



— ATHANASSIOS KALIUDIS

How a small lab wants to rescue the offshore wind power industry

European offshore wind-turbine manufacturers are struggling to keep their heads above water in a highly competitive international market. A small Danish lab is hoping to come to their rescue by following in the footsteps of the shipbuilding industry: by relying on highly productive laser hybrid welding.

When it comes to prophesying what will happen in the energy industry, there's one thing experts agree on: offshore wind power has a definite role to play in the broad macroeconomic future. What's more, that role is set to become increasingly important, as demand for clean energy is growing. On the face of it, that seems like good news for wind-turbine manufacturers. So why is there such a tangible feeling of uncertainty along Europe's coastlines? Essentially, the wind-turbine sector is facing the same dilemma as many other industries: its products are unquestionably superior in technical terms, but the prices are simply too high for many customers. The problem lies in the manufacturing costs. Assembling a wind turbine remains a predominantly manual, time-consuming job – and specialized welders command very high hourly wages. That's why the industry is desperately searching for automated methods.

— **Investments in automation can pay off**

The problem is that wind-turbine components are enormous, have complex geometries and are made using materials whose thickness in millimeters starts in mid-range, double-digit territory. Faced with that kind of challenge, even automated systems end up being too complex and costly. European wind-power companies have so far balked at making such huge investments. But all that might soon change: a small company in the Danish town of Munkebo is hoping to allay manufacturers' fears by showing them how investments in automation can pay off in the long term. The Lindø Welding Technology (LWT) institute is a subsidiary of Force Technology, a technology consulting company. A project manager at LWT, Steen Erik Nielsen is responsible for innovative welding technologies. He doesn't regard either himself or his colleagues as researchers: "We leave it to other people to tackle the basics," he says. "Our goal is to deliver tangible results to manufacturers." In the case of wind turbines, his approach is modeled on a very specific example: shipbuilding.



— Laser hybrid welding already saved the shipbuilding industry

Around 15 years ago, European shipyards were in the same situation as wind-turbine manufacturers find themselves in today: they were stuck using expensive, manual manufacturing methods, and global competitors were breathing down their necks. One by one, the European shipyards fell by the wayside; the last remaining shipbuilders frantically searched for something that could save them. They changed their mindset, welcomed the laser into their production halls - and have managed to stay afloat. "Laser hybrid welding played a crucial role in achieving that," says Nielsen. "We were able to show that it works and fits the bill of cost-effective automation. That helped us get it certified as an application method, and now laser hybrid welding is in widespread use throughout the shipbuilding industry." The idea now is that laser hybrid welding could also save the European wind-turbine industry. Over the past five years, Nielsen and his colleagues have completed four projects funded by the Danish government that focused on various parts of the manufacturing process. "As far as laser power goes, we have plenty of resources to draw on," says Nielsen with a smile. LWT's cutting-edge 32-kilowatt laser system delivers enough power for materials of just about any thickness. In addition, it can produce welds up to 25 millimeters deep in a single pass. Two 200-micrometer fibers connect two 16-kilowatt TRUMPF disk lasers to a laser welding head, which is positioned on a robot arm together with the arc-welding system. "With this set-up we can demonstrate the hybrid process very realistically," says Nielsen. "The absence of technological limitations means we can focus entirely on process design."



Now two defenders of the European wind turbine industry are hoping to repeat that feat: project manager Steen Erik Nielsen and technician Jørgen Thomsen from Force Technology/LWT. Photo: Kasper Fladmoose



Technician Jørgen Thomson from Force Technology wants to rescue the offshore wind energy industry through laser hybrid welding. Photo: Kasper Fladmoose



Welds up to 25 millimeters deep: Force Technology /LWT engineers use a 32-kilowatt laser to demonstrate laser hybrid welding processes for the maritime and the offshore wind turbine industries. Photo: Kasper Fladmoose



The nodes are a crucial part of the underwater lattice structure that supports a wind turbine. It takes several days to make one of these by hand - but the method developed by Force Technology / LWT gets the job done in just a few hours. Illustration: Gernot Walter



Die zwei Kämpfer für die Windkraftindustrie in Europa, wollen den Trick wiederholen: Projektmanager Steen Erik Nielsen und Techniker Jørgen Thomsen von Force Technology/LWT. Foto: Kasper Fladmoose

— Only two instead of ten welding passes necessary



