

Offshore Wind Validation Centre – Technology Transfer project case study: Alnmaritec

A great example of the breadth of support available under the Offshore Wind Validation Centre – Technology Transfer (OSWVC-TT) project can be found in the case of Alnmaritec.

The Blyth-based company builds boats for commercial applications all over the world. From patrol boats for Middle Eastern oil fields to pollution control boats in service in Barbados, Alnmaritec has designed, built and supported the use of more than 160 craft.

Its boats are manufactured using marine-grade aluminium alloys. Strong, light, resistant to corrosion and more likely to deform rather than just break on impact, aluminium has numerous properties that make it an excellent choice for boatbuilding. It can, however, be difficult to weld.

Alnmaritec carries out the majority of its structural welding using the metal inert gas (MIG) shielded process, with the tungsten inert gas (TIG) shielded process used for thinner parts. Although these manually applied gas shielded arc welding processes are effective, they can take considerable time and the aluminium alloy panels are sometimes affected by heat distortion.



The company contacted the OSWVC-TT project to see if there were improvements it could make to its joining methods that would lead to efficiency gains. It sought guidance in three distinct areas: improving its fusion welding processes, exploring the use of

friction stir welded parts, and using adhesives for some of its joining applications.

Funded by the European Regional Development Fund and Middlesbrough Council, the OSWVC-TT project, which finished at the end of 2015, offered free, in-depth technical consultancy to engineering and manufacturing companies in North East England. The support was delivered by TWI, a research and technology organisation specialising in materials performance, structural integrity and, primarily, welding and joining.

Practical help from experienced welding engineers

TWI Principal Project Leader Colin Eileens visited Alnmaritec's premises in autumn 2014 to assess current welding practices and suggest areas in which they could make improvements. Following a tour and discussions with Alnmaritec staff, a programme of support focusing on three discrete areas was agreed.

TWI would help Alnmaritec commission two mechanised linear seam MIG welding systems the company had recently acquired, which would coincide with the development of preliminary welding procedure specifications that would provide a platform for subsequent welding procedure qualification tests.

Alnmaritec staff use visual and dye penetration inspection (DPI) methods on welds. TWI agreed to write a DPI procedure, authenticated by a PCN Level 3 technician, to guide them in their work.

Finally, TWI would visit Alnmaritec to deliver 'toolbox' knowledge transfer sessions to fabricator welders at the company. These would cover topics including the fundamentals of MIG and TIG welding processes, considerations for working with aluminium and ways to minimise distortion.



Out with the old, in with the glue

Although Alnmaritec was already making use of adhesives when it contacted the OSWVC-TT project, it was only doing so to a very limited extent. To establish whether it could use them more widely, and increase its understanding of adhesives technology, it sought the advice of TWI adhesives specialist Ewen Kellar.

Using adhesives in place of welding can reduce manufacturing time and costs, eliminate structural distortion resulting from heat input and greatly reduce the energy costs of manufacturing.

Fire regulations mean that a craft fabricated exclusively using adhesive bonding would not pass safety tests, but a boat's wheelhouse structure is not subjected to such stringent regulations. Using adhesives here would be particularly beneficial, as it would avoid heat distortion from welding and allow the use of thinner material. This would reduce the weight of a relatively high part of the boat and lower the centre of gravity, improving safety and stability.

TWI agreed to deliver a package of support to Alnmaritec to help them explore this avenue of manufacture. First, it would identify up to four suitable adhesives for the job. Then it would establish pre-treatment processes for the aluminium to be bonded, ensuring maximum bond durability. The design of the wheelhouse would be reviewed and suitable joint geometries selected. Finally, TWI would help Alnmaritec identify suitable jiggling systems to ensure parts would be properly held together while the adhesive between them cured.

The benefits of solid-state joining

The third branch of support delivered to Alnmaritec under the OSWVC-TT project focused on the potential advantages of the company adopting friction stir welding (FSW). Joints made in aluminium using this method avoid many of the pitfalls of fusion welding, and the marine industry was one of the very earliest adopters of the technology after it was invented by TWI in 1991.

An FSW specialist from TWI initially visited Alnmaritec to evaluate the feasibility of the company adopting FSW as a fabrication method. Finding that it was technically viable, he worked with Alnmaritec to identify a suitable initial application, settling on the stiffeners attached to the underside of a craft's deck plates.

When the specialist returned several months later he found that Alnmaritec had begun buying prefabricated FSW panels to use in its boats. To support the company's ongoing use of FSW parts, TWI provided a range of information comprising details of potential FSW subcontractors and panel suppliers, FSW training courses available at TWI and onsite FSW contract services.



The consultation left Alnmaritec fully informed and well placed to exploit FSW technology in the fabrication of its boats. TWI pledged to provide further support to the company in this area should it be required.

In total, the support delivered to Alnmaritec in these three areas by the OSWVC-TT project has already led to the creation of five new jobs, and the safeguarding of a further eight. The company is now in a position to improve its manufacturing processes and increase its competitiveness.

Alnmaritec is one of many companies to have received support under the OSWVC-TT project, which came to an end in December 2015. For more information about the programme visit www.twi-global.com/oswvctt.

