

DECREASING ENERGY CONSUMPTION OF WATER-SUPPLY PUMPING SYSTEMS IN THE ASPECT OF POLISH BALANCED ENERGY POLICY

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Abstract

Economic growth and society affluence are connected with the growth of energy demand. Recently, energetic issues have got political and social priority rank in the majority of developed countries, including Poland. We still have quite a lot to do in forming and developing national energy policy. The paper presents requirements and determinants of actions resulting from the current legal regulations. The possibilities of effective realization of energy programs in production and operation processes in all the fields of society activity with special consideration of pumping systems have been presented.

Streszczenie

Wzrost gospodarczy i zamożność społeczeństwa wiąże się ze wzrostem zapotrzebowania na energię. Zagadnienia energetyczne uzyskały w ostatnich latach rangę priorytetu polityczno-społecznego w większości rozwiniętych krajów na świecie, w tym Polski. W kształtowaniu i rozwijaniu krajowej polityki energetycznej jest jeszcze sporo do zrobienia. W pracy przedstawiono wymagania oraz uwarunkowania działań wynikających z aktualnych przepisów prawnych. Wskazano możliwości realizacji programów efektywnego wykorzystania energii w procesach produkcyjnych i eksploatacyjnych we wszystkich dziedzinach funkcjonowania społeczeństwa, ze szczególnym ukierunkowaniem na wodociągowe układy pompowe.

Keywords: Pumping systems; Water transport; Decreasing energy consumption; Energy policy; Energetic efficiency.

1. INTRODUCTION

In the recent years Poland introduced many fundamental social and economic reforms leading to economy transformation. However, there are still many problems to be solved and low efficiency of Polish economy is one of them. The level of energy consumption in Poland is high, general efficiency is low and potential of energy conservation and rationalization is high. The paper discusses some issues connected with these problems with the focus of this branch of industry with reference to water transport.

2. FORMAL AND LEGAL BACKGROUND OF THE ISSUE

The connection between energy and environment protection in government regulations is one of the elements of balanced development policy in our country. Poland up till now has no document which would be unequivocally and totally devoted to energetic efficiency, neither is there a detailed plan of energy conservation. Among key documents which are connected with energy efficiency issues and include energy policy the following ones can be mentioned:

- *Power Industry Act* [1], accepted in April 1994 and being constantly updated with amendments which determine the principles of energy policy of the country and conditions of energy supply and use.
- *Energy Power Policy till 2025* dated 1 July 2005 [2] which includes guidelines of lowering national power consumption within primary energy and energy consumption. This document determines fundamental guided energy saving technologies e.g. electric drives of varied rotation speed or energetically effective devices.
- *Ecology Policy for Poland for the years 2007-2010 including forecast for 2011-2014* dated 18.01.2007, [3] which aims at:
 - implementation of the rule of distinction between society pressure and economic growth (decoupling);
 - strengthening management system of environmental protection resulting in e.g. checking the regulations from the point of view of their congruency with UE regulations, its changes and simplifications as well as coordination
 - climate protection (reduction of airborne dusts emissions of green house gases by means of the most up-to-date energy saving technologies
 - profound restructurization of production and consumption patterns through increase of energy consumption effectiveness and resources by introduction of indexes of resources and energy consumption, water and energy per product entity in particular sections of economy [4].
- *Energy Charter Treaty and the Energy Charter Protocol dealing with energy efficiency and relating aspects of environment protection* dated December 1994 [5], which include Energy Charter Treaty as well as actions taken by international organizations and assemblies in the field of energy efficiency and environment protection aspects in energetic cycle. The treaty determines possibilities of elaboration of energy efficiency programs including drawbacks analysis and possibilities of improvements of energy efficiency, preparation of energetic labeling and performance standards, evaluation of energetic cycle influence on natural environment and elaboration of legislative and controlling instruments.

On 17th May 2006 *energy efficiency directive on end-use efficiency and energy services* came into force [6] and imposed duty on Poland to intensify actions aiming at reduction of energy consumption by end-users in the nine years of its validity, starting 1st January 2008 by

1% every consecutive year. Due to these requirements *the Ministry of Economy* has prepared assumptions of the bill which has to come into force by the end of May 2008. New bill is to create legal frames for the system of steps taken in order to improve energy efficiency of our economy, leading to measurable energy conservation [7,8]. It should also be stressed that all actions and projects regarding improvement of energy effectiveness in a given economy sector of other EU countries have to fulfil requirements stated in *2001/42/WE Directive on evaluation of influence of some plans and programs on the environment* [9], as well as the aim of *2005/32/WE Directive which states general rules of setting requirements for ecodesign for energy-using products* [10], which is to determine high level of environment protection by means of potential influence of energy using products on environment, which as a result is beneficial for both consumers and end-users.

3. ENERGETIC EFFICIENCY OF PUMPING SYSTEMS

The tasks which are currently given to companies which operate and maintain pumping systems consist in not only obtaining parameters and insurance of high degree of reliability but also minimalization of energy consumption. Such an index which evaluates the degree of energetic effectiveness of an object which runs constantly is the total efficiency of the system. The higher efficiency of a pumping system the lower energy consumption. Among actions which have great influence on decreasing water pump systems' power consumption the following can be mentioned [7,11,12,13,14]:

- Modernization of pumps and other elements of pump sets or their exchange which results from previous energy audits. Replacing an old pump engine with modern engine increases the efficiency by 1-3%, results comparable to buying a new pump. It is approximated that the rise amounts to 5% of the whole system.
- Performing proper correct operation and maintenance as well as repairs which enable proper technical state of the pump, which in turn results in decrease of pump efficiency connected with its wear in the range of 3%
- Correct choice of optimal pumps for a given installation gives a possibility of increasing energy efficiency amounting to 4%
- New hydraulic solutions for pump installations

aiming at minimizing of flow losses and reduction of losses resulting from optimization of net parameters such as pipelines diameters or introduction of new layout of feeding spheres (up to 10% savings)

- Optimization of controlling system and steering of parameters which result in higher energetic effects (up to 20%)
- As it is clearly seen from the above mentioned suggestions energy efficiency of pumping installations depends mainly on their users who have possibilities to perform reasonable energy saving operation and maintenance and constant improvement of systems.

If we ask a question why we should save energy in pump systems, one answer can be given directly referring to the pump users, which is connected with constant increase of electrical energy costs (PLN/kWh), significant rise in costs of consumed energy by pump systems in the total costs of water pump companies and formal and legal requirements [7].

4. PURSUIT OF NATIONAL ENERGY EFFICIENCY

As it was mentioned in chapter 2, *EU directive 2006/32/WE* [6] states obligatory reduction of energy consumption by end-users till 2008. Thus, statutory introduction of obligatory reduction of power consumption should be expected and in result focus on the increase of performance of operating pump systems. However, the question remains how we are going to proceed to achieve energy efficiency in order to meet EU standards.

In order to realize balanced energy policy in Poland, *National Agency for Energy Conservation S.A. (KAPE S.A.)* has been created as a result of agreement of share holders realizing social and economic policy of Poland stated in Parliament act and government decision. *KAPE S.A.* plays strategic role in the market of power services on national level, in preparation of tasks of balanced energy policy and their realization according to European standards in collaboration with both national and foreign entities. *KAPE S.A.* takes steps aiming at improvement of energy economy by means of undertaking pro-ecological enterprises connected with expertise, analysis and advise for central administrative bodies, energetic sector and end-users, including e.g. water pipe companies. The following actions need our attention [4,15,16,17]:

- Preparation and realization of project within inter-

national programs (e.g. EU, including international collaboration) and management of international programs in which Poland takes part. One of such examples which is important for people or companies which operate and maintain pump systems can be "Polish program of effective usage of energy in electrical drives" realized in collaboration with *Global Environment Fund, program of UN for UNDP development and Agency for project implementation FEWE (Polish Foundation for Energy Effectiveness)*.

- Organization of conferences, seminars and workshops, both national and international. For that reason special center has been created, special unit of *KAPE: Polish-Japan Energy Conservation Technology Center* which enables gaining both theoretical and practical specialists' knowledge on possibilities of effective energy management in different branches of industry. Within the scope of operation of this agency there is also preparation of guide books and promotional leaflets e.g. *magazine Energy, Money, Environment – bulletin Energy Observance* issued in collaboration with *Foundation for Energy Observation* etc.
- Running secretariat of *Power Auditors and Energetic Planning*, playing a role of vericator of energy audits ordered by *Bank of National Economy*
- Preparation of financial mechanisms of financing investments regarding energy efficiency and identification of these investments

According to *National Agency for Energy Observation* [18] financial support for enterprises connected with energy saving can be granted by many institutions in Poland including *National Fund for Environmental Protection and Water Management, Voievodship Funds for Environmental Protection and Water Management and Ecofundusz Foundation*. Among banks which operate in Poland there are a few which have special offer for energy saving investments in a form of a special credits or partially written off loans.

5. CONCLUSIONS

Promotion of energy conservation and simultaneous growth of energy efficiency are directly connected with the decrease of the burden on natural environment. It is the key issue as far as balanced development of our country is concerned and one of the conditions of Poland's functioning in EU. At the same time, from economic point of view, it is important issue for Poland, particular waterworks companies as

well as for each citizen. Achieving the above mentioned aims requires complex and instant actions at the institutional, regional, national and European level.

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