Cool welding technology heats up industry

Joining forces to extend lifespan of cathodic plates

The standard lifespan of cathodic aluminium plate conductors is 12 to 18 months, due mainly to a loss of effectiveness from corrosion and wear. Used in the mining industry, these plates are essential to electroextraction operations when separating zinc from a liquid solution of the ore.

Faced with frequent part replacement and the rising cost of aluminium, Quebec-based Soudures J.M. Tremblay (SJMT) was determined to find a cost-effective way to extend the life of their cathodic plates through either repair or refurbishment. With over 25 years of experience in the manufacturing industry, they were no strangers to coming up with imaginative solutions.

But following attempts to repair the plates in-house using a conventional arc-welding process, during which the high heat input would distort the cathodes, SJMT turned to the National Research Council (NRC) and an eco-friendly solution known as friction stir welding.

Bonding for success

Unlike traditional arc-welding methods, friction stir welding (FSW) uses a non-consumable rotating tool to continuously join two surfaces without melting them. In doing so, it minimizes the heat input and eliminates the resulting distortion in the assemblies, an ideal outcome that would effectively allow SJMT to restore their cathodes and double their lifespan.

With a solution in-hand, SJMT was also introduced to robotic FSW, an innovative process that employs a robotic platform to automate welding and repairs. And while global robotic FSW research has typically been limited to a lab environment, NRC's new control technologies offered SJMT an opportunity to deploy a 3D solution directly to the production floor.

Seeing an opportunity for SJMT to grow, NRC linked the company with its Industrial Research Assistance Program (IRAP), where the company was able to receive financial support and business advice from Industrial Technology Advisors, including one with extensive experience in the welding field.

“The technical and financial support from NRC-IRAP has allowed us to grow and further develop our business," says Gail Comeau, Project Manager at SJMT.

After successfully determining robotic FSW to be a feasible approach to repair their cathodes, , the partners embarked on an ambitious project to develop, build and test an automated FSW workcell with a rail-mounted industrial robot that could refurbish cathodes at a higher production rate, helping SJMT to not only secure their market share, but to diversify it.

Automating the future

Following five years of research, development and testing, the partners can now celebrate a fresh approach to welding automation. Born out of necessity, this innovative robotic FSW technology, one of the first such applications in the Canadian manufacturing sector, has increased SJMT’s production efficiency and capacity far beyond its initial expectations.

“Within two months of installation, we refurbished more than 3000 cathodes. The deployment of automation elements reduced production time by 80 percent and labour intensity by 50 percent,” adds Comeau. Beyond these impressive numbers, primary and scrap metal waste has been reduced by 35%, while the lifespan of the cathodes has doubled.

With the teams successfully working together to share knowledge, facilities and passion for their work, the outcome has provided a Canadian company with many of the essentials it needed to innovate, adapt and compete. In addition to having quickly moved from the initial lab concept to the manufacturing floor, the technology has already attracted the attention of the mining, transportation and aerospace sectors, helping to galvanize support for innovation and ensure it a solid future.