Remote Sensors to Monitor Structural Integrity in Pipelines

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Situation & Problem

Nowadays, pipelines represent one of the most common for transporting fluids. The risk of a spill due to pipeline damage is always there. Although there are various organizations working on reducing the losses from pipelines failures, our project aims to predict the failure before it occurs by means of using sensors and database systems. [1]

Pipeline Factors

- The build up of materials on the pipe wall (Fouling) is detrimental to the performance of the pipeline. [3]
- Slight variations in the quality of the plants output can lead to significant accumulation of oxidation products.

Prevention Methods

- Pressure regulation
- Cathodic Protection
- Corrosion Coupons
- Pipeline Markers[5]

Detection Methods

- Water Balance
- Monitoring pressure
- Remote sensors and computer-based modeling to monitor pipelines. [5]

Solution

Types of Sensor Networks

- Each node operates independently of other nodes.
- Efficient power consumption
- Improved communication quality.
- Alternative power sources.
- Compromising physical location of the pipeline.
- Expensive for lengthy pipelines.

Sensor network Management

- Sensor networks are composite wireless networks of small, low-cost sensors, which collect, monitor and broadcast environmental data. Therefore, it eases the acquisition and controlling of physical environments from remote locations with better accuracy. [7]

Evaluation of Solutions

- No power management issues in the sensor network.
- Provides uninterrupted communication between the sensor and the Network Control Center (NCC)
- Cheaper to implement compared to the use of Integrated Wired/RF Wireless Networks
- The functionality of the sensors network is to monitor and control the environmental data obtained
- Organization of the sensors as well as network management system ease the optimization of data analysis process.
- Database systems are used in representing the data graphically and easing the data analysis to the end user.

References