A Compositional Gas Flow Model for Predicting Pressure and Heating Value Distribution in Complex Pipeline Network System

Field Case: Off-take Station X, Indonesia

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Abstract

Natural gas pipeline network was made up of several points of supply and several delivery points connected by pipeline, allowing steady-state flow of natural gas in the complex pipeline network system. Gas operator companies have a responsibility to provide gas to the consumers with certain rate and pressure described in the sales contract. Therefore, the companies should be able to preserve gas pressure and rate distribution in every delivery point (customer's entry point) to fulfill the contract, as well as predicting the consumer's increasing demand of gas in the future. This paper is mainly focused on determining gas pressure distribution, flow rate in each segment and heating value in each delivery points of a complex gas pipeline network.

The system model consists of a set of nonlinear simultaneous equations obtained by writing the continuity equation at each node in the system. Therefore an iterative technique, for example Newton method, can be applied to obtain a solution of these systems of equations. The method requires that a good initial guess to be given for all unknowns to ensure convergence of the method. Usually this is not an easy task. In this paper, the Genetic Algorithm technique was proposed to overcome the problem. This algorithm is basically used to locate pressure distribution and rates which then being use as initial guess for executing Newton method to find solutions for pressure distribution and rates. Using field case at Off-take Station X, the result of this model has been also compared with software commercial.

Keywords: *genetic algorithm, steady-state, gas pressure distribution, heating value distribution*