



# IBP1556\_13 STUDY OF CONSUMPTION FORECASTING SYSTEMS NATURAL GAS DISTRIBUTION

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## Abstract

The forecasting of gas consumption has a fundamental importance to the natural gas distribution companies, since, it is common that the supply companies include clauses in their contracts that force the distributor companies to perform the daily programming of natural gas volume to be withdrawn, this kind of companies are subjected to the application of penalties if the volume exceeds programmed limits previously established. In the present work are studied the potentialities to use of predictive models based on mathematical regression techniques, time series and artificial neural networks in forecasting daily gas consumption, with the intent to improve the methodologies currently used. Thus, it was studied the application of the forecasting techniques previously mentioned to the gas volume daily prevision of a gas distributor company in the Brazilian northeastern, characterized by the predominance of industrial consumers with dissimilar behaviors.

## 1. Introduction

Natural gas has a wide spectrum of applications e. g. it is normally used as fuel in different areas as: industrial, commercial and residential. Besides, natural gas is used in the oil production, for example in techniques as the gas lift, where it is re-injected with the intent to take out the oil from underground [1].

The nowadays context is characterized by a scenario where the participation of natural gas has increased in the energy matrix. Consequently, its production, transport and distribution became more important. In general, the gas supplier company adjusts, by forecasting consumption techniques, its gas production in function to the pipeline transports capacity and its client's consumption.

The gas supply companies have included clauses in their contracts that force the distributor companies to forecast the natural gas volume to be daily withdrawn. Penalties are applied to the gas distributors if the gas consumed exceeds the volume programmed [2].

Motivated by the need to avoid penalties, the natural gas distributors have created empirical methodologies to calculate with anticipation the natural gas volume to be consumed at every network point within the lowest error margin.

In the academic context, the most researches performed to improve the gas consumption forecasting have used Artificial Neural Networks (ANN), mainly by the ability of ANNs to deal with nonlinear phenomena. The multilayer feedforward has been the type of ANN more commonly used. Additionally, there are works using recurrent ANNs, adaptive ANNs and even ANNs combined with fuzzy logic [2, 3, 4, 5 and 7].

In the ANNs applications to forecast natural gas consumption in very cold places, where the heating systems use the natural gas as primary source of heat, it become clear the relationship between gas consumption and climatic conditions, as temperature and/or wind speed. In these applications those variables are treated as input to the ANNs predictor [6 and 7].

Moreover, the literature also shows the use of statistical methods, for example, the Box-Jenkins methodology through the ARIMA model for time series forecasting. In these method are explored the dependency of future behavior with the past.

In places like the Brazilian northeast, object of this study, the influence of climate, either by temperature or wind speed, is not a predominant factor in forecasting, once it is a hot region where unlike the above cases, are used

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