

ESAB Customizes Automated Roll Build-up System For 83 ft.-long Marine Propulsion Application

- Proven process developed for steel mills adapted for propeller shaft cladding.
- Simple, reliable, accurate side-beam system reduces repair time by 70 percent.
- Yard also adds tractors with quick-change heads for SAW and gouging.

Situation

A Washington State shipyard working on large (50-ton, 80+ ft.) propeller shafts contacted the ESAB automation team because it struggled to obtain consistency with older shaft weld overlay (“cladding”) systems that were highly dependent on manual input.

Complication

This yard had some of the most exacting quality requirements ever encountered by the ESAB automation team. Further, the alloys involved are especially heat sensitive and expensive (they can contain manganese, chromium, nickel, molybdenum, columbium and vanadium). Excess heat input can deflect the shaft or degrade metallurgical and mechanical properties, reducing service life.

Solution

ESAB installed a shaft build-up system that featured the LAF 1001 power source and a side-beam mounted heavy-duty welding head and completely enclosed flux feed and recovery system to deposit 1/8-in. diameter high alloy wire. The welding head can make a weld up to 88-in. long on shaft diameters ranging from 4 to 48 in. The shafts rest in two sets of roller beds with a motorized lead roller and a non-motorized follower; the bed can turn shafts weighing up to 60 tons (other rollers can handle up to 135 tons).



BENEFIT #1

Proven Technology

ESAB developed and perfected its shaft build-up systems because of the need for weld cladding on continuous caster rolls and run-out table rolls in steel mills. When the Washington State shipyard contacted ESAB, the automation team was confident it had a robust solution with its side-beam system and the proven PEK controller to coordinate weld head movement, drive roll rotational speed (with encoder feedback) and the welding process.

Propeller and rudder shafts (typically made from a marine-grade base material such as 316 stainless or Monel® 400) come into the yard because they have excessive wear, typically in bearing and seal contact areas, or they have been damaged by crevice corrosion or stray current corrosion. When the wear becomes too deep or irregular, the shaft is removed from service, machined down, built-up with a high-alloy overlay wire for enhanced wear and corrosion resistance and then machined to tolerance.

Due to the complications of positioning a 50-ton shaft, moving it back to the roller table for automated welding rework incurs “astronomical” costs. The alternative is to repair using a manual or semi-automatic process, which increases variability, something the yard largely all but eliminated by switching to ESAB.

Further benefitting the yard, he explains that the ESAB system is easy to run. All the welding and movement parameters are programmed into the controller, so the operator basically has to position the weld head, push the start button and monitor the process.

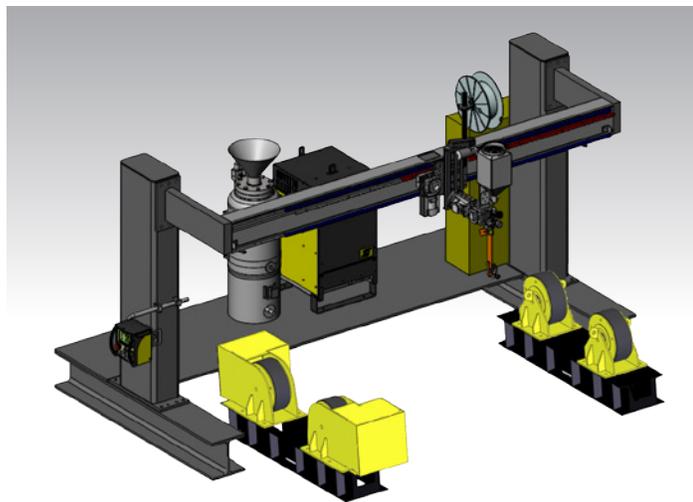
Overall, Searels estimates the ESAB solution reduced repair time by an estimated 70 percent. Because of this success, the shipyard has added a second cladding system and will soon add a second set of rollers.



BENEFIT #3

A2N Custom Tractor for SAW & Gouging

In addition to propeller shafts, the shipyard needs to repair plate up to 3 in. thick. As is common when welding thick plate, weld procedures require back-gouging to ensure 100% penetration. To improve productivity, the shipyard purchased four A2N Multitrac welding tractors with two heads each: one for single-wire SAW and a specially modified Arcair® N7500i head for carbon arc gouging. The A2N Multitrac allows an operator to weld one side of the plate with the submerged arc welding process, flip the plate over, switch to the gouging head in about five minutes and then back-gouge the weld. After another quick change to the welding head, the operator then completes the joint.



BENEFIT #2

Quality, Consistency and Simplicity

“The acceptance criteria for this cladding application were the strictest I’ve seen,” says ESAB Automation Specialist Shane Searels, who has 11 years of cladding experience. “That’s why the quality and repeatability of our solution was essential, as no manual operator can match the consistent overlay thickness or heat input control of an automated system.”



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