Breakthrough in LNG propulsion

In February this year Gaz de France (GdF) ordered the first LNG carrier to be fitted with diesel electric propulsion. The 75,000 cu m vessel is to be built at Chantiers de l'Atlantique for delivery in 2004 and will be employed in the Mediterranean trades.
The new ship is also unique in another important way - it is the first LNG carrier to be built with the new CS1 membrane cargo containment system - an amalgamation of the best parts of the existing Gaz Transport and Technigaz membrane systems.
Wärtsilä will provide the ship with four of its 6L50DF engines, configured for dual-fuel operation. Each dual-fuel engine will develop 5700 kW at 514 revolutions per minute (rpm), and will be able to switch over from natural gas to marine diesel oil automatically, should the gas supply be interrupted, while continuing to deliver full power.
When running on gas, reliable ignition is achieved by injecting a small quantity of diesel oil directly into the combustion chambers as pilot fuel which ignites by compression ignition as in a conventional diesel engine. The Wärtsilä 50DF engines use a "micro-pilot" injection system which requires less than one per cent of the fuel energy than what is needed for liquid fuel at nominal load. Electronic control regulates the micro-pilot injection system and the air-gas ratio to keep each cylinder at its correct operating point between the knock and misfiring limits.
One of the concerns with dual-fuel diesel engines is the high pressure at which the gas would have to be introduced into the plant. However, as Wärtsilä points out, its 50DF units require gas pressures at the engine inlets of only four or five bar. Thus, the gas compressor will not be markedly different from those currently in use on steam turbine ships.
The diesel electric package chosen by GdF will reportedly have a propulsive efficiency in excess of 40 per cent, in contrast to the 30 per cent or less quoted for steam turbines. Environmental advantages should also accrue. The combination of natural gas fuel, an overall low fuel consumption and nitrogen oxide (NOSUBxSUB) emission levels which, according to the manufacturer, are 10 times lower than those from a traditional diesel engine, will ensure significant reductions in NOSUBxSUB and COSUB2SUB emissions from the 50DFs compared to those from either steam turbines or conventional diesels.
An important route for the new CS1 membrane tanker will be the transport of LNG from Algeria to Fos near Marseilles where ship size restrictions impose the 75,000 cu m capacity limit on the ship. The round trip voyage will take about one week at a service speed of 16 knots, which can be achieved with three of the four generating sets.
The ship is also being designed for spot market trading, such as voyages to the US, during which the service speed can be increased to 18.5 knots using all four generating sets.
The GdF LNG carrier will not be the first dual-fuel diesel engines to be supplied by Wärtsilä. In October 2001 the engine builder won a contract to supply four 6L32DF dual-fuel engines for each of two 4,000 gross ton (gt) offshore supply vessels (OSVs) building at Kleven Verft A/S in Norway for Norwegian owners.
Like the LNG carrier, the LNG-powered OSVs will have diesel-electric propulsion. The dual-fuel engines, each of 2020 kW output at 720 rpm, will drive the main generating sets which, in turn, will power two azimuthing thrusters as well as provide all shipboard energy requirements.
The 94.9-metre long vessels will have a maximum speed of 17.2 knots. Statoil will take the OSVs on long-term time charter when they are completed in 2003, for use in delivering supplies to oil and gas platforms in the North Sea. They are the first offshore vessels to be powered by LNG.

Statoil has chosen to fuel the supply vessels on natural gas because it burns cleanly, an important consideration in Norway. The country has undertaken to achieve by 2010 a national NOSUBxSUB emission level which is one-third below the volume given off in 1999. The savings in NOSUBxSUB emissions from the two OSVs, estimated at 390 tonnes a year, will be taken as a credit to offset emissions at Statoil's land-based facilities.