Although there is notional evidence of reduced government funding for maritime technological research in various European Union countries, and not least for work involving marine engineering and propulsion, the development of major, pan-industry research endeavours under the Fifth and Sixth Framework Programmes points to a significant stream of EU sponsorship. The European Commission is now carrying out a process to identify thematic domains for future funding support under the aegis of the follow-on Seventh Framework Programme.

As the largest study of its kind to date, the Hercules integrated project has the ambitious remit to develop new technologies to drastically cut gaseous and particulate emissions from marine engines, and concurrently increase engine efficiency and reliability, and thereby reduce specific fuel consumption, carbon dioxide (CO_2) emissions and life-cycle costs. It has set targets for improvements to be available onboard ships, and on an incremental basis, from 2007 and as far ahead as 2020.

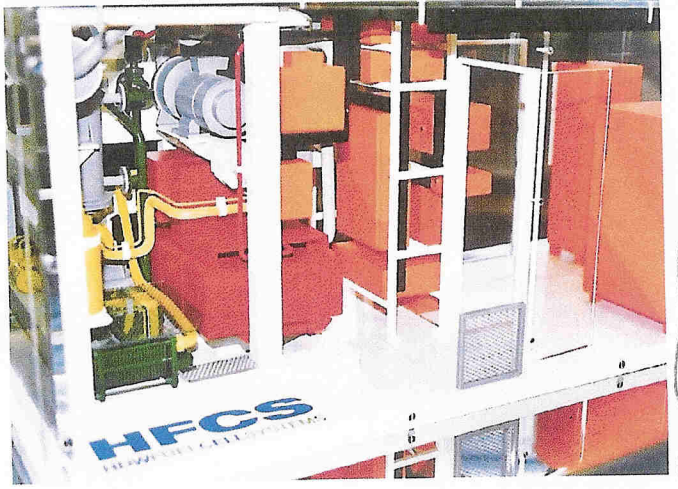
Implemented last year within the compass of the Sixth Framework Programme, and with funding support from the Swiss federal office for education and science as well from the EU, the Hercules initiative has 40 participants from 10 countries. Management of the project has been assigned to Augsburg-based Uleme EEIG, set up jointly for that specific purpose by project partners MAN B&W Diesel and Wärtsilä Corporation.

The long-term study programme covers both two-stroke and four-stroke machinery, and has been divided into 10 work packages (WPs), with each WP comprising two tasks. One of the principal aims is a 20% reduction in oxides of nitrogen (NOx) and 5% less particulate emissions by 2007. Parallel goals include a 1% improvement in fuel consumption and 10% enhancement in

■ MAN B&W and Wärtsilä are part of the Hercules project, and are tasked with playing a leading role in the development of initiatives addressing environmental and performance factors for both two- and four-stroke machinery

Environment provides R&D spur

Wide-ranging research aims to deliver shipboard solutions within a relatively short time-span



■ GL, Siemens and HDW Fuel Cell Systems are collaborating on a 160kW hydrogen-based demonstrator

engine reliability, relative to 'best available technology' already in service.

Further substantial advances in performance have been targeted for 2010 in these and other areas, including lifecycle costs. By 2020, it is envisaged that technology development will have resulted in a 5% improvement in fuel efficiency and corresponding CO_2 unit output, 60% less NOx, 40% less particulates and other emissions, 40% reliability gain, and 20% cut in life-cycle costs.

Work encompasses fields such as the thermodynamics and mechanics of engines with extreme design parameters, advanced combustion concepts, and multi-stage 'intelligent' turbocharging.

Investigations also include so-called 'hot' engines, using energy recovery and compounding techniques, as well as engine-internal emission reduction methods and advanced after-treatment methods for heavy fuels, new sensors for emissions and performance monitoring, low-friction engines, and adaptive control for 'intelligent' engines.

The ultimate goal is to have improved products and designs available to the market for shipboard use from 2010 onwards. Engines offering a subsequent higher set of values regarding fuel consumption, emissions, reliability and lifecycle costs are expected to be ready in 2020.

Studies embraced by one of the work packages, WP2 (advanced combustion concepts), relates to combustion system simulation. ETH University of Zurich's contribution relates to the development of a spray/combustion chamber test facility, closely representing the combustion system in current, large, two-stroke diesels.

Its partners in this specific area of work include the Paul Scherrer Institute, Finnish-owned Wärtsilä Corporation and its Swiss company Wärtsilä Switzerland, Abo Akademi University, Helsinki University of Technology, and the Laboratory of Marine Engineering at National Technical University of Athens.

During 2005, the intention was to order large main components for the test plant in Switzerland from non-participant manufacturers, while specific, smaller parts would be produced by the partners. The spray/combustion chamber was scheduled to be commissioned this year, along with the design, testing and integration of the control system. The first measurement campaigns for experiments based on the spray/combustion chamber are planned for the end of 2005.

Ultimately, the enhanced simulation tools are to be employed to identify suitable options for combustion system optimisation, a powerful motivator for the involvement of Wärtsilä, as an engine developer.

Fuel cell focus

Germanischer Lloyd has remained in the vanguard of technological research and practical considerations relating to the marine use of fuel cells, and the society is associated with a range of German initiatives in both the commercial and military domains.

The society considers that the tightening and proliferation of controls on emissions will spur the development of fuel cell technology as a viable energy alternative in passenger ship and cruise vessel applications.

The primary advantage offered by such a power source is the near emissions-free operation, and another key benefit is the production of electrical energy at a higher efficiency level than that offered by diesel engines. However, the amount of energy that can be delivered is the main challenge in the commercial marine market.

GL observed that fuel cells currently offer unit power outputs from several hundred kW