Pipeline leak diagnosis using wavelet feature extraction and radial basis function neural network (RBF-NN) classifier

Transporting oil and gas through pipelines has a long history. Leaks, which are the main faults of pipelines, can cause serious problems such as safety, environmental and economic problems. Specially, in places where the pipeline crosses fresh water sources, for instance, rivers these affectations are more noticeable and dangerous.

Therefore, many methods and techniques for leak detection with various applications have been proposed to prevent further loss and danger. However, a good leak detection method not only decreases the false alarm rates, but also identifies the leak location and leak size. In this paper a novel leak detection approach is introduced, in which the leak detection problem is treated as a classification problem. Since in most practical cases, the end pressure of the pipeline has been fixed by equipment this novel approach only uses inlet pressure.

By using OLGA software to simulate the pipeline different leakage conditions to monitor the changes of the pipeline inlet pressure in these conditions. In order to approximate these inlet pressure signals to practical conditions a normal noise is added. The wavelet domain features are extracted from the noisy signals and are adjusted as input stes for the radial basis function neural network (RBF-NN) classifier. The obtained results show a better performance compared to a RBF-NN classifier which uses statistical feature extraction techniques, instead.
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