



2015 IEEE International Symposium on Robotics and Intelligent Sensors (IRIS 2015)

## Development of Track Wheel for In-pipe Robot Application

Ana Sakura Zainal Abidin<sup>a,\*</sup>, Muhammad Farhan Aiman Mohd Pauzi<sup>a</sup>, Mohammad Muaz Sadini<sup>a</sup>, Muhammad Hamizan Zaini<sup>a</sup>, Sim Chia Chie<sup>a</sup>, Shahrol Mohammadan<sup>a</sup>, Annisa Jamali<sup>a</sup>, Rasli Muslimen<sup>a</sup>, Muhd Fadzli Ashari<sup>a</sup>, Mohd Syahmi Jamaludin<sup>a</sup>

<sup>a</sup>*Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia*

---

### Abstract

At present, the application of pipelines in industries is becoming more severe. The application is not limited for home application only but it can stretch up to thousands of kilometers across countries. Pipelines are used to transport water, sewage, flammable liquid, high pressure gasses and oil. In order to ensure efficient pipelines performance, the pipelines need to undergo routine monitoring, maintenance and repairing activities. However, due to the nature of pipelines that are long, interconnected, and sometimes buried underground or far beneath the sea make it hard to accomplish the tasks. Relying on human labor for the cleaning and maintenance process is not efficient, not safe and not economical. Therefore, there is a strong demand for a robot that can help the cleaning and repairing process in the pipelines. The main aim of this research is to produce an in-pipe robot. This paper will specifically discuss about the development of hardware and software of track wheel for in-pipe robot application. The Caterpillar concept has been chosen to be considered for further development. The Caterpillar that is equipped with special made track wheel is able to move and also climb in pipelines. The scope of this project is limited to 14" inner diameter of UPVC pipe. The development of the wheel track has followed a systematic engineering design process. Experiments have been conducted to validate the software and hardware. As a result, the developed track wheel successfully climbed up to 30° without skidding or slipping. Consequently, the designed track wheel can be considered to be applied as locomotion of the in-pipe robot. The track wheel can be used to move, climb and maneuver the robot in the pipeline smoothly.

© 2015 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of organizing committee of the 2015 IEEE International Symposium on Robotics and Intelligent Sensors (IRIS 2015)

*Keywords:* In-pipe robot, wheel track, pipeline, engineering design process

---

\* Corresponding author. Tel.: +6082-583306; fax: +6082-583410.  
E-mail address: [zaasakura@feng.unimas.my](mailto:zaasakura@feng.unimas.my)