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# Textile enterprises development of electricity consumption models

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**ABSTRACT:** The article develops models for determining the total electricity consumption and specific electricity consumption based on the last 5 years of electricity consumption at the textile enterprise "GLOBAL CARPETING PRODUCTION" LLC, which is the object of research. The following methods were used in the development of these indicators: linear, logarithmic, exponential, exponential, polynomial, linear filtering. Based on the research, a model has been proposed that allows to calculate the consumption of electricity, total and specific electricity consumption with high accuracy. At the same time, the features of the models used to solve the problem are described in detail.

**KEYWORDS***:* Energy audit, trend line, linear trend, logarithmic trend, exponential trend, degree trend, polynomial trend, linear filtering trend, reliability level.

## I. RELATED WORK

The main goal of the energy policy of the Republic of Uzbekistan is the rational use of energy resources, the assessment of energy saving resources, the correct distribution of electricity consumption and the introduction of the concept of energy saving among employees and their application in practice. On the example of a number of decisions and resolutions adopted in recent years, we see that the issue of achieving efficiency through the rational use and regulation of energy resources has risen to the level of state policy [1-3].

## II. INTRODUCTION

The solution of energy saving problems at industrial enterprises is based, first of all, on the study of energy consumption modes, taking into account the structure of production, the level of operation and optimization of the correct energy supply for technological processes. The power supply of industrial enterprises or large electrical consumers should be designed in such a way that for many years' consumers have to work with low-value waste. With future changes (changes in electricity consumption in enterprises), it is necessary to ensure optimal losses in energy consumption. To do this, it is necessary to control the design process and consumption conditions, graphs of electrical loads, losses in equipment [4-5].

From the preliminary data on electricity consumption obtained as a result of energy audits conducted by textile industry enterprises in the course of implementing the country's energy policy when implementing measures to save energy resources and rational use of energy, it is necessary to develop norms for the efficient use and consumption of the target set. As a result of this work, the goal of the above energy policy is partially achieved. The state of energy consumption of GLOBAL CARPETING PRODUCTION LLC, one of the textile enterprises of Uzbekistan, was considered. Based on the results of accounting for the energy consumption of a textile enterprise for 2018-2022, an energy consumption standard was developed based on a sample of general data on electricity consumption for the whole enterprise [6-8].

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**Table 1. Monthly electricity consumption by the textile enterprise GLOBAL CARPETING PRODUCTION LLC for 2018-2022**

| Period | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| January | 326808 | 557145,6 | 501926,4 | 522486,8 | 544869,6 |
| February | 1203513,6 | 561009,6 | 475838,4 | 495762,2 | 487952,2 |
| March | 927139,2 | 678566,4 | 415531,2 | 406842,6 | 426895,8 |
| April | 876926,4 | 599956,8 | 319334,4 | 368498,6 | |
| May | 510676,8 | 475301,2 | 365971,2 | 347962,8 | |
| June | 485481,6 | 398337,6 | 266395,2 | 324982,2 | |
| July | 475036,8 | 458016 | 441360 | 468723 | |
| August | 711374,4 | 282830,4 | 222364,8 | 234648,2 | |
| September | 480048 | 554428,8 | 331300,8 | 368463,8 | |
| October | 259627,2 | 444921,6 | 499300,8 | 521984,6 | |
| November | 44721,6 | 71697,6 | 612484,8 | 598642,6 | |
| December | 713500,8 | 492883,2 | 744955,2 | 628461,8 | |
| **Total:** | **7014881,4** | **5575094,8** | **5196763,2** | **5287459,2** | **1459717,6** |

The company has a period of 51 months of electricity consumption. To select a functional relationship in Microsoft Excel, an adequate functional relationship was selected, including several mathematical relationships, using a standard set of functions for constructing a trend line (for alignment. The trend line function is closed in using a trend line to visualize trend changes (graphics). analysis is the average image of the analyzed indicator.In Excel, the trendline is a graphical approximation function, and it has: linear, logarithmic, exponential, exponential, polynomial and linear filtering.Different functional interactions are described separately for the specified time period of electricity consumption.

The geometric representation of a linear direction is a straight line. Therefore, a linear approximation is used to describe a measure that increases or decreases at a constant rate [9-10].

The linear trend is the most advanced and widely used part of mathematical programming (in addition, it includes: holistic, dynamic, non-linear, parametric programming). After conducting a linear trend based on a period of 51 months of energy consumption, a diagram was formed (Figure 1), according to the results of the dependence on the diagram, the equation in the form y = -3568.1x + 573828 and the confidence level was obtained up to $R^2 = 0.0709$.

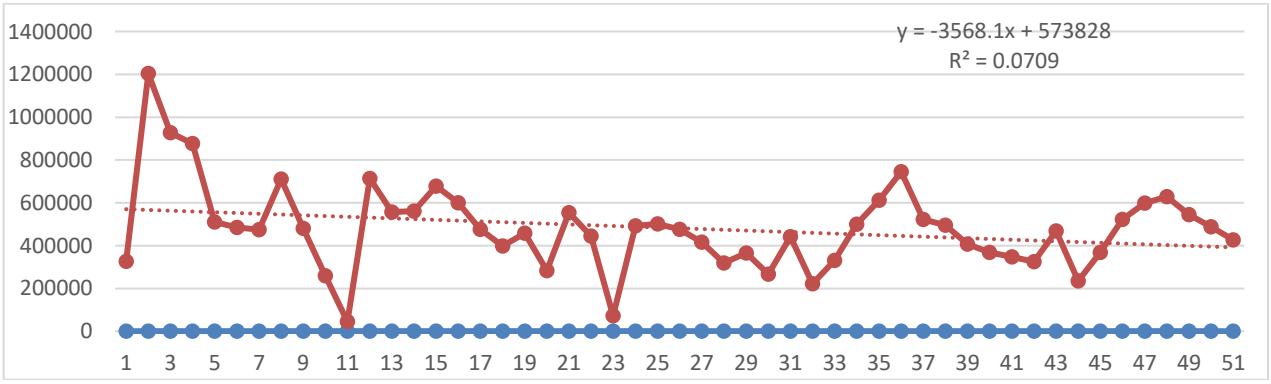


**Figure 1.** Line trend diagram

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The logarithmic trend is used for the following changes in indicators: rapid growth or decline, then - with relative stability. The optimized curve is adapted to the detailed "property" of the quantity. The logarithmic trend is responsible for predicting sales of products that are just entering the market. Next, a logarithmic functional dependence was formed based on a period of 51 months of energy consumption (Fig. 2), according to the results of the dependence on the diagram, an equation of the form y = -83917ln (x) + 731837 and a confidence level close to $R^2$ = 0.1407.

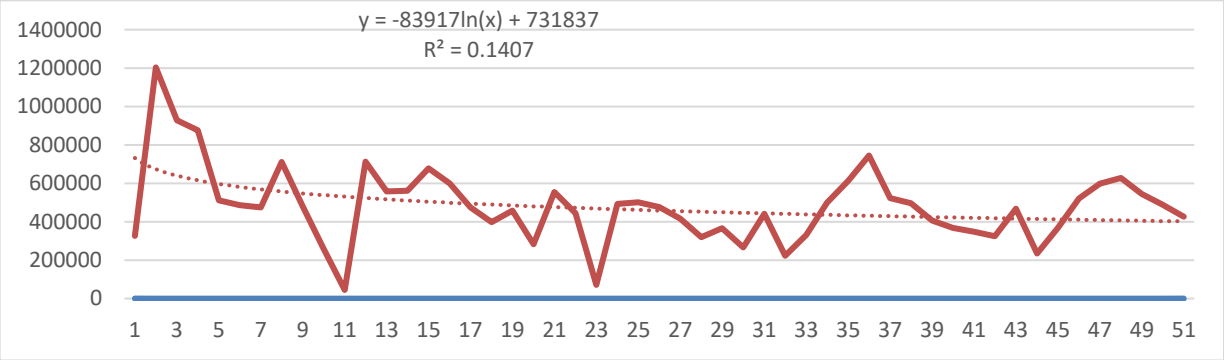


**Figure 2. Diagram of a logarithmic trend**

This type is useful if the exponential trend is that the input values change at a constantly increasing rate. Exponential approximation does not apply when there are zero or negative characteristics. In the next place, the indicator functional dependence was formed on the basis of a period of 51 months of energy consumption (Figure 3), according to the results of the dependence in the diagram the equation of the form $y = 469413e^{-0.003x}$ and A reliability level close to $R^2$ = 0.0077 is described.

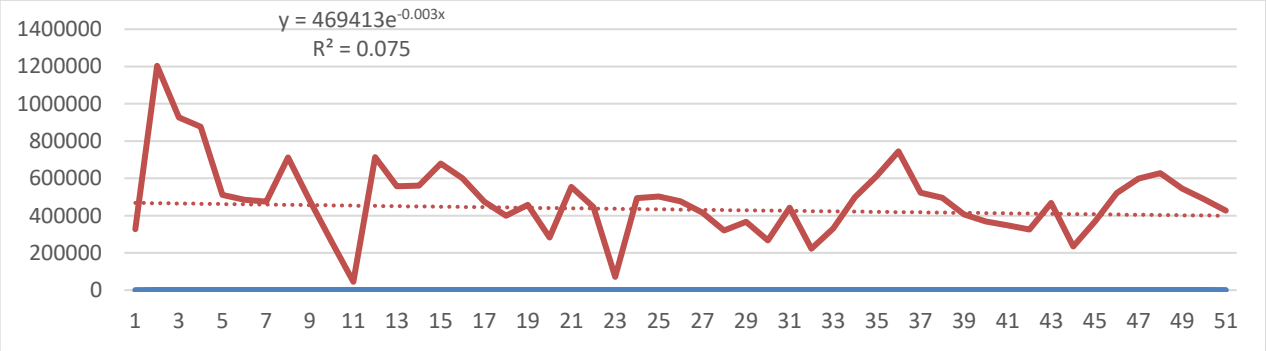


**Figure 3.** Diagram of exponential trend

Next, a level functional dependence is formed based on the 51-month value of the energy consumption period and a diagram is built (Fig. 4). According to the results of the dependence in the diagram, it can be seen that the reliability level is described close to $R^2$ =0314.

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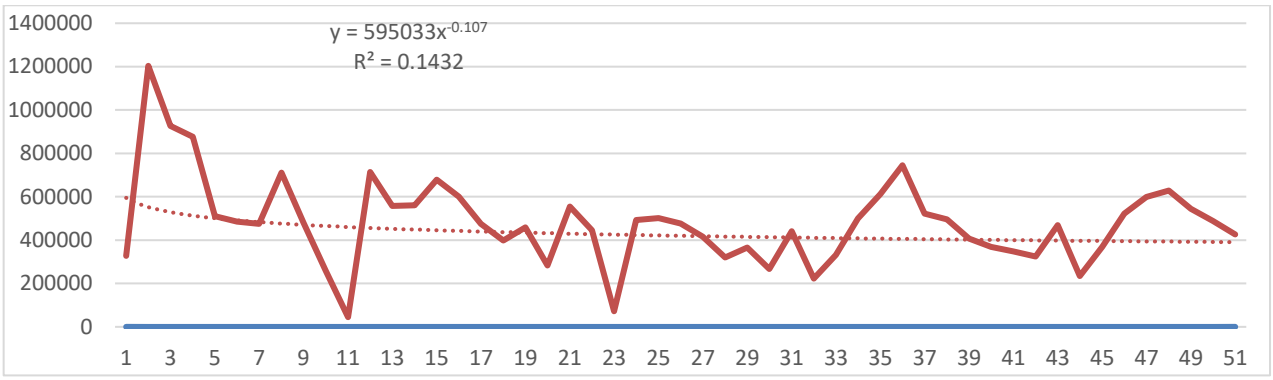


**Figure 4.** Diagram of the trend of degree functional dependence.

A polynomial trend curve has both increasing and decreasing variables. For polynomials (multilayer), the degree is determined (with maximum and minimum values). For example, one extreme (minimum and maximum) is the second degree, two extremes are the third degree, and three are the fourth degree. In Excel, a polynomial trend is used to analyze a large set of data about an unstable value. Next, a polynomial trend is built based on a period of energy consumption of 51 months (Figure 5) - An equation of the form $y = 0{,}0023x^5 - 0{,}0124x^4 - 24{,}772x^3 + 1785{,}7x^2 - 46932x + 838221$ is described and the confidence level is $R^2 = 0.2169$.

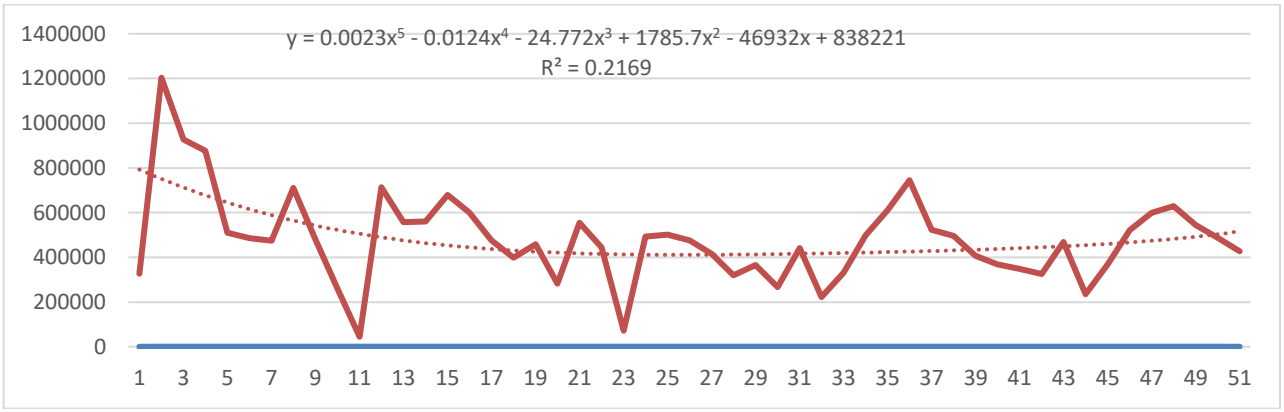


**Figure 5. Diagram of a polynomial trend**

Then, the linear filtering created a functional dependence on the basis of a period of 51 months of value of energy consumption, created a diagram (Fig. 6), corrected the errors in the diagram according to the results of the dependence.

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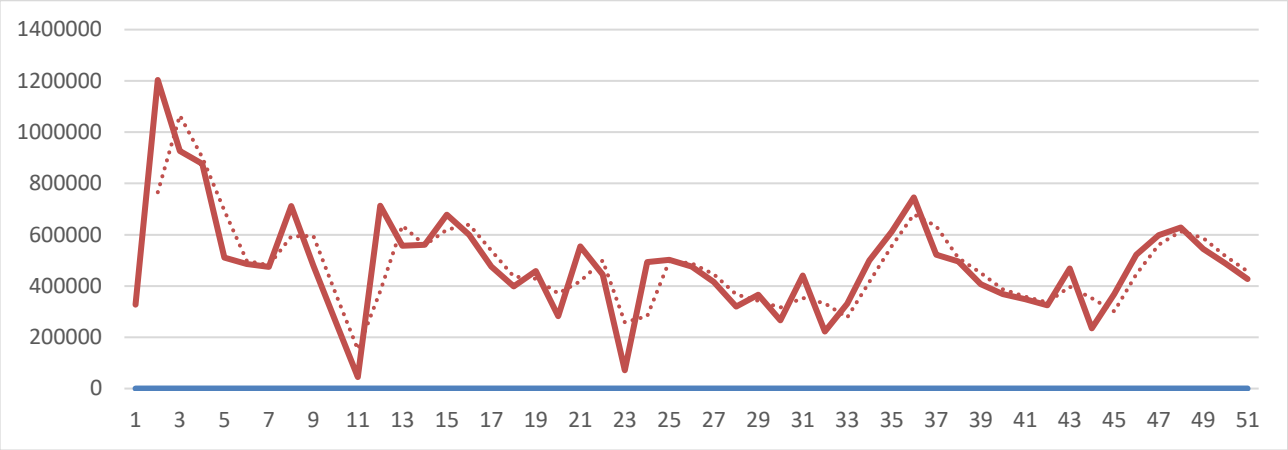


**Figure 6.** Line filter trend diagram

According to the results of the competition, the functional relationship with the highest degree of reliability of the polynomial model $R^2 = 0.2169$ is most clearly described:

$y = 0{,}0023x^5 - 0{,}0124x^4 - 24{,}772x^3 + 1785{,}7x^2 - 46932x + 838221$

## III.CONCLUSION

The results of the above calculations show that the degree of approximation in the linear model is R2 = 0.0709, in the logarithmic model the degree of approximation is R2 = 0.1407, in the exponential method the degree of approximation is R2 = 0, 0077, the degree of convergence in the model is R2 = 0.0314, the degree of convergence in the polynomial model is R2 = 0.2169. It is advisable to use it in determining the specific consumption, and this model is considered stable. Its sustainability is based on the above results.

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