

Aluminium innovation gives stronger and lighter ship hulls

Sapa has installed at its plant in Finspång, Sweden the largest friction stir welding (FSW) machine in Europe and one of the largest in the world. The new large-scale FSW machine offers single-sided and double-sided welding of aluminium profiles with material thicknesses up to 16 mm, produced as 18 by 3.5-meter panels. The panels can be produced curved as well as flat. Increasing panel length by nearly 30 percent, as well as adding another half-meter in width, helps the marine industry reduce the number of components used in the production of large hull structures, compared with today. This reduces assembly time and cost spent in other areas, such as quality certification. It will become fully operational in October.

Sapa is introducing to the marine industry super-large and light friction stir welded panels extruded with the marine-dedicated 5083 aluminium alloy. This new combination will enable shipbuilders to manufacture stronger hull structures while saving costs. The 5083 alloy is a proven high-strength alloy for waterline applications. Never before has this alloy been joined in this way into panels as large as 18 meters in length and 3.5 meters wide. FSW joins flush metal surfaces through the effects of a rotary tool, pressure and heat. No filling is needed, and FSW provides better properties and less heat deformation than other forms of welding. Double-sided welding is faster and generally produces higher quality results than single-sided welding.

“Using our extrusion technology for 5083 marine-grade profiles, alongside our friction stir welding techniques, we help shipbuilders improve the quality and construction efficiency of their vessels. Our ability to join thin-walled lightweight designs into large panels will make a big difference in the marine industry, where such sizes are best suited, and where cost and lead time savings are key,” says John Thuestad, executive vice president responsible for Sapa’s extrusion organization in Europe.

As the first company in the world, Sapa introduced friction stir welding in 1996 to enable a process of solid-state joining as a production method. The method drastically advanced Sapa’s production and has brought to life new applications for customers the world over. FSW generates less heat and therefore less distortion than traditional welding. Unlike MIG-welded parts, extruded sections maintain their straightness and flatness throughout the FSW process. As a result, the weld zone maintains a higher proportion of the original mechanical properties.

Aluminium reduces weight and cost

In the marine industry, weight saving is also one of the levers for reducing cost. It has a direct impact on transportation cost as well as cost and time for installation and decommissioning. The marine industry use aluminium extrusions commonly in structural applications, such as hulls, decks and superstructures. In this area, Sapa develops and delivers machined, pre-assembled and finished components using its extrusion technology and friction stir welding techniques.

Aluminium is significantly lighter than steel, but without sacrificing strength, and it can improve structural quality and efficiency. It can cope with heavy structural loads and hostile environments, and the qualities of extruded component design provide high torsion resistance. Furthermore, aluminium does not get brittle even with the lowest possible temperature, outperforming steel by far. In the right alloy, aluminium also forms a natural oxide layer that protects the material from corrosion.

About the 5083 aluminium alloy

The 5083 alloy meets stringent technical requirements and is the material of choice for marine hull structure applications. Compared to 6xxx-series alloys, it has a better base material to post-weld strength ratio, which makes it easier to weld, since it needs less heat input, and more predictable in terms of post-weld strength. The 5083 marine extrusions excel in corrosion resistance in a salt-water environment and therefore are particularly suited for applications in the waterline area.

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