TECH NEWS

ONE LAYER AT A TIME

REINVENTING THE REPAIR SERVICE APPROACH: WAAM

ANDRITZ has been working hard behind the scenes with the latest technologies to revolutionize the approach to repair of expensive cast parts in the pulp and paper industries. Now, utilizing Wire Arc Additive Manufacturing (WAAM), it is possible to dramatically shorten the cost of heavy cast equipment repairs, shorten downtime, and improve environmental performance.

Metal 3D printing with welding robot

In an industry where heavy-duty equipment operates under extreme mechanical stress, high temperatures, and corrosive conditions, the pulp and paper sector has long accepted that large cast components will eventually crack and require expensive replacement. ANDRITZ is now challenging that assumption with Wire Arc Additive Manufacturing (WAAM) – a hybrid technology that combines conventional manufacturing with precise robotic 3D metal printing to repair what was previously considered unusable and destined for the scrap heap.

WAAM uses a robotic welding system to deposit material in very small, controlled layers rather than traditional large weld pools. This layer-by-layer approach eliminates the residual stresses and cracking that plague conventional repair welding.

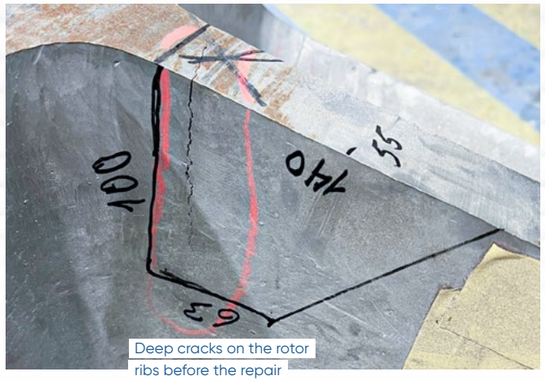
Mikko Wiren, Service Manager at ANDRITZ, has overseen the development of the technology for the past five years. "The big difference from traditional welding is that the software allows the repair to take place in small sections," he explains. "You don't have the usual large pool of liquid metal going into a mold. Instead, you print very, very small pieces, layer by layer."

The result is material properties that match and, in some cases, exceed those of the original material. Extensive university and independent laboratory testing has confirmed equivalent or superior yield strength, impact strength, corrosion resistance, and freedom from pores or cracks.

ECONOMIC SAVINGS OF UP TO 50% – REPAIR TIMES DRAMATICALLY REDUCED

The most compelling demonstration of WAAM to date involves the repair of a rotary valve rotor used in pulp mills. These large, approximately 1.5-tonne components feature a final layer of extremely hard welding material, which is prone to cracking under operational loads. Traditionally, deep cracks meant scrapping the entire rotor and ordering a new cast replacement costing typically around 100 KEUR with lead times of six to seven months.

Using WAAM, ANDRITZ technicians removed the cracked sections of the ribs and rebuilt them layer by layer using robotic technology. "We removed a bigger part of the rib and started printing it back," says Wiren. "With gradual layers, there is no build-up of tension as in conventional repair welding."



Deep cracks on the rotor ribs before the repair

The repaired rotor was returned to the mill and has now been running successfully for over a year, proving that the repair method worked well.

The economic and operational benefits are significant. Repair costs are typically a fraction of a new part – representing savings of more than 50%. Turnaround time is reduced from six or seven months to roughly one month. "Instead of investing in a new cast piece, more than half of the cost can be saved by repairing the original," Wiren confirms.

SUBSTANTIAL ENVIRONMENTAL GAINS

Beyond cost and speed, WAAM delivers substantial environmental benefits. A detailed life cycle analysis by Savonia University of Applied Sciences compared repairing 50 kg of material on an existing rotor versus manufacturing a new 1.5-tonne cast part. The repair route dramatically reduces raw material use, energy consumption, and CO_2 emissions. Even when using fossil-based electricity, the carbon footprint is far lower; with green electricity, it is lower still.

Wiren emphasizes the sustainability angle, "The environmental benefits are clear to see when comparing the carbon footprint; melting one tonne of steel takes a huge amount of electricity. By adding material to the old piece instead of starting from scratch, we avoid that entirely."

The technology is currently utilized at ANDRITZ's workshop in Savonlinna, Finland, but the company sees broader potential. Because WAAM is essentially digital, future applications could include sending repair files electronically and performing work closer to customer sites, further reducing logistics, emissions, and downtime.

FROM THROWAWAY TO CIRCULAR

For pulp and paper producers facing ever-tighter sustainability targets and pressure to minimize waste, WAAM offers a practical way to extend equipment life while cutting costs and the carbon footprint. It turns a throwaway approach into a circular one.

Wiren sums up the philosophy behind the innovation, "In our industry it has been too easy to say, 'You need to buy a new part'. Now we have to think outside the box. How about if it's not 100 KEUR, it's 10 KEUR to 15 KEUR and we don't scrap it?"

As mills worldwide seek more resilient and responsible maintenance strategies, WAAM is proving that advanced repair is not only possible – it is already delivering results in daily operation.

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Repaired rotary valve rotor using WAAM