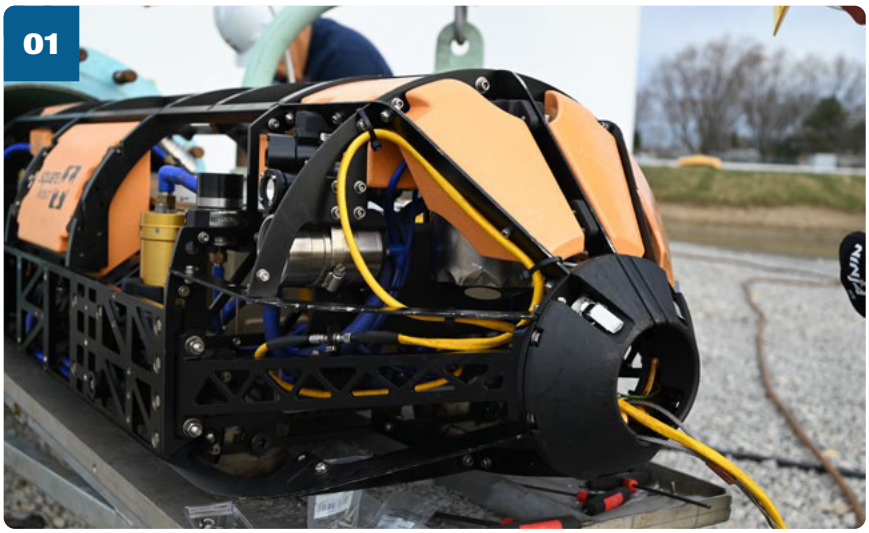
FROM MANUAL TO MECHANICAL

Tank Storage Magazine looks at how drones, robots and automation are promoting safer and more efficient inspection methods

DRONES AND robotics are fast becoming a preferred option for tank maintenance. Whether it's robots entering confined spaces, crawlers cleaning the sides, or drones running the show when it comes to monitoring and inspections, terminals are increasingly turning to equipment like this to reduce risk and asset downtime. Robots that can be submersed in hazardous materials and map out the structure of a tank, all while keeping an eye out for corrosion under insulation (CUI) and other maintenance issues help shorten inspection cycles and keep tanks in service – meaning less hassle for the operator.

'Inspection cycles that traditionally require weeks or months are reduced to days,' say Ross Jarvis, technical director at Square Robot, a technology and services company that designs and manufactures autonomous submersible inspection robots for aboveground storage tanks. 'Operators maintain throughput, gain higher-density corrosion and settlement data, and receive standardised digital datasets that support predictive maintenance and risk-based inspection planning.'

Square Robot's submersible systems have been proven in the field – and awarded often at the Global Tank Storage Awards in the past few years. The robots perform on-stream inspections of aboveground storage tanks while they remain full and operational, autonomously navigating tanks containing gasoline, diesel, jet fuel, renewables, and other products. The data collected during these sessions is immense – phased-array ultrasonic data, tank-bottom elevation and settlement mapping, and internal visuals. This approach allows terminal operators to maintain operations, stay aligned with API 653 and EEMUA 159 requirements, reduce downtime, eliminate confined space entry, and avoid emissions associated with draining and cleaning.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Drone-based systems can achieve a similar data output, without having to put anything in the tank at all. 'A tethered drone, such as our Scout 137 Gen 3, can inspect for hours in one continuous session, covering large surfaces while collecting visual, positional and UT data at the same time,' explains Eivind Sivertsen, marketing director at drone developer ScoutDI. 'Terminals avoid erecting scaffolding, reduce permit and safety requirements, and can complete inspection tasks with a smaller on-site team. The digital workflow also makes review and reporting more efficient.'

KEEPING TANKS ONLINE

For terminals to maximise theeir financial output and save valuable time, it's crucial that operations can continue as normal while an inspection is underway; as much as possible. For terminals, performing an inspection whilst the tank is still in operation means there is no financial loss associated with taking the tank offline, no logistical planning in where to put the product in the meantime, and much less human and environmental risk from emptying and filling the tank. The reliance on separate subcontractors for product transfer, venting, cleaning, coating removal, inspection, repair, and repainting results in elevated costs and significant downtime.

Kayihan Gundogdu, technical manager

PRIORITISING SAFETY

Since 2000, Gerotto has been the reference in Italy for the sale of suction excavators and industrial vacuum cleaners in construction, remediation and industrial cleaning. Daniel Devò, export sales manager, says: 'No-man entry robots are the go-to technology if you want to have the highest level of safety. The main goal is to save lives, and the only way is to keep people outside of the 'line of fire'.

Gerotto's robots are used primarily used for cleaning operations inside confined spaces and hazardous area, and are ATEX Zone 0 and IECEX certified, fully remote controlled and fully hydraulic. 'The main task of these machines is tank cleaning, and this can be done connecting the robot to a suction unit (vacuum truck) or a pump that can be mounted on board of the machine or positioned outside the tank.'

AUTOMATING EPC WORK

Red-D-Arc provides a comprehensive portfolio of welding automation equipment that is well-suited for the fabrication and maintenance of large-scale cylindrical structures like storage tanks. The company uses automation to help create a smarter, safer and more valuable workforce at the terminal. It allows for the welder's role to shift from being a strenuous, hands-on operator position to becoming a highly skilled automation specialist.

Delano Cline, product manager of Weld Automation at Red-D-Arc says: 'This transformation is achieved through upskilling where the automated equipment, like an Automatic Girth Welder (AGW), handles the repetitive, physically demanding and often hazardous work creating the freedom for a human worker to focus on more sophisticated tasks, such as problem-solving, quality assurance and system optimisation.'

These automated systems can also be integrated with tank inspection data. 'The Non-destructive testing (NDT) report on an ageing tank will be directly imported into the automation system, which will then prescribe and execute the repair procedure autonomously, minimising human intervention and maximising precision,' Cline notes.

'Robotic inspections keep tanks online during integrity assessments, eliminating downtime, temporary storage, and waste streams tied to draining and cleaning.'

at AIS Field, explains: 'The traditional tank maintenance process requiring tanks to be emptied before inspection, creates significant financial, operational and safety challenges. On average, one tank maintenance can cost $500,000-$2,000,000 (€430,000-€1,700,000) and require over 1,500 confined-space manhours, along with considerable emissions and waste generation.'

AIS Field's RUVI OilDiver enables in-service inspection, reducing downtime to zero, minimising safety risks and cutting overall maintenance costs, while allowing continuous operation of storage assets. Square Robot's Jarvis adds: 'Robotic inspections keep tanks online during integrity assessments, eliminating downtime, temporary storage, and waste streams tied to draining and cleaning. To date, Square Robot has eliminated 200,427 confined-space entry hours by enabling on-stream inspections.'

LEARNING THE LIMITS

Naturally, there are some limitations and challenges in adopting robotic inspection technologies. Gundogdu from AIS Field highlights this: 'From a development perspective, creating reliable systems for harsh, explosive and contaminated environments requires careful sensor selection and robust design, which can be technically demanding.'

Plus, not every tank is suitable for this type of inspection. In the case of Square Robot, Jarvis explains: 'Robotic inspection is limited by tank design, product type, and cleanliness requirements. Our robot requires a 24-inch roof or shell manway for entry and an abundance of sediment can impact the quality of PUAT data.' This is also the case with ScoutDI's drones, as Sivertsen notes: 'Some tanks with strong air currents, steam or very small entry points may not be suitable.' Surfaces with heavy product residues may require pre-cleaning, and dense obstructions can limit flight paths.

There's also the challenge of actually implementing these technologies on a larger scale. 'Adoption within large, established oil and gas or petrochemical companies can be slow due to the sector's conservative nature, strict regulations and bureaucratic approval processes,' says Gundogu. For ScoutDI's drones, the UT method still requires trained operators who understand ultrasonic readings and how to validate signals. 'In general, drones complement existing methods rather than eliminate them,' says Sivertson.

While the existing workforce is slow to adopt these technologies, the new workforce may actually be swayed by the likes of drones and robots. Gerotto's Daniel Devò, export sales manager, explains: 'Robotics has proven to elevate the productivity of the operations compared to manual labour – especially as they can work 24/7 without shifts. But we are now also facing a phenomenon that is 'employee scarcity'. Less and less people want to do dangerous jobs, and the problem is the same all over the world. However, robotics can help service providers and contractors to keep productivity high, fulfil client expectations and maybe even get young people interested in the sector.'

For more information:
www.aisfield.com
www.gerotto.it
www.red-d-arc.com
www.scoutdi.com
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01 Square Robot's SR-3HT C1D2-certified submersible robot

02 RUVI OilDiver being deployed through the top manhole for in-service inspection of a naphtha storage tank