

Robotic Purge Dam Investigation to Improve Pipe Welding Efficiencies

CEEDWA

Monadelphous

Research Brief



TOGETHER WE DELIVER

There is a business need to improve how the Engineering Construction (EC) division installs and removes welding purge dams on applicable projects. As an example, stainless pipe welding requires the weld section of the pipe to be flooded with an inert gas to ensure the welding operation is successful. This is currently completed with foam dams attached to ropes and hoses for removal and gas supply. This results in having to sequence welding, increased risks of rework, and the risk of leaving the purge dam inside the pipe.

It hypothesised that EC could develop a robot to send inside pipes that could serve this purpose and reduce welding setup time. In addition, the aim would be to purge a more immediate zone around the weld rather than fill the section of pipe, therefore reducing gas usage.

Key Points

With a robot, the welding process is more independent and flexible.

The robot can navigate through pipes; more precisely install purge dams leading to better gas sealing reducing likelihood of leaks; and can retrieve purge dams autonomously.

This autonomy reduces dependency on strict sequencing of activities. Welders can now focus on their tasks without being constrained by the timing of purge dam installation and removal.



Traditional Approach



Piping Crawler



Purge Dam

Combination of the above
which are currently available

Deliverable 1: Thesis

Typical structure of the thesis:

1. Introduction
2. Objectives
3. Industry Review
4. Requirements Analysis
5. Commercial Options & Viability
6. Conceptual Design
7. Detailed Design
8. Prototype Development
9. Testing and Validation
10. Design Refinement
11. Cost & Benefits Analysis
12. Implementation Plan
13. Conclusion
14. References
15. Appendix



Depending on the findings during the initial investigation, this may progress to undertaking trials at Monadelphous' Bibra Lake facility to assess the effectiveness and efficiency of proposed ideas and prototypes. This is also an opportunity to potentially broaden the scope of the thesis to improve welding efficiency in other areas should they be identified.

Deliverable 2: Robotic Purge Dam Development

Two robotic purge dams will be developed for implementation on an EC site with an applicable scope of works.

Based on initial proof of concept discussions within Monadelphous, the solution would most likely involve modifying existing piping crawler robots. The final design will be researched, justified, and implemented based on the output from the previous deliverable. The document can be revised in the second phase where needed to support the implementation.



Student Engagement 1 – 2024

Student Engagement 2 – 2025

Note: Whether to proceed with the Year 2 engagement will depend on the technical and commercial findings from the thesis.

