Inland waterway hybrid boat

A new passenger vessel on the River Oise boasting a state-of-the-art diesel-hybrid propulsion solution is reducing emissions, enhancing efficiency and ensuring commuters and tourists travel in absolute comfort

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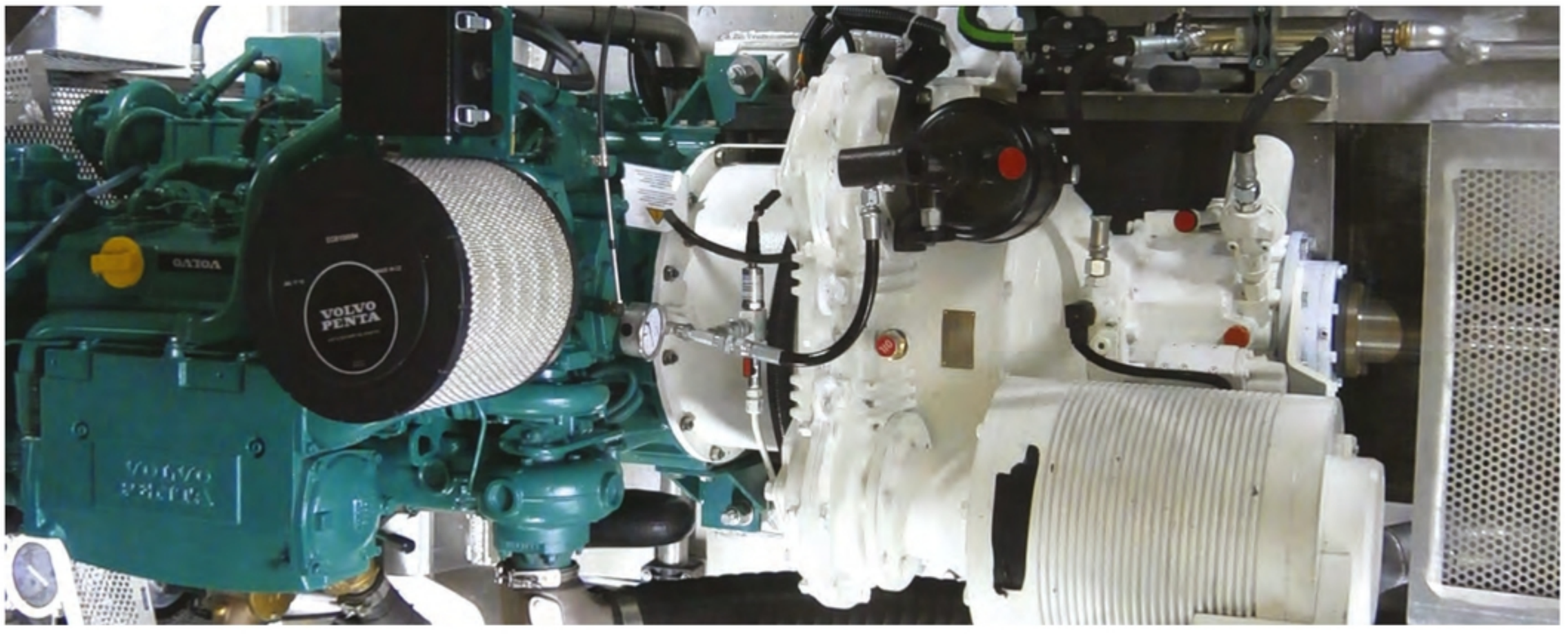


Above: A Volvo D5A TA engine, Transfluid HM2000 hybrid transmission and Powershift Revermatic 11-700RBD unit mean L'escapade can operate at a 8km/h cruising speed and top speed of 14km/h in complete silence in electric mode

A new hybrid boat application powered by Transfluid propulsion technology has come into service on the River Oise, in France and Belgium. This forward-thinking development from the Communauté De Communes Des Deux Vallées was formed as part of a technology road map that looks into local transportation meeting very tough environmental demands while ensuring that local passengers and tourists can commute in total comfort.

The result of the venture is L'escapade, a modern and clean-running passenger boat designed by Belgium-based DN&T naval engineers at the Alumarine Shipyard in Couëron in western France.

For the construction program, Alumarine Shipyard came up with a perfect technology blend to ensure high-performance thrust characteristics for the new application while further enhancing the technical features of the Transfluid hybrid system. The result is a state-of-the-art product that ensures high levels of efficiency, safety and comfort as well as offering additional features such as high-tech navigation.

Measuring 28m in length and 5m in width, L'escapade can accommodate a total of 102 passengers at sea or 60 people during the onboard restaurant service. The boat is equipped with a Volvo D5A TA engine rated at 118kW at 2,300rpm, combined with a Transfluid HM2000 hybrid transmission and a Powershift Revermatic 11-700RBD unit with a reduction ratio of 1.88 as well as an integrated thrust bearing. The electrical power of the hybrid system is 75kW; energy is provided by Exide $FeLiPO_4$ batteries that supply the hybrid system when L'escapade is navigating in electric mode.

Development goals

As part of the project's development goals, the partners had to deliver a boat that was able to navigate the Oise at cruising speed and could also operate in near silence. The vessel also had to lend itself to different types of uses, including catering cruises and special customer events. A variety of technology solutions were looked at, but in the end Alumarine Shipyard concluded that the Transfluid hybrid system could meet all of the project's requirements.

L'escapade is able to navigate in all-electric mode and in complete silence during certain stages of a journey on the Oise. It can also call on the Volvo diesel engine as required, thus ensuring safety and an enhanced operating range, especially as the batteries can be partially recharged when the system's diesel mode is active.

Another advantage of the system is that the hybrid module enables a booster mode to be realized. In this setting, thrust of the diesel engine can be added to that of the e-motor during transitional rotation speed phases as well as complex navigation phases and maneuvering, therefore ensuring a far better and wider maneuvering capability.

The technology enables the boat to operate at a speed of 8km/h with an electric motor speed of 900rpm, which is an optimum speed setting for river sailing. At this speed, thrust consumption is around 50A. The top speed in electric mode can be reached by switching to the electric motor at around 1,800rpm. At 14km/h, power consumption is 250A. Results from preliminary tests were backed up by real-world pleasure sailing analysis that showed L'escapade is able to operate throughout the day covering two tours/journeys of around four hours each while running in diesel operation mode, with the batteries being charged during the night while the boat is berthed.

When running in diesel mode, a top speed of around 20km/h can be reached using the maximum rotation speed of the diesel engine. A cruising speed of 14km/h can be reached with a diesel engine speed of around 1,800rpm. In this scenario, propeller power is rated at around 55kW. In generator mode – essentially when the battery pack can be recharged – 35kW is consumed, enabling the diesel engine to provide a thrust that brings it to its point of highest efficiency of load applied and where the number of revolutions per kilowatt-hour is at its lowest.

This feature allows the boat to gain greater efficiency from the diesel engine since the power absorbed by the propeller is added to that of the total power absorbed by the generator while recharging the batteries. Here, it is important to note that the efficiency of the diesel engine increases when the applied load approaches the maximum thrust output during a specific speed operation, and the total sum of the two loads means that the engine can reduce fuel consumption per kilowatt-hour delivered.

Smooth delivery

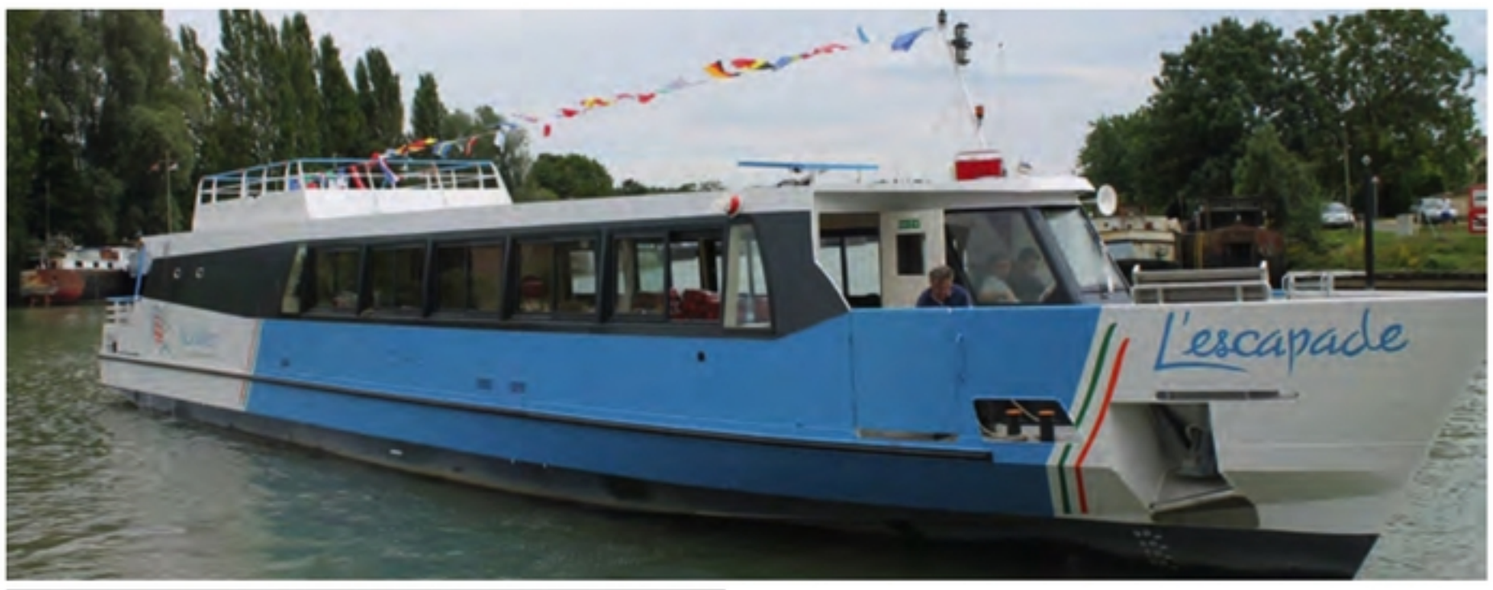
The Transfluid hybrid system fitted on L'escapade is the HM2000 model, with a 75kW rated electric engine at a rotation speed of 3,000rpm, powered by 300V DC batteries via a single frequency bidirectional drive that enables the use of the electric engine both as a motor and a generator. At the same time, the Transfluid Revermatic 11-700RBD fitted on the hybrid system ensures that thrust and power delivery are very smooth.

Such a straightforward solution, combining a hybrid transmission and hybrid marine reversing gear, is seen as a major engineering advantage by shipyards because of the ease of assembly that sees the diesel engine, hybrid system (including e-motor and batteries) and the transmission all installed without any manufacturing complexities.

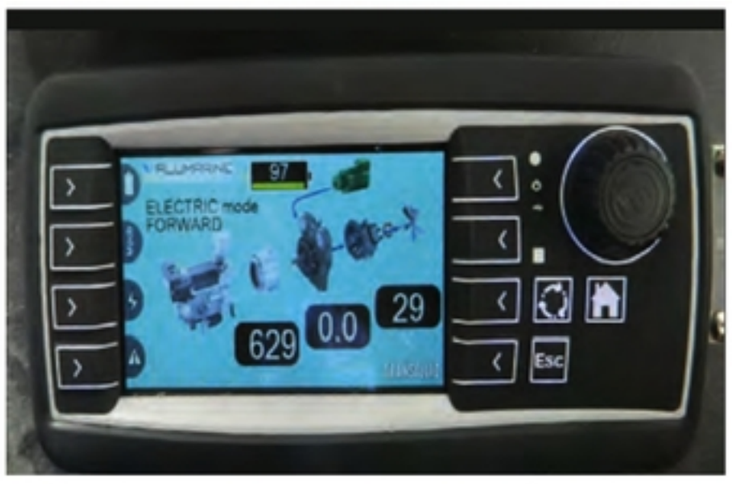
What's more, the hybrid system's interface is completely standardized, therefore enabling the shipyard to freely choose the most suitable diesel engine for a given application, and thus ultimately meeting its maximum propulsion efficiency goals.

The first impressions of L'escapade have been both encouraging and very positive. Today, commuters and tourists sail on the Oise in absolute silence, surrounded by nature and without the noise and the emissions of conventional marine propulsion technology that's loud, constantly vibrates and harms the surrounding environment.

Such positive feedback means that the future for this part of the marine sector looks bright. This new-generation technology allows operators to reduce emissions and enhance efficiency (therefore saving on overheads), while the local environment is preserved and commuters and tourists can travel in absolute comfort.



Below: Up to 102 people can be accommodated on board L'escapade at sea, or the vessel can comfortably seat 60 for its onboard restaurant service



Above: Maximum propulsion efficiency is made possible thanks to the hybrid system's standardized interface, which enables the shipyard to freely choose the most suitable diesel engine for a given application