ABSTRACT

RESEARCH ON GAS LOSSES REDUCTION FROM NATURAL GAS DISTRIBUTION SYSTEMS

Because natural gas is a true treasure of the country's energy, one of the major problems is the introduction of latest technologies, which involve, firstly, the drastic reduction of gas losses in sectors such as drilling, mining and transport, distribution and delivery to beneficiaries.

This PhD thesis addresses an important issue for natural gas distribution companies namely that relating to the loss of gas distribution systems. Romanian distributors register a total annual loss of around 3% of the volume of gas distributed, quantified at over 100 million Euros. Leakage is due to several causes. In general, losses due to corrosion defects is about 2 / 3 of total losses and in the remaining third the counting losses represents a big part of them, which shows the importance given to them in this doctoral thesis

The thesis is structured in five chapters, each one dealing with an aspect of the thesis problem.

The thesis addresses an important issue that arises in gas distribution systems that relate to losses generated by systems measuring gas volumes delivered to customers. There is a difference between the volumes of gas measured and taken over by SRMP – at a normal state and gas volumes delivered to households and small industrial consumers in the local conditions of pressure and temperature.

The thesis analyzes the dynamic of errors in distribution network, where more customers with variable 24 hour consumption are connected. Calculations are made with the numerical simulator Simone and allow the determination and visualization of error propagation due to gas measurement without correction along the network.

For a complete picture of the phenomena, the thesis presents a numerical analysis made with ANSYS for the loss of gas through the defects of the buried pipes. A thorough analysis of the pressure gradient around the defect and gas flow was made. The analysis is made for different positions of the defect.

For the first time in Romania, the thesis addresses the study of the influence of atmospheric pressure on natural gas consumption. A methodology to calculate the influence of atmospheric pressure variation on the volumes of gas consumed was established. This methodology demonstrates, by using AFT Arrow software, that atmospheric pressure variations affect the consumption of natural gas. This fact must be included in the strategy of determining the allocation of gas to reduce penalties.

This thesis addresses some of the modern solutions to reduce gas losses in distribution networks. The loss level determines the size of "technological losses" which is part of the annual balance sheet of the distribution companies. Several new modern solutions to reduce losses addressed in this thesis can be considered:

- Obligation of pressure and temperature correction of gas volumes measured at small consumers;
- The influence of atmospheric pressure on the dynamics of natural gas consumption;
- The taking into consideration of the atmospheric parameters in natural gas measurement points;
- Determination of gas loss through defects of the buried distribution pipelines with the original theoretical method validated experimentally.