards' impact on global economic business models, infrastructure requirements and compliant propulsion techniques, with the obvious need to further improve the environmental performance of the shipping sector and the quality of the atmospheric environment.

Euromot is an accredited observer to the IMO. We see ourselves in a role to provide technical competence and reliable know-how on advanced internal combustion engine technologies to IMO MEPC members. We enable the legislator to develop technically feasible and cost-effective product regulations on the basis of comprehensive technical background information and sound engineering judgment. Our claim in this context is not to develop own policy targets.

D&GTW: *Did the correspondence group's report on the availability of compliant Tier 3 NO_x technologies play a decisive role in achieving the 2016 implementation date for the existing NECAs?*

Euromot: The principle of conducting technology background studies on best available technologies — and making them publicly available — is very common in European and international legislation. 'Available' in this context generally means techniques that are developed on a scale that allows implementation in the relevant industrial sector under economically and technically viable conditions. This means taking into consideration the costs and advantages without prescribing the use of one specific technique,

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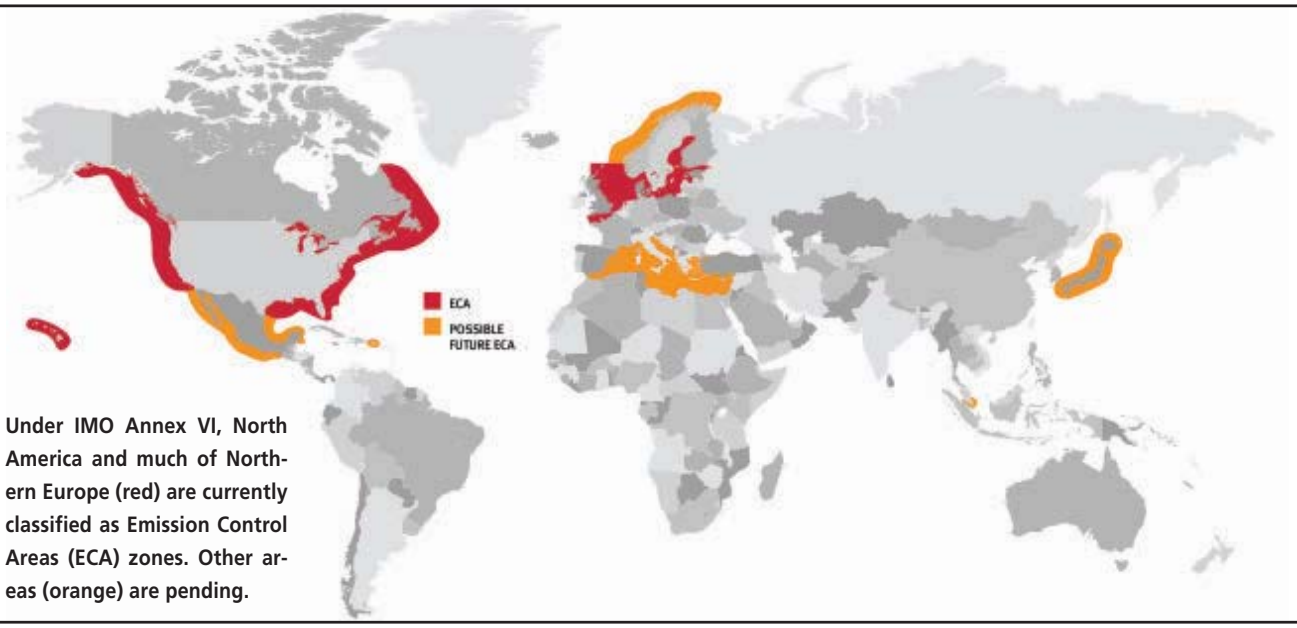

Under IMO Annex VI, North America and much of Northern Europe (red) are currently classified as Emission Control Areas (ECA) zones. Other areas (orange) are pending.

Courtesy of DuPont.

thus guaranteeing that those compliant technologies are reasonably accessible to the operator. It was only consequent that the MEPC set up a correspondence group on the assessment of technological developments to implement the Tier 3 standards under MARPOL Annex 6 in October 2010.

The correspondence group membership covered a broad spectrum of the marine transportation industry, including governmental representatives from the IMO member states, the European Commission, shipowners and manufacturers from expert organizations (shipbuilding, oil, engine and exhaust gas aftertreatment industries). The group was chaired by the U.S.

As the representative of the international internal combustion engine industry, including our sister associations in the U.S. and Japan, Euromot contributed significantly to the development of the final report that was submitted to the MEPC in February 2013. Specifically, the participants identified a variety of technologies that have the potential to achieve the 2016 and later Tier 3 NO_x limits, either alone or in some combination with each other. These include selective catalytic reduction (SCR); exhaust gas recirculation (EGR); use of liquefied natural gas (LNG), either in a dual-fuel (diesel pilot injection with gaseous LNG as the main fuel) or alternative fuel arrangement; and other technologies such as direct water injection, humid air motor (HAM), scrubbers, treated water scrubbers, variable valve timing and lift, as well as dimethyl ether (DME) as an alternative fuel.

At the MEPC session in April 2013, some flag states raised concerns about the maturity of the technologies recommended by the correspondence group, and on the adverse effects on the competitiveness of ports and the maritime transport business in general. Euromot submitted an 'information paper' to the IMO, providing additional background on the current technical status of SCR, EGR and LNG, as well as on some critical aspects of the aforementioned Tier 3 compliant technologies. We appreciated the fact that the IMO reconfirmed the recommendations of the correspondence group.

What matters most to us is that we have proven ourselves as a technically experienced and reliable partner for the maritime transport sector, the flag states and the regulatory bodies at the IMO. Our member companies offer a variety of technical solutions so that customers can best balance their needs in terms of cost efficiency, environmental performance and operational profile. Regarding the further legislation process at the IMO, Euromot remains available to consult with regions considering the designation of further NECAs and assist them to achieve a seamless introduction of IMO Tier 3-compliant engine technology.

D&GTW: *What about NECAs? Are*

there any petitions from the Baltic and North Sea areas, the English Channel or from others?

Euromot: The IMO process to designate a sea area to NO_x control typically takes two to three years. For the Baltic Sea, an application document has been prepared by the Baltic Marine Environment Protection Commission (usually referred to as Helcom) since 2008. After the last MEPC meeting, Anna Peterson, from the Swedish Transport Agency and chair of the Helcom Maritime Group, stated that determining the implementation dates of future NECAs on a case-by-case basis would facilitate the discussions within Helcom of an application to the IMO to designate the Baltic Sea a NECA.

D&GTW: *Do you expect other NECAs to be introduced shortly now that the limits have been clearly defined?*

Euromot: The boundary conditions and clean air targets for new NECAs are clearly defined now, and the existing NECAs in North America and the U.S. Caribbean Sea will demonstrate the IMO's effectiveness soon after January 2016. In our opinion, the political breakthrough in London could only have been achieved because the IMO decided not to impose a rigid implementation scheme for any newly designated NECA. This decision has contributed to close consideration of environmental aspects and the economic factors of a specific region, creating a suitable introduction period that addresses these challenges.

D&GTW: *What impact on the gas infrastructure in ports, bunkering systems, etc., is expected from the IMO's decision to implement the January 2016 Tier 3 NO_x standards in existing NECAs?*

Euromot: The potential of LNG as a marine fuel has captured the imagination of the shipping community, and there is certainly a strong drive to investigate adopting LNG to meet regulatory compliance. Our regulatory home base is the EU, where Transport commissioner Kallas launched the EU Clean Power for Transport Strategy, which includes an action plan for a comprehensive EU framework on LNG for shipping. The commission indicated that it expects its core ports to have LNG available by 2020. The IMO global low sulfur compliance deadline will be either 2020 or 2025, depending on the outcome of a low sulfur fuel availability review in 2018.

LNG is not only considered as the ship fuel of the future for maritime, short sea and coastal shipping, but also for inland waterway transport. The LNG Rhine-Main-Danube master plan is an important project in the expansion of LNG infrastructure. This

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master plan views inland navigation as a pioneer market for LNG, both in terms of the use of LNG as a fuel and its transportation. One vision of the master plan is that inland ports on the Rhine-Main-Danube rivers axis could become distribution centers for small scale LNG supply towards their hinterland. Inland ports along the Rhine-Main-Danube axis could thereby operate as nodes from which other markets (e.g., public transport, including buses) could be supplied with LNG.

Programs of supranational government bodies — like the IMO or the EU — that encourage LNG supply do not necessarily mean adoption will be easy and cost-efficient for the user. Market implementation will be driven by a combination of local price and regional regulation. It will be crucial to match the critical mass of investment in terminal infrastructure, bunkering systems and LNG-fueled or LNG-carrying vessels with intelligent financing tools for implementing these new technologies through competitive business models.

The full, safe and efficient exploitation of gas and dual-fuel engine technology, however, requires the development of a complete and favorable internationally aligned regulatory framework, and this is where our expertise comes in again. Euromot does not promote market-based instruments to facilitate any specific abatement technology or alternative fuel, but we are participating in the current review of the IMO IGF Code (International Code of Safety for Ships Using Gases or Other Low Flash Point Fuels) for the construction and equipment of ships carrying liquefied gas in bulk or gas-fueled ships. We are also a stakeholder in the development of a uniform standard for technical requirements for inland waterway transport vessels in Europe. A cooperation between the European Commission and the Central Commission for the Navigation on the Rhine that is addressing, among other things, provisions for regulating the use of LNG as a fuel that should be harmonized as closely as possible with the IMO IGF Code.

D&GTW: *Are the members of Euromot satisfied with how things are progressing? Are there any aspects of the regulations that needs to be addressed or changed?*

Euromot: We appreciate that the IMO has adopted a clear set of rules, avoiding the diversification of regulations away from international towards regional or stand-alone standards. This has the potential to create a larger market, enabling engine manufacturers to increase the scale of our R&D investment and benefit from economies of scale in the maritime markets, whether for seagoing ships or inland waterway vessels. Internationally harmonized legislation with effective and reasonable lead times is also good for our customers because it helps us to provide them with environmentally highly efficient and cost-effective technology at competitive prices and, most importantly, at the right point in time.

NEWSMAKERS

HPI: Houston, Texas, U.S.A.-based HPI has appointed **Gordon Sims** as director of light industrial and aeroderivative turbines. Sims will oversee services related to the installation, commissioning and maintenance of light industrial and aeroderivative turbines, while directing business development and sales activities for the division.

Sims began his career in Winnipeg, Manitoba, Canada, at Standard Aero, progressing from a mechanic to roles as energy services director and regional sales manager for the southwest U.S. and Latin America regions. Most recently, Sims worked as regional sales manager for MTU Maintenance in San Antonio, Texas, U.S.A.

D. Lambert

MIRATECH: Don Lambert has been appointed as business development engineer by Miratech. Based in Calgary, Alberta, Canada, Lambert will be responsible for understanding customers' business challenges and objectives related to mitigating engine exhaust noise and emissions, and liaising with R&D, engineering and product development teams to identify or create solutions using Miratech products.

M. Makinen

ROLLS-ROYCE: Rolls-Royce has appointed **Mikael Makinen** as president of its marine business. He joins the company from McGregor, where he was president. Prior to that, Makinen held several senior positions at Cargotec and Wärtsilä.

Makinen will lead a business of more than 6000 people located in 35 countries. Together, they serve more than 4000 customers in the offshore, merchant and naval sectors, with equipment installed on 25 000 vessels.

M. Fruehwirth

HELLA MARINE: Hella marine has named **Markus Fruehwirth** as its new European division manager. A 20-year Hella marine veteran, Fruehwirth previously served as the company's key account manager in Europe.

In his new position, Fruehwirth will continue to refine the sales and marketing strategy, maintain close partnerships with distributors, feed the product development pipeline and maintain the company's network of recreational, commercial and workboat contacts.

CLARIFICATION: Errant data submitted by one OEM affected the total engine output range for reciprocating engine orders sized 5.01 to 7.50 MW in the 2014 Power Generation Order Survey (May 2014 *D&GTW*). The data has been replaced and an amended 2014 Power Generation Order Survey can be found online at www.dieselgasturbine.com.