



Sophisticated Robotics for Challenging Pipe Inspections

NUCLEAR SERVICES



Customer: Undisclosed

Project: Piping Cleanliness Inspection

Location: United States

Services: Engineering, Design, Field Service

for the project were exceeded with visual particle detection capabilities and the ability read laser measurements from a polished surface with an accuracy of .015"

A solvent spray system was also developed to help remove tape or particle residue left behind from construction. Once applied, the solvent and debris were removed via a suction system that captured and stored the anomalous material for further examination in a laboratory.

The Challenge

Within specific nuclear systems, piping cleanliness is of paramount importance. So much so, that even dust particles as small as approximately .006" could be severely detrimental to the system.

Rolls-Royce was approached to provide a remote inspection and retrieval solution to service 40 feet of high regulation piping. The robotic system was given 26 different functional specification requirements to work to which included:

- 360° in pipe rotation
- Ability to detect particles as small as .006 inches
- Foreign object removal capabilities
- Multiple contingency end effectors including vacuuming and scraping
- Variable pipe ID range from 16" to 21"
- Traverse vertically and horizontally
- Laser measurement capabilities with a tolerance of ± 0.015 inches

The Rolls-Royce Solution

To answer this challenge Rolls-Royce developed a sophisticated robotic workhorse. Named the Navigator, the system was built, tested and qualified to meet all 26 functional specifications required by the customer. In some areas, particularly visual particle detection size and laser measurement tolerances, requirements

Scope of Work

- Develop and demonstrate a prototype system based on prior civil nuclear tooling technology
- Perform a detailed re-design, manufacture and test of the prototype robot in accordance with a listing of detailed and challenging functional requirements.
- Deliver a fully tested, qualified production robot, ancillary equipment and related deliverables to perform a 100 percent visual inspection of designated piping systems.

Customer Benefits

- The use of robotics to perform final pipe cleanliness verification, in lieu of the direct human eye, facilitated significant changes to the shipbuilder's construction sequence resulting in significant savings in ship construction schedule and cost.
- The developed tooling along with a highly trained inspection crew are now fully capable and qualified to provide 100% objective visual evidence to address technical challenges of the future.



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