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IMPROVING THE EFFICIENCY OF INDUSTRIAL PROCESSES FOR REDUCING THE ENERGY BILL

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Abstract

The concept of energy analysis is defined and applied to industrial processes. The study discusses the significance of choosing the definition of efficiency, system limitations and problem definition. The purpose of this report is to show the simplicity and value of using the concept of energy analysis in the analysis of industrial processes and to develop conventions and standards in the field of process efficiency. In the situation of the Republic of Moldova, the implementation of projects to improve energy efficiency and the use of renewable energy sources contributes to reducing the degree of the energy dependence of the country and also represents a national contribution in the fight against climate change.

Keywords: energetical analysis, the industrial process, energy efficiency

1 INTRODUCTION

The Republic of Moldova faces challenges due to growing dependence on energy imports and low energy resources, as well as the need to limit climate change and overcome the economic crisis. Energy efficiency is an important way to address these challenges. For the Republic of Moldova, which needs to catch up with the economic performance gap with the developed countries of the EU, these challenges are particularly important and hence the constant concern for the field of energy efficiency. [1-3]

Industrial enterprises are interested in developing and improving their performance in environmental protection by controlling the impact of their activities, services and products on the environment. To be effective, companies must be run by a structured and integrated management system within the organization. The main purpose of a management system is to comply with the requirements of quality, environmental protection and socio-economic requirements. [1,3]

In the industrial sector, there is a growing need to reduce energy consumption in order to increase the efficiency of its use.

There are two basic ways to reduce energy consumption:

- Either less energy is used per unit of product or service;
- Either a mutation is made towards a mix of less energy-intensive products and services. [1]

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2 THE CONCEPT OF ENERGY CONSERVATION

Energy conservation in industry involves:

a) Increasing energy efficiency in the conditions of a given technology, through technological changes increasingly improved in terms of energy.
b) Changing technologies and using more energy-efficient technologies.
c) A mutation towards a mix of fuels, which would make it possible to reduce the use of deficient fuels (generally more expensive) and hydrocarbons, respectively, in favor of more abundant fuels (generally cheaper);
d) Replacing the use of energy deficient fuels with new energy sources.
e) A wide range of technical and organizational measures adapted to each category of technological consumers. [3,4]

The credibility of any energy optimization measure and implicitly the decision to implement it have as key factors the price of energy, therefore the reduction of energy costs, and the possibilities of purchasing fuels.

Energy conservation should not be an end in itself - both consumers and society can obtain significant benefits if they are approached rationally. The promotion and implementation of energy conservation measures always starts from the need to identify these benefits, in their physical, economic and social dimensions. [4,5]

3 THE TECHNICAL, ENERGETICAL AND ECONOMIC EFFICIENCY OF ENERGY CONSERVATION IN INDUSTRY

Energy efficiency includes a set of methods, solutions, and investments, which are applied in the technological process to reduce energy consumption with the provision of technological parameters.

This term is very broad and refers to the efficient use of energy in ways that allow us to obtain the same benefits, while saving energy. Energy efficiency has an impact not only through the conscious and intentional reduction of energy consumption, which has the effect of reducing the final price of the product, as it pays less for its production. [4]

Economic efficiency means that the result outweighs the costs. Economic efficiency is the final threshold for verifying all types of efficiency, as it outlines the framework for sizing the efforts that an industrial enterprise can make, as well as the effects obtained by using the allocated resources. [5-8]

Increasing energy efficiency in industry will always benefit users and will lead to a rational use of energy in many industries, leading to:

- reducing specific energy consumption
- raising the level of labor use, with immediate and significant effects on profitability.

It can be concluded that the improvement of the performance of an industrial enterprise is mainly due to the decrease in manufacturing costs. One way to achieve this is to use less energy for the same purpose. [5,7]

4 BUILDING MATERIALS AND GLASS INDUSTRY

The main technological processes in these sectors, which consume about 90% of all energy used in these industries, are the following:

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- Melting glass.
- Baking bricks and other building materials.
- Drying of ceramic materials before baking.
- Cement manufacturing. [3]

4.1 Glass manufacturing

Heat recovery up to a gas temperature of 220^0C is considered to be an effective way to recover secondary energy. A practical solution is to produce superheated steam to produce electricity, which can be used right inside the company. In parallel with this operation, some of the steam can be used to produce hot water in heat exchangers or to preheat the air required for adhesion. [3,4]

For each specific case, it is necessary to carry out a detailed technical and economic calculation each time, because the multitude of thermal installations and schemes, as well as the diversity of heat use conditions, do not make possible the existence of universal technical and energy solutions.

4.2 Cement manufacturing

When raw materials are treated in a high-capacity rotary furnace, a large amount of heat is discharged through the hot dust-laden gases. This heat cannot be used directly in the process but can be recovered for useful purposes with the help of suitable installations. [3,7]

Gas cooling is done from 360^0C to 200-220^0C, by producing steam (7 bar, 295^0C), used for:

- Preheating the heavy oil for heating the rotary drum oven.
- Heating of some spaces in the factory.
- Production of electricity in turbines with steam, superheated air or hot water.

4.3 Manufacture of ceramic bricks and tiles

Three essential parameters explain the diversity of situations encountered in the manufacturing units of bricks and ceramic tiles:

- Raw materials used.
- Manufacturing facilities.
- Manufactured products. [3,5]

In the field of brick and ceramic tile manufacturing, the energy conservation policy has three phases:

- Optimizing the management, regulation and maintenance of installations, which allows reducing energy demand and heat loss as well as reducing waste.
- Modification, with low investment, of existing equipment to improve performance by insulating hot parts, streamlining distribution circuits, using recoverable heat.
- Introduction of modern installations, with better energy efficiency. [7,8]

5 BARRIERS TO IMPROVING ENERGY EFFICIENCY IN INDUSTRY

A. Limited decision-making by industry decision-makers of the potential for energy savings and related economic benefits (when and where to save energy, and at what price).

B. The policy and regulatory framework in the field of energy efficiency is still incomplete, resources and implementation capacities - inadequate.
C. Limited financial resources of enterprises in combination with the focus on technological processes and primary capital costs (faster than on operational costs).
D. Lack of initiative among many managers, inherited from the old administrative command structure.
E. The relatively small share of the cost of energy in the cost price of most products in the priority industries of the republic.
F. Low availability of loans (high bank share, poorly developed alternative forms of financing) and unfavourable investment climate in the country.
G. High levels of corruption and bureaucracy at all levels. [1,3]

6 THE WAY FORWARD FOR DECISION-MAKERS AND INSTITUTIONS

A. Increase the promotion and support of energy efficiency in enterprises in the industrial sector
B. Defining clear and regulatory frameworks, where appropriate.
C. Operationalization of smart, efficient schemes and their adaptation to support programs for investments and improvements in the field of energy efficiency, more precisely, clear and secure mechanisms.
D. Minimize transaction costs in projects and investments in the field of energy efficiency.

7 CONCLUSIONS

Apart from energy-intensive industries, where energy conservation measures lead to spectacular results, some of the above concepts can be applied in other economic branches, with very good results.

The effort required to reduce energy consumption in order to conserve it is often less than that required to procure and produce it. Energy optimization must be targeted at consumers in all industries.

The complex issue of energy conservation in industry must be analysed in the concrete context of a structure of energy consumption and production, knowledge of technologies and infrastructures consuming and producing energy, through a close collaboration between specialists in industrial energy and process engineers. This is the only way to identify and apply the best energy efficiency solutions.

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