

5.3.4. THEORETICAL AND EXPERIMENTAL BASIS OF TEST SIGNAL PARAMETER DECISION IN THE LEAK DETECTION AND LOCATION SYSTEM

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Introduction. The purpose of pipeline exploitation reliability growth is the accident-free functioning of gas-transport systems. Impossibility on-line detection of emergency state and defect localization results in considerable economic and ecological losses. Leak is a pipe wall through defect. Leak appearance reasons are technical, natural and anthropogenic factors. Among the last is unauthorized access.

Body. It is suggested to use pressure wave propagation to detection and location leaks in pipeline [1]. Pressure wave propagation is a plane wave which travels at acoustic velocity within the fluid medium indicative pipeline leak or unauthorized offtake. Leakage causes additional influence over wave propagation because of acoustic impedance. Reflected wave amplitude and time difference between test and received signals identify site and measure of leakage. It is shown theoretic dependence between leak reflect factor and wave frequency for different leakage radiuses.

Impulse energy determines distance of detection. Energy increase due to a pulse width worsens potential exactness of distance measuring. A method of decision is using difficult signals for example Barker signal or signal with line frequency modulation.

Experimental researches on a plastic pipeline 24 meters long with the use of different types input signals are made. The purpose of model researches is to determine minimal measure of system detecting leak; to determine maximal identification distance for defined leak, experimental determine acoustic signal attenuation coefficient as function of pipe diameter, wall material and test signal frequency. It is received theoretical and experimental frequency dependences of attenuation coefficient and propagation velocity for the pipes with different diameters. It will allow to choose the best parameters of test signals for the pipeline.

The adaptive filtration is used for reflected signals allocation. The method increases value signal-noise.

Hardware for experimental researches are organized on the basis of computer. The main functions of computer system is test signal generating, reflected signal recording, adaptive filtering, detecting and localization site of leak. Authors offer structure of automatic leak detection system.

The next step of method testing is introduction of automatic leak detection and localization system on operating technological pipelines.

Conclusion. Special kind of input signal and adaptive filtering permit to increase the distance of pipeline examine and filter out background noise. One site to access pipeline fluid is needed. The system can be used for pipelines of various diameters and materials. Fast oil and gas pipeline leak detection and accurate location can reduce the loss of leakage.

References:

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