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Development of Cleaning Device for In-pipe Robot Application

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Abstract

Pipelines are essential tools for transporting water, oils, gases and sewer from one place to another. Pipelines are used to interconnect networks from one station to another that involved various diameter sizes and fittings to compensate intended directions. There are many issues that influenced performance of the pipelines namely aging, corrosion, cracks and use to clog up with debris, or sediments after long use. There are number of methods available to clean the inside of the closed pipeline namely traditional method like boiling, picking, alcohol and salt and cleaning kits, or tools kits such as wire and plunger or large-gauge snake. However, all the methods can over-stress older pipeline and cause leaks that make even more extensive repair procedures needed to fix the problem. Chemical fluid for pipe cleaning is also not suitable to all types of pipeline because the chemical can erode the pipe wall. Currently, service robot is the best solution that purposely developed to facilitate humans being activities including cleaning, inspection for cracks or repairing damage in pipeline. This paper intends to report about the development of cleaning device for in-pipe robot application. The development covers both software and hardware of the device. Significant experiment has been designed to validate the function of the device. It is proof that the device has successfully clean the soft and moderate clog. The success of the cleaning device can be attached to the in-pipe robot and the outcome is expected to assist pipeline cleaning operations. Thus, enable the pipelines to transport efficiently with minimum cost of operation.

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1. Research Background

Application of pipelines is very important in all over the world. Pipelines are used to distribute water, gas, oil or chemical fluid at certain length of distance in a closed piping system. Pipelines are also used to transport fluids within a building or between one station to another station or even thousands of distant kilometres, which is long and interconnected networks that involved various diameter sizes and fittings to compensate the intended fluid directions [1]. Due to the pipeline conditions, it is very challenging for the closed pipeline if it got blocked or even clogged that can affect its overall performance. Prior research has identified a number of causes that can influence the pipeline performance. Usually, it is not solid objects that swirl down the drain that causes a clog. The fact is that the clog is gradually built from its internal diameter. After certain period of time, the accumulated clog will reduce the pipeline diameter that consequently restricts free flow of water in the pipeline. Meanwhile, sludge is a formation of sticky concoction of soap scum, grease, hair, food particles or even the dissolved minerals in the water.

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