

LINDE-G

EFFICIENT CHASE/GUARD VESSEL SUITABLE FOR CREW TRANSFERS

On Wednesday 24 April, Rederij Groen's newest vessel was christened right in front of their head office in Scheveningen, the Netherlands. The ship was built by Shipyard De Hoop as one of its 55 m FSIV series, which was nominated for Ship of the Year in 2015. The series was developed as a versatile and exceptionally efficient platform, with a strong focus on seakeeping. While the first vessel in the series was built as a crewboat, there are many other applications for the platform. The *Linde-G* will be used as a chase vessel providing support and crew transfers to seismic research vessels.

Low-resistance

Fré Drenth, technical director of Shipyard De Hoop: "For us, efficiency starts with a low-resistance hull. This is extremely important for a ship like this, which we offer with a maximum speed of 25 knots. At speeds above 10 knots, for a vessel with a waterline of 50 m, the wavemaking resistance starts to become dominant, and we went to great lengths to reduce this as much as possible. The hull is a double-chine displacement hull with a fine entry on the waterline and excellent volume distribution. To reduce the bow wave, we asked the hydrodynamic specialists from Van Oossanen Fluid Dynamics to optimise a bulbous bow. This bulbous bow reduces the resistance by almost 9%." During the development of the ship, in 2013, Van Oossanen also proposed to try the Hull Vane®, a hydrofoil-like appendage at the stern of the ship. The company optimised the Hull Vane specifically for the 55 m FSIV and it was tried during sea trial with and without Hull Vane®, while measuring the fuel consumption. The tests showed a reduction in fuel consumption of 10% at 12 knots, increasing to 15% at the top speed. The difference in generated wave pattern were also clearly noticeable.

Fré Drenth: "Our goal initially was to offer the bulbous bow and the Hull Vane® as options on the vessel, so clients can choose. At shipyard De Hoop, we are strong proponents of the KISS principle: Keep It Simple, Stupid. However, the results of both the bulbous bow and Hull Vane® were so good, that it would be stupid not to apply them from the design, so they are now both standard and all five vessels we built in the series have a bulbous bow and a Hull Vane®."

Streamer

MAKING LESS WAVES, USING LESS ENERGY

Efficient power production

Rick Tempelman, project manager of Shipyard De Hoop: "This platform is developed for applications with a wide speed range. The ship needs to be capable to do a high top speed, but in many cases, many running hours will be spent at a much lower speed, such as patrolling duty or when working as a chase vessel like *Linde-G*. It is known that a diesel engine does not like to be underloaded for long periods of time, it leads to sooting (visible as black smoke), inefficient combustion and a lot of emissions of NOx gases. This is why we developed this series with a three-stage hybrid propulsion system, but with a minimum of components.

Streamer

A SHIP WITH THREE GEARS

3 Hybrid modes

Up to 6 knots, the vessel can run in diesel electric mode, using only a 250 kW generator which covers both the hotel load and drives the propellers through E-motors on each of the gearboxes. The control is very fluid and precise, and the ship is practically silent. The fuel burn in this mode is only approx. 55 l/h. Above 6 knots, the 250 kW genset becomes too small. We then start up the portside main engine, but keep it unclutched from its gearbox. Instead of driving the gearbox, it drives an alternator on its free end at the forward side. The power of this alternator goes through variable frequency drives, for to the E-motors on each gearbox. Effectively you are sailing on one main engine, but with both propellers, the bowthrusters and the hotel load all driven electrically by one 2.350 kW engine in diesel-electric mode. This is also the operating mode used during dynamic positioning. The ship can reach 13 knots in this mode with only 410 kW of power and only burning approx. 144 l/h.

When more speed is needed, both main engines are started up and work in diesel-direct mode. In this mode, the top speed on *Linde-G* is just above 20 knots, but it could be increased to 25 knots with different propellers. There is currently a large power margin at 20 knots, which means that the ship can maintain its speed (and schedule) regardless of the weather or loading condition. This is the notion of “speed-keeping”, where the vessel is designed for an operational profile and real-life conditions rather than a top speed which is achieved only during trials. At 20 knots in calm water, *Linde-G* runs at 75 % of her maximum power and burns approx. 600 l/h of diesel.

Because of the diesel-electric modes, which provide very precise speed control through the variable frequency drives, the propellers can be fixed-pitch propellers, in spite of the wide operating range. Fixed-pitch propellers have a higher efficiency than controllable pitch propellers, which lose a bit of efficiency due to the larger propeller hub. The entire electrical installation was done by Eekels Elektrotechnik.

Seakeeping

The 55 m FSIV platform (DP1 escort vessel) is designed for excellent seakeeping. One of the main contributors to this is that the vessel has a steel hull, while most crewboats have an aluminium hull. Anyone who has spent time at sea in rough water on both an aluminium and a steel vessel can vouch for the difference: a heavier steel hull ploughs better through the waves than a lighter aluminium hull, which feels more like a cork, bouncing on the water. So while aluminium has an advantage on fuel consumption, because it is lighter, it has its downsides as well. Steel also has better fatigue strength properties, is more ductile and hence less prone to water ingress in case of an impact, is more fire resistant and can be repaired easily in even the most remote regions. Equally important for the seakeeping is the hull shape. *Linde-G* has a very fine entry on the waterline, which means that she is less excited in pitch motions and less prone to slamming than ships with a fuller bow. Above the waterline, the raked stem and reserve buoyancy mean that there is a limit to the motions, and shipping green water on deck is avoided in all but the worst cases. *Linde-G* has a small wavebreaker on top of the shelter deck if this would be the case. Finally, both the bulbous bow and the Hull Vane®

contribute to pitch damping, just like the bilge keels contribute to roll damping. This means less vertical accelerations onboard, leading to less seasickness and crew and passengers which are less exhausted after a trip in rough weather. In the design of the vessel, the accommodation is placed further aft than on most crewboats, again with the goal to reduce ship motions felt by the passengers.

Unique capability

Erik Groen, operations manager of Rederij Groen: “We have already several chase vessels in our fleet, which provide assistance to seismic research vessels. They basically make sure that the large seismic vessels, which tow a wide array of expensive cables with kilometres of length, can sail their track undisturbed by other ships, or without having to make a detour for buoys, fishing nets or other obstacles. A lot of these ships are former fishing trawlers, but we have also built dedicated chase vessels. *Linde-G* is the first one which adds a capability to this, which is the possibility to carry out crew transfers. We expect this to be in high demand, to reduce the cost of helicopter transfers.”

Crew transfers

To be able to effectively carry out crew transfers, the speed of *Linde-G* comes into play. The distances to be crossed can be as large as 100 nautical miles, which takes an eternity on a normal chase vessel or platform supply vessel, which typically will cruise at 12 knots. Another condition is of course the passenger compartment, which provides comfortable and spacious seating for up to 55 passengers. Last but not least, *Linde-G* is equipped with a large davit on the aft deck. The davit normally doesn't carry a boat, but it is dimensioned to pick up the crew transfer vessels from the seismic ships, fully loaded with passengers. This means that the passengers can embark and disembark on deck of the *Linde-G* (and on the seismic vessel), and never have to do a more dangerous ship-to-boat transfer, which can be hazardous in heavy seas. *Linde-G*'s dynamic positioning system is perfectly suited to create a calm “lee” on its side, to pick up the transfer vessel. The control for the davit is placed on the starboard bridge wing, giving a very good overview. Right next to it, a removable Dynamic Positioning console can be placed, allowing for very precise joy-stick manoeuvring during launch and recovery of the crew transfer vessel.

Stern platform

What immediately jumps out when one sees the *Linde-G* is the large stern platform, with green plastic grating on top. Easily mistaken for a driving range for golfers, it is actually intended to protect the Hull Vane® which is located underneath. At the same time, it provides easy access to the waterline, which is very important as these ships are often used as a safety/standby vessel. It is much easier to disembark from a liferaft onto the stern platform than it is via a ladder. During one of the sea trials, the platform was even used for a winching exercise by the Dutch coastguard.

Linde-G is equipped with a number of other rescue devices such as a Jason's cradle and a deck crane. The 190 square meter aft deck also has container fittings for three 20-foot containers, while a fourth one can be placed on the sheltered foredeck.

Accommodation

Shipyard De Hoop has gone to great lengths to build a quiet ship. This includes exhaust silencers - which are standard on pretty much any ship, except for crewboats - and a completely flexibly mounted accommodation. Six spacious cabins are provided, each with a private bathroom.

Versatile platform

Patrick Janssens, C.E.O. of Shipyard De Hoop: “The 55 m FSIV series was initially developed for the oil and gas sector as a Fast Intervention Supply Vessel. This market has been difficult for the past few years, due to the low oil prices and a record number of crewboats in lay-up. However, we’ve noticed that the main characteristics of this vessel – a wide speed range, excellent efficiency and seakeeping – correspond closely with other ship types. We’re currently in the outfitting stage for two Offshore Patrol Vessels, which will be used as security vessels in West-Africa, and we’re very close to signing a deal to build one as a Yacht Support Vessel, carrying all the toys and helicopter for a much larger yacht. We think that there’s also a market as a compact inter-island ferry for passengers, vehicles and containers. The first vessel in the series, Karina, will be used as an FSIV in the North Sea.

Workhorse

Being christened on Wednesday 24 April by Linde Groen, granddaughter of Henk Groen, the founder and managing director of Rederij Groen, *Linde-G* was already on her way to Norway two days later and escorting a seismic research vessel on Sunday. Compared to the existing guard vessels in the fleet, Rederij Groen expects to have a 30 % lower fuel consumption in spite of the added capabilities (speed and davit crane). Perhaps the most striking feature of *Linde-G* is what is not visible: it sails efficiently in a very visible and audible way, from very low to very high speeds, showing almost no generated waves and no visible exhaust fumes.