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Existing Methods and Approaches to Forecasting Electric Consumption at Industrial Enterprises

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ABSTRACT: The article provides an analysis of existing methods for forecasting power consumption using the example of ferrous metallurgy enterprises. Based on the analysis of existing methods, shortcomings and main tasks are identified to improve these methods.

KEYWORDS: forecasting, power consumption, methods, consumer, production, volume of information.

I. RELATED WORK

Many works are devoted to a solution of the problem of forecasting of the electric power. Works on short-term forecasting of volumes of a power consumption of such scientists as Voronov, I.V., Demura, A. V. which offered forecasting on the basis of neural network, Hnatiuk, V.I., Lagutkin, O. E. who offered a method on the basis of a tekhnotsenoz, Manusov V. Z., Nikiforov, who offered forecasting on the basis of the regression analysis, Kleopatrov D.I. who offered forecasting on the basis of exponential smoothing are of special interest. However the offered methods cannot be applied to the solution of a problem of forecasting of volumes of electricity consumption at the power marketing enterprise, due to some restrictions, which include: impossibility of use of a large number of factors, use of the subjective assessments, a need of the use of statistic selections for a major period of time, the requirements to technical and program tools.

II. INTRODUCTION

Existing methods of forecasting have individual characteristics and have their advantages and disadvantages. these methods are combined to increase the reliability of forecasts when applying them. The choice of forecasting methods depends on such key factors as the timing for which the forecast is made and the amount of information. It should be noted that in forecasting, the larger the amount of information, the greater the reliability of the forecast. Below are the theoretical foundations of these prediction methods.

When operating an energy economy, primary information is important, which is used in planning normal operating modes. Based on the forecast, the following tasks are solved:

- determination of effective methods and approaches to forecasting power consumption;
- calculation of real and optimal modes of operation of energy systems;
- evaluation of reliability parameters, quality of electric energy, etc.

Effective forecasting of electricity consumption determines the success of industrial enterprises. Each of the enterprises, due to the preliminary determination of the amount of power consumed, strictly adheres to it, since deviations entail fines [1; 2].

Currently, the forecasting of electricity consumption for a certain period is the most topical topic in the electricity market.

Of the currently available about 150 forecast methods, 20-30 basic methods are used in practice. The existing methods of forecasting are classified by the following criteria: the degree of formalization; principle of action and obtaining predictive information.

Based on the analysis of time series of power consumption parameters, methods for forecasting the specific consumption of electric energy have been developed. The disadvantage of this approach is that it does not take into account factors of ambient temperature, cloudiness, longitude of the day, day of the week, planned inclusion and disconnection of energy-intensive objects, etc. Only with large quantities of consumers this approach yields more



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accurate results, and for a separate electric user of accuracy approach is not large. To obtain a more accurate prediction of the power consumption of a manufacturing enterprise, an analysis of internal production factors is necessary [3; 4].

To solve the problems of forecasting power consumption, in the first place, an in-depth analysis of the power consumption of individual production sites is carried out, then algorithms for forecasting the electric power consumption as a whole for production are used.

When determining the projected values of specific electricity consumption, it is necessary to take into account a large number of influencing factors, which as a result determine the level of this indicator. The type and technical condition of the main technological equipment in the melting process, the nomenclature of metal, the volume of consumable components during the process and secondary energy carriers (compressed air, oxygen, etc.), etc., are taken into account. The presence of errors when taking into account these factors can lead to deviations from the actual values of the predicted power consumption.

It is known that forecast methods are divided into formalized, heuristic and complex. In isolation, each forecast class is characterized by its own merits and limitations.

With the use of formalized methods, only quantitative indicators are obtained. When developing these forecasts, it is assumed that in the long term the system will evolve as it did in the past and exists in the present. This method includes methods of extrapolation and regression, the method of group accounting of arguments, etc..

Heuristic methods are associated with the use of the specialist's intelligence capable of anticipating qualitative changes in the development of the predicted object due to the availability of his knowledge and practical experience. These methods are used in cases of existence of spasmodic processes in the development of the system, they are subdivided into individual methods and methods of collective expert assessments.

Combining in a single formalized and heuristic way performs complex forecasting, which allows to increase the reliability of forecasts.

In work [3] the forecasting of volumes of consumption of electric energy by the ferrous metallurgy enterprise was considered. The solution of the tasks is carried out by levels, factory-wide, workshop, technological. Predicting specific values is based on the empirical dependences of the specific energy consumption on the quantity of products. The disadvantages of the proposed method is a factor when forecasting the volumes of electricity consumption method is not tested on real data on the production of basic products and energy consumption, and it is also impossible to take into account a number of parameters affecting the value of specific energy consumption.

In work [4] scientific and methodological issues of energy consumption forecasting by energy-consuming consumers were considered. A systematic approach has been applied in predicting the absolute and specific values of the use of electricity. There are the following disadvantages of this method: the presence of a large number of uncertain and resource-intensive parameters; low at adaptability, the impossibility of modeling non-linear processes in practice.

III. CONCLUSION WORK

Thus, according to the above review, we can conclude that the solution of the issues of forecasting power consumption at the enterprises of the ferrous metallurgy, in particular electric steelmaking, is a complex task. As well as forecasting power consumption by the metallurgical industry requires indicators of forecast calculations, such as: accuracy, reliability of calculations. On this basis, the development of the method and algorithms for predicting the parameters of electrical consumption, taking into account the electrical regime of the iron and steel industry, is an urgent and sought-after task.

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