MONASH
ENGINEERING

MONASH University

Faculty of Engineering

Summer Research Program 2023-2024

Project Title: Cutting Edge! Exploring Robotic Attachments for Efficient/Sustainable Material Separation

Supervisor(s): Victor Chang, Yunlong Tang, Jenny Zhou

Department: Civil Engineering, Mechanical and Aerospace Engineering

Email: victor.chang@monash.edu

Website profile of project supervisor: https://research.monash.edu/en/persons/victor-chang

---

Objective

Australia's oil and gas industry will need to decommission more than 1800km of subsea flowline used in the off-shore facilities before 2050. Instead of sending these flowlines to the landfill, it will be beneficial to separate and recycle the useful materials in an environmentally responsible way.

This is the 2nd phase of the research efforts aiming to enable automation process to separate different layers of the decommissioned subsea flowlines. The objective is to examine the suitability of various robotic arm attachement in pipe cutting and separation. Evaluation matrix will focus on factors such as energy consumption, noise, cutting time, wear and tear, and dust generation (human exposure). Together, we'll uncover new innovations by examining various cutting tools and attachments, aiming to revolutionize the industry with efficient and sustainable solutions. By integrating sustainability into our work, we'll minimize energy consumption and noise levels while maximizing productivity and longevity. Collaborate with like-minded individuals, gain hands-on experience, and ignite your career in this fast-evolving field. Don't miss this opportunity to shape the future of robotics - apply today and be part of our mission!

Project Details

Our overall program is to design a system capable of processing different types of flexible pipes with various sizes and configurations while also: 1) Maintaining the integrity and purity of the materials within the pipes and minimising overall material loss; 2) Reducing the generation of airborne dust particles in processing; and 3) Producing a modularised system which enables a mobile implementation able to accommodate the changing processing demands in remote locations.

The whole program structure is shown in Figure 1 below. In our previous efforts, we have successfully applied image processing to determine the flowline characteristics and also determined the suitability of the flowline into the automated separation system. In addition, we are able to use the information to decide the best separation approaches. However, among the limited number of flowline separation systems on the market, most are purely mechanical based that is not only manpower intensive, but also prone to occupational and health concerns. In order to further improve the current practice, this task involves designing an interface which allows for a process of communication relaying the identified optimized approach to the separation system itself.

The main objective for this project is to evaluate different robotic arm attachments, such as hot knife, wire cutter, laser cuteer and rotary tools, in pipe cutting and separation. Evaluation matrix will focus on factors such as energy consumption, noise, cutting time, wear and tear, and dust generation (human exposure). The team will be supervised and assisted by both academics and industry partners.

Prerequisites

We aim to form a multiciliary team that comprise of Civil/Environmental/Mechatronic/Computer Engineers who are interested in robotic/industry automation, and more importantly, with a sense of responsibility of sustainable operation. The candidate should have 1) good knowledge (or experience) with PLC programming or robotic system; 2) demonstrate good portfolio in GitHub or Bitbucket; 3) good teamwork and communication skills.

Additional Information

Applicants can contact project PI, A/P Victor Chang, for more information. An interview will be needed before commencing the project.