Snapshot Report

Robotic X-Ray Cable Trials

Robotic X-Ray Cable Dynamic Stress Testing Trials

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Prepared by
Allan Miranda

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Project Description

X-Ray driven technological solutions for beef and lamb automation are currently designed with fixed X-Ray solutions. In addition to this, similar existing X-Ray technologies for the detection of metal, fat/lean trimming and QA are also fixed X-Ray in nature. As a result, there is a gap in knowledge around how dynamic and moving X-Ray installations can be done while ensuring an adequate lifetime for the X-Ray cables being used, to ensure that the ongoing maintenance costs of moving X-Ray installations do not cause barriers to adoption.

This study involved performing stress testing of a high-voltage X-Ray cable using a robot moving through expected paths, at required speeds for a high-demand application. The robot was programmed to carry out multiple path profiles in order to stress the cable through its expected real world use case.

Project Content

This project involved the following critical stages: -

- Design conceptualisation of the trial assembly which would allow us to assess the feasibility and design requirements for reliably x-ray scanning on a robot.
- Design and fabrication of the trial setup to allow for the assessment of cable stress as a robot emulates the various intended scan paths.
- Procurement of parts required to carry out the trials – including robot, high-voltage x-ray cable etc.
- Program several robot moves to simulate the various scan paths at various speed profiles. The robot would go through these moves for multiple cycles throughout the course of the trials.
- Breakdown and assessment of the X-Ray cable by the manufacturer to inspect for any significant damage.
- Analyse trial results to assess feasibility of dynamic x-ray scanning, which moves can/can't be made, and what design considerations apply.

Project Outcome

Upon carrying out the destructive examination of the X-Ray cable after being stressed through multiple cycles to determine whether any significant damage was noticed in any of the internal layers of the cable, we found that: -

1. Cable assembly received at the manufacturer site and inspected for any visual damage. Some minor scuffing marks were visible on the outer PVC which is typical during install/handling.
2. The cable PVC jacket was then removed to inspect for any damage on the PVC or the braiding itself. Upon inspection, normal braiding imprint was visible on the inside circumference of the PVC jacket. No broken strands were found in the braiding layer as well.
3. The braiding layer was then removed to inspect whether any damage could be noticed on the semiconducting tape. There was no surface or "thru" damage found on the tape. When the tape was removed by force, it was visible that the original bonding was still intact.
4. Finally, the inner core fillers, bare inner core conductors and insulated inner core conductors showed no signs of stress, blistering, elongation, or abrupt bends (kinks).

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Benefit for Industry

The main purpose of these trials were to assess the feasibility and design requirements for reliably X-Ray scanning in a dynamic application. Understanding the maintenance requirements and service costs for such a system was critical to ensure we wouldn't create a barrier to implementing this technology. In order to achieve this goal, the project involved performing stress testing on a high voltage x-ray cable using a robot going through the expected paths and at the expected speeds for a high demand application. After going through a large number of cycles, the cable was ready to be assessed for any damage.

Carrying out the detailed assessments allowed us to gain a greater understanding of the maintenance and service life implications the processors would likely experience throughout the course of the systems operation. The testing would allow us to highlight any preventative maintenance requirements for the system and also quantify the running cost for the customer, which can be a barrier to adoption in the industry. Additionally, design solutions can be implemented to mitigate any significant damage noticed during the trials.

From a ROI perspective, using a robust and fit-for-purpose X-Ray cable is critical, especially due to their cost and function in the wider scope of our system. If the cable fails during operation, it could lead to downtime which in turn could mean significant cost implications for processors. Thus, these tests were deemed critical to assist with the adoption of the technology in the industry.