Press Release

Green hydrogen production on Kite Ships – with cynapse® gearboxes from WITTENSTEIN alpha

April 22, 2024

“Energizing a sustainable industry”: WITTENSTEIN alpha makes the motto of this year’s Hannover Messe come to life very aptly – in the form of smart gearboxes from the TPK+ series with cynapse® functionality, as deployed by startup company OCEANERGY on its Kite Hydrogen Ship Prototypes and implemented for the production of green hydrogen. When wind energy is harvested for electrolyzing seawater directly on board, these power-dense, intelligent and communication-enabled hypoid gearboxes perform important functions controlling the four up to 1200 meter-long ropes of the Kite Propulsion system’s 60 square meter kite.

OCEANERGY opted for a reliable, future-proof technology comprised of robust TPK+ gearboxes and their cynapse® functionality, i.e. with integrated sensors, logic and an IO-Link data interface in the gearboxes. “These smart gearboxes will supply essential operating and status data, while the energy ships that produce green hydrogen in the six permanent oceanic trade wind zones will be smartly navigated there according to the wind forecast”, explains Ulrich Dobler of the Stuttgart-based startup’s Executive Board.

Kite Hydrogen Ship – inspired by kitesurfing

It was kitesurfing that provided the inspiration for the Energy Ships – hardly surprising in view of the fact that OCEANERGY CEO Dr. Wolfram Reiners is an avid enthusiast of this thrilling water sport. “The basic idea was to harness the forces acting on the kite that pull the kite’s ropes and convert them into electricity”, he says, recalling the early days. At the heart of the Kite Hydrogen Ship concept is the patented K1 Kite Propulsion system, which can be imagined as a green power socket for the on-board electrolysis process. The challenge for the smart hypoid gearboxes is to control the kite’s four frequency converter-driven ropes as they generate electricity during the harvesting journey by launching and pumping the kites. A large

WITTENSTEIN SE develops products, systems and solutions for highly dynamic motion, maximum-precise positioning and smart networking for mechatronic and cybertronic drive technology.

TPK+ gearbox with cynapse® functionality in use at OCEANERGY

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part of the energy that is generated in this way by the K1 Kite Propulsion system is utilized directly on board for the production of green hydrogen. “A hydrogen plant of this kind is designed to produce around 1000 tons of green hydrogen during its eight-week harvesting journey”, Dobler continues. “That adds up to a good 6000 tons per year – enough to supply about 40,000 hydrogen cars or power an Airbus for almost twelve months.” The aim of the energy ship fleet now in the pipeline is to produce green hydrogen costing just 2 euros per kilo by 2035 – in other words, significantly more economically than with any other green technology known to date.

Dynamic wind loads of up to four tons per rope – no problem for a TPK⁺ hypoid gearbox

Hypoid gearboxes from the TPK⁺ series were selected to control the four steering ropes while pumping the kite based on simulation and application data. Their right-angle design is central to the ultra-space-saving principle of the entire K1 Kite Propulsion system and its integration into a seaworthy container. These size 300, two-stage gearboxes have a ratio of i=100 and are characterized by high torsional rigidity, low torsional backlash and greater absorption of external forces. The high-quality hypoid teeth simultaneously ensure high torque and exceptionally smooth running.

cynapse® functionality enables gearbox monitoring online on the high seas

When a Kite Hydrogen Ship sets off semi-autonomously on a harvesting journey, the kites – and hence the propulsion system’s main axis – will be subjected to extremely diverse movements and forces. It was this that tipped the scales for OCEANERGY in favor of the TPK⁺ with cynapse® functionality. “Transmission functions and operating data like acceleration values can be monitored and analyzed remotely in this way on the high seas”, comments Felix Bartels, Senior Mechanical Engineer.

More WITTENSTEIN gearboxes assist wind harvesting

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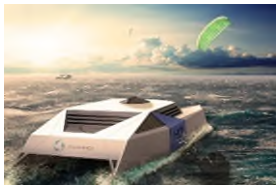
OCEANERGY not only uses smart TPK⁺ gearboxes to control the ropes but also to handle other propulsion tasks on board its Kite Hydrogen Ships with assistance from WITTENSTEIN alpha gearboxes. For instance, the manual control unit of the K1 Kite Propulsion system features a low-backlash TP⁺ planetary gearbox from the alpha Advanced Line, a compact, torque-dense NVH worm gearbox from the V-Drive Value family and two TPM⁺ rotary servo actuators. The slewing ring utilizes a torque-dense and torsionally rigid XP⁺ planetary gearbox with special output geometry as the basis for its ultra-compact, space-saving overall design.

For more information on Kite Hydrogen Ships, go to:
www.oceanergy.com

Pictures:

01-WITTENSTEIN-OCEANERGY-Einbausituation-TPKplus:
Hypoid right-angle gearboxes from WITTENSTEIN alpha's TPK⁺ series are used to control the kite's four ropes, which can be up to 1200 meters long. Photo: Andreas Kolibius (right, Sales Engineer WITTENSTEIN alpha GmbH) with Ulrich Dobler (left, CEO OCEANERGY AG). (Source: WITTENSTEIN SE)



02-WITTENSTEIN-OCEANERGY-Kite-Schiff:
Searching for a truly sustainable path to green hydrogen production, startup company OCEANERGY developed the "KITE HYDROGEN

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SHIP" technology, which allows green H_2 to be produced directly on board by harvesting wind energy and electrolyzing seawater. (Source: OCEANERGY AG)

Texts and photographs in printable quality can be downloaded from https://www.wittenstein.de/en-en/company/press/.

WITTENSTEIN – one with the future

With around 2900 employees worldwide and sales of €519 million in 2022/23, WITTENSTEIN SE enjoys an impeccable reputation for innovation, precision and excellence in the field of cybertronic motion – not just in Germany but internationally. The group possesses exceptional expertise for the mastery and further development of all technologies relevant to mechatronic drives and comprises six innovative Strategic Business Divisions. We develop, produce and sell products such as high-precision servo drives and linear systems, servo systems and motors as well as cybertronic drive systems for many areas of application including machine and plant construction, aerospace or oil and gas exploration. Nanotechnology and software components round off the portfolio. With 25 sites in more than 45 countries, the WITTENSTEIN group (www.wittenstein.de) is represented in all major technology and sales markets.

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