Gas support tugs aim to stay out longer

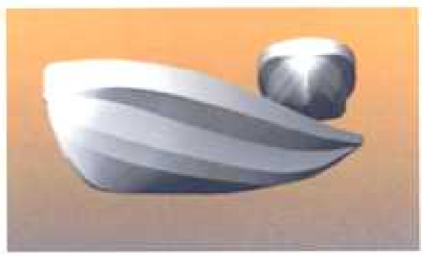
Tugs are typically designed to spend a few hours away from shore at the most, limiting their ability to engage in FLNG terminal support work. Now, Lightning Naval Architecture has plans to launch a new infield support tug concept, capable of continuous offshore operation for weeks at a time.

Australian waters are to play host to several planned floating liquefied natural gas (FLNG) terminal start-up projects, spurring local vessel designers to draw up new concepts to best serve these offshore energy hubs. Inevitably, such service necessitates an ability to operate independently from shore for longer periods than usual, to reduce fuel costs and to make the most efficient use of the operator's time. One such designer, Lightning Naval Architecture (LNA), has subsequently put together a plan for a new type of infield support vessel, capable of operating away from shore for weeks at a time, and of offering superior stability to the majority of conventional tugs, many of which have been designed to spend just a few hours away from shore.

Key considerations for the concept, which is still in its infancy, include the development of a tug capable of demonstrating minimum ship motion, maximum bollard pull, optimal seaworthiness and stability and improved crew habitability and comfort compared to what has previously been available aboard conventional support tugs.

Describing the predicted benefits of the new concept, Hans Stevelt, LNA design team leader, tells *Offshore Marine Technology*: "The size of the LNG terminal tugs will be relatively small considering the environment in which they will be operating. They must [therefore] have a high stability to safely deliver the desired bollard pull in open sea conditions. They are likely to be on 24/7 standby whenever an LNG carrier is alongside the FLNG facility, and these vessels will typically be operating offshore for up to five weeks, so maintaining a low crew fatigue level is very important."

The size of the concept vessel's accommodation area will obviously depend on the number of crew members required, Stevelt adds. "The demand for onboard facilities will also depend on whether the



An early model of the proposed hull form for LNA's new support tug concept

FLNG facility will include a pen where the tugs can tie up when off-duty, and make use of its presumably more generous personnel amenities and a 'shore power'-type arrangement," he says.

In the meantime, LNA's interior design team is utilising 3D CAD visualisation software packages to develop potential onboard tug accommodation solutions. It is also worth bearing in mind that FLNG terminals will be handling varying annual production capacities, and that some of these may only match the carrying capacity of 50 large LNG and condensate tankers.

Propulsive considerations

In terms of seaworthiness, LNA's challenge is to strike the right balance between smooth vessel movements and high stability, Stevelt continues. "One key design aspect of paramount importance for offshore terminal tugs is the ability to control and limit the peak towline forces caused by the tug's movements in heavy seas," he says. "For this purpose, an active tow winch can be used, which would act like a constant tension winch and reduce the peak loads in the towline. Further, in order to achieve smooth vessel movements, a low stability is desirable; this, however, contradicts the desire for a high stability, for safety reasons."

Optimising bollard pull is another crucial component of the new concept. Stevelt comments: "In general, tugs operate under very varying power demands. The power required for the maximum bollard pull is typically three times that required for normal transit speed. Increasing the engine load beyond the 30% MCR during transit does not result in a significant gain in speed, only in significantly increased wave-making and fuel consumption."

Although LNA has not decided on the new concept's propulsive backbone yet, Stevelt hints that a hybrid propulsion plant set-up may prove the most adequate solution. There are a number of various combinations that he sees as suiting an infield support vessel with an 80tonne bollard pull. As an example, Stevelt suggests: two azimuth thrusters, each with controllable pitch propellers and two power input shafts, one driven by the main diesel engine and the second, reverse-fitted shaft, driven by an electric motor; two main engines, each generating 1850kW and coupled to one of the azimuth thrusters; and one 1200kW main diesel generator and one 250kW harbour diesel generator, both of which would connect to a frequency drive and power the two electric motors driving the azimuth thrusters, as well as the tug's onboard systems.

Stevelt says: "The azimuth thrusters could operate at optimum pitch and RPM settings during transit and loitering in pure diesel electric mode, using the frequency drives and electric motors. When full bollard pull is required, the azimuth thrusters could be powered directly by the two main diesel engines as well as the electric drives." Such an arrangement could also provide much welcomed propulsion redundancy, in case the main engine stalls during berthing operations.

Another option may be to equip the tug with a dual fuel option, enabling the vessel to make use of LNG; seemingly a no-brainer, given the vessel's proximity to the FLNG unit, albeit a proposal that could be hampered by budgetary constraints. *OMT*