

Comparative Analysis of ARIMA-based Models for Forecasting Pressure in Natural Gas Pipelines

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Abstract

Effective monitoring of natural gas pipeline networks is essential for balancing supply and demand. Traditional simulation methods have limitations in predicting future trends due to their inability to fully capture complex dynamics in gas flow. This study employs ARIMA-based models, including ARIMA, ARIMAX, SARIMA, and SARIMAX, to forecast future pressure values at the receiving facility of a gas transmission network. The models are evaluated using the Mean Absolute Percentage Error (MAPE) and Root Mean Squared Error (RMSE) to assess performance. Notably, the SARIMAX model demonstrates superior performance in the normal forecasting approach, while SARIMA excels in the rolling forecast origin approach. Both models have significant statistical coefficients and exhibit no significant autocorrelations in the residuals, indicating their robustness in forecasting pressure and flow rate conditions at the sink for future times with low error rates

Index Terms

ARIMA, ARIMAX, SARIMA, SARIMAX, gas pipeline, forecasting