

# MECHATRONICS BOOK SERIES

## ROBOTICS AND AUTOMATION

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Rini Akmeliawati  
Wahju Sediono  
Nahrul Khair Alang Md. Rashid



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INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

# **MECHATRONICS BOOK SERIES: ROBOTICS AND AUTOMATION**

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## **Editors**

Rini Akmeliawati  
Wahju Sediono  
Nahrul Khair Alang Md. Rashid



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## CHAPTER 28

### Intelligent SCADA Based Pipe Monitoring System

M. J. E. Salami, A. M. Aibinu<sup>a</sup>, Mohd Shafie Bin Sani and Nurfaizal Bin Wahid

Intelligent Mechatronics System Research Group

Department of Mechatronics Engineering, International Islamic University Malaysia

P.O. Box 10, 50728, Kuala Lumpur, Malaysia

<sup>a</sup>maibinu@iium.edu.my

#### 28.1. Introduction

A SCADA system, utilized as a leak detection system, employs various sensors to measure physical or chemical parameters (pressure, temperature, flow rate, level, and concentration) in pipelines or tanks and converts these parameters into electronic signals. These signals are sent to a data acquisition system, a signal conditioning unit, and are finally analyzed using computer algorithm to produce a leakage determination. SCADA systems are used to control large networks of pipelines such as oil and gas monitoring. A central computer monitors the system for changes in pressure, flow rate, and volume of liquid. More than one leak detection algorithm can be integrated into a SCADA system to monitor the entire pipeline network. This allows for accurate leak detection, including leak location and flow rate identification. (Baile, 2003)

One of the most important application of SCADA system is in Oil and Gas transportation. This industry is among the important business in the world. Oil and gas regarded as the main energy source of the world nowadays. However, this business exposes human being to risk. The rise in oil and gas industry can be fatal especially with respect to ecosystem and pollution. Throughout history, there are many cases of oil pipeline burst which cause losses to the oil and gas company. Monitoring is important to detect earlier damage of the pipeline. This action can save the cost of maintenance while prevent serious damage along the pipeline. (Clark, 2004). A very long oil and gas pipeline is hard to monitor. Long range pipeline used to transport crude oil from oil field or to transport oil to transporting port. Minor leakage is hard to be detected and accident can happen anytime as oil and gas is an highly flammable material. Continuous monitoring system is a must in oil and gas pipeline. Thus, SCADA present an effective solution to these problems. Oil and gas pipeline built to optimize the oil and gas company revenue. The pipeline operation must not disturb in order to maintain maximum output of processed oil from the refinery. Leakage detection must be done without shutting down the pipeline system. To conclude, SCADA system will save time and money by detecting the leakage location. (Baile, 2003)

The purpose of this project is to design and develop an Intelligent SCADA-Based pipe monitoring system for oil and gas in particular. The aim of this project is to study technique of detecting pipe burst, leakage and weak flow rate. All parameters monitoring need to be done by SCADA. In addition, the intelligent SCADA system also can make its own decision in handling situation.

The significance of this project is that it can prevent worst leakage and burst coming inside the pipe. It can detect the crack that occurs inside the pipe and further actions needed to be taken before it get worst. The government usually distributes the crude oil using pipeline installed offshore. So, it is crucial to maintain this pipeline to guide against any burst or leakage as the cost of maintenance is high. Instead of spending money on repairing pipes, it can be control directly or treated immediately.

Oil and gas pipeline is an important element in oil and gas industry. It is used for oil and gas transportation and it is more efficient than other method such as tanker ship and railroad. However, it also has its drawbacks, firstly, it can be very dangerous. Secondly, minor leakage can cause fatal losses and pollution of the ecosystem. Detection of leak in pipelines is an important task for