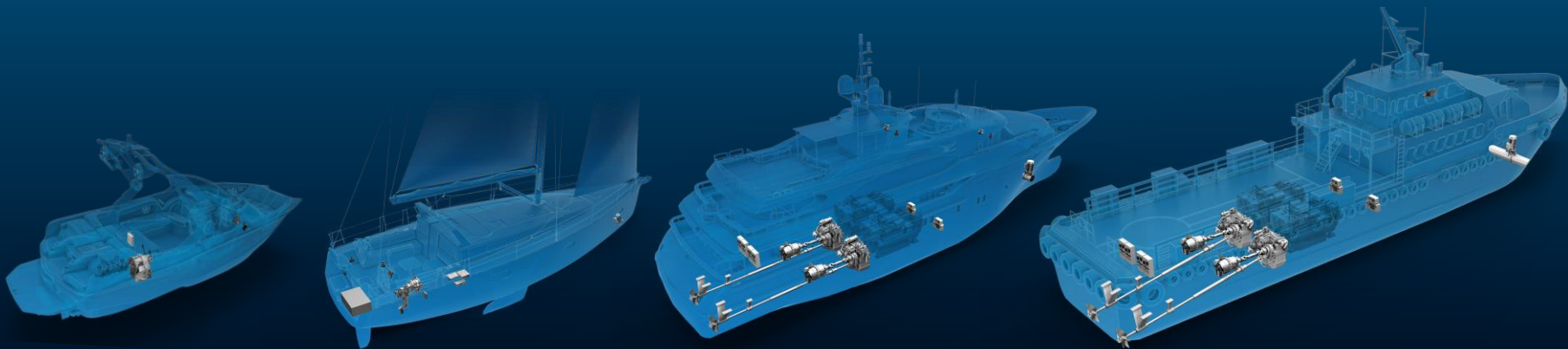




Shaping Next Generation Mobility

Marine & Special Driveline Technology



01

New Series of hybrid transmissions and hybrid system



Q: Does Driving mode mean electric drive? - genset- power electronic - el motor - azimuth. Is there such an option? Without gearbox and drive motor?

A: Electric Driving Mode only - is possible. The system is for a standard drive (genset- power electronic - el motor - gearbox, propeller)

Q: Can We update existing systems with that system?

A: Update is possible - depends on the available installation room

Q: You said that the 4th shaft solution for hybrid GB prevent limitations coming from the clutch max torque. May you better explain the reason? When diesel and E-motor are working together in boost mode the clutch shouldn't have the capacity to withstand the sum of the input torques?

A: The main input clutch does not need to take the torque of the PTI, is not the limiting factor. Other solutions (Inline) have the sum of the torque of both engine.

Q: JMS will work with the hybrid system?

A: From a technical point of view: Yes. But it is not yet available



Q: Are you going to offer a range of different gearbox ratio?

A: Up to now, we have only PTI solutions for the models, which are shown in the presentations.

Q: Will smaller gearboxes being considered? ZF2000

A: ZF2000 could be an option but it depends on the business case - means the global market requests.

Q: Do you have any plan to do re-design for other products ?

A: Yes, other models are already in discussion.



02

Intelligent transmission for 1000 hp power range



Q: Does the new controls have all approvals like DNV/GL BV etc.?

A: Yes, it does.

Q: Does this new POC valve block have emergency function for gear activation?

A: Yes, it does.

Q: Is ESGI processor replacing traditional engine & gearbox control systems?

A: Yes. In 2021 and 2022 we are going to properly manage the transition between current controls product portfolio and new generation.

Q: Is it possible to adapt the engagement characteristics to the individual application?

A: Yes. New shifting technology allows to setup different shifting parameters in order to be adapted to each application.

Q: Will gearboxes in Padova also get hybrid options in the future?

A: Several small gearboxes are already compatible with hybrid applications in sandwich configuration. PTI availability on small gearboxes has been already investigated: PTI option could significantly affect gearbox cost on such range.



Q: Will there be need of speed pick-up to control the speed of trolling of the new control system for ZF 400-series?

A: Intelligent Transmission option already include own shaft speed sensor. The ESGI processor will control with a close loop logic the output shaft rpm.

Q: How do you change the engagement characteristics? Laptop? Or is there an integrated interface?

A: Parameters adjustment and calibration could be performed both from laptop and control heads.

Q: Is it possible to control other gearbox brands with the ESGI and new controls?

A: In principle yes (especially if mechanically actuated). To be developed in a second stage.

Q: When is the electrical propulsion becoming sellable?

A: Currently we completed the proof of concept stage. In order to be sellable, the necessary industrialization investments should be put in place. In order to grant the necessary ROI for such investments a solid business case should be identified together with a potential customers.



Q: Will gearboxes in Padova also get hybrid options in the future?

A: Yes, the new ZF control platform has been developed in order to be compatible with all ZF transmissions.

Q: Can your electric system be combined with conventional shaftline FPP instead of saildrive?

A: Yes.

Q: Will ZF be supplying the "sandwich" e-motors/generators?

A: No.

Q: Can you add a number of batteries to extend the range?

A: Yes.

Q: What is the weight of 60kWh battery pack?

A: Roughly 400 kg

Q: Will you schedule technical trainings for these new systems for ZF partners?

A: Obviously.



03

ZF Thruster - New development of CRP thruster and CMS introduction

Q: Can your remote monitoring service communicate with a more comprehensive system that manages the whole boat?

A: Yes, our CMS can be included in other systems as well. Depending on the system customizations need to be taken into consideration.

Q: Is the remote condition monitor system already available?

A: Yes, the system is available.

Q: Can we have email addresses in order to contact speakers later on?

A: Yes, please contact info.zfmarine@zf.com we will make sure to bring you in contact with the right person.

Q: Question to all three. Is a special high voltage training/ certificate necessary for maintenance respective repair. Or just being a 'normal' electrician sufficient?

A: ZF Marine Krimpen for Thruster Systems: For our standard scope it is not necessary however when we also supply the electric drive system, then it is needed.

Q: Which part of the world is showing the most interest in these type of products?

A: There is a interest from all over the world for all kind of vessel types.

