

AN APPROACH TO THE INSTALLATION OF AN ENERGY MANAGEMENT SYSTEM IN A MIXED FEED INDUSTRY

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Abstract: *Following the two oil crises of the 1970s, the world as a whole has trimmed its energy budget, while still economically growing and projecting the Environment, by higher efficiencies. Especially in feed mill design and equipment, there has been much greater attention on energy management. Besides this, there are very limited studies on energy efficiency and management in the Turkish feed industry in the open literature.*

In the present study, first, the structure of the Turkish mixed feed industry was treated. Next, the Turkish regulation on industrial energy efficiency was studied in terms of applications in the mixed feed industry. An energy management system was then suggested towards the mixed feed industry. Finally, the results obtained were evaluated and discussed.

Key words: *Energy Management; Energy Efficiency, Energy Efficiency Law, Mixed Feed Sector, Turkey*

1. INTRODUCTION

Historically, the agriculture sector has been Turkey's largest employer and a major contributor to the country's gross national product (GNP), exports and industrial growth. However, as the country developed, share of the agriculture has declined in importance relative to the rapidly growing industry and services sectors. Due to the export oriented industrialization policy, rapid growth has been substantial development in the agriculture sector based industrial sectors. Beside this, agricultural potential has not been fully realized nationwide. Despite agriculture's diminished role in Turkish economy, agriculture still accounts for a large share of total output and employment [1].

Energy efficiency in feed mills has increased significantly since the mid-1980s. Over the same period, however, feed compounders have developed products requiring more energy-intensive processing. In this regard, energy efficiency pelleting remains critically important, especially as margins on livestock and poultry feeds have become very narrow [2]. Among the most important inputs to the animal feeding are several kinds of mixed feeds, which are met by three different ways, namely: (a) their own small-scale mixed feed plant, (b) private small-scale mixed feed plant companies, and (c) mixed feed factories. In the recent years, the demand on the mixed feeds has increased significantly [3].

Management in the world-wide formula feed industry has a formidable task facing it during the decade of the 1990s and on into the 21st century energy management. It is likely that the control of energy use and its costs will become the most important challenge any manufacturing industry in the years ahead. In this regard, in feed mill design and equipment, there has been much greater attention on energy management [4].

In Turkey, planned energy conservation activities have been implemented since 1981 by the General Directorate of Electrical Power Resources Survey Administration (called EIE in Turkey). However, by establishing the National Energy Conservation Centre within the body of EIE by the Ministry of Energy and Natural Resources (MENR) in December 1992 to increase the effectiveness of the activities and extend them overall the country, these studies have significantly increased. Based a nation-wide study carried out by EIE in 1993 it concluded that the Turkish industrial sector has approximately an annual energy saving potential of 30%. A regulation on industrial energy efficiency was issued in 1995, followed by two announcements related to designing energy management courses and carrying out energy audits, in 1996 and

1998, respectively [5].

The main objectives in doing the present study are twofold, namely (a) to present an energy profile of a Turkish mixed feed sector, and (b) to suggest an energy management structure for this sector, in which very limited energy efficiency studies have been performed.

2. CONCEPTS OF ENERGY, ENERGY EFFICIENCY AND ENERGY MANAGEMENT

Energy is an indispensable factor for the social and economic development of societies. Energy is also an engine of the development, and is defined as working capacity of a system. However, this explanation describes its physical characterisation. From another point of view, namely energy efficiency, it can be defined as providing "money" which makes life comfortable. Briefly, we may suggest that "energy" may be shortly defined as "money, even "cash" [6,7].

Energy efficiency is often confused with energy conservation. Conservation simply means using less energy, typically by switching things off, whereas efficiency relates to achieving the same quality and level of some 'end use' of energy (e.g. heating, cooling, lightening) with a lower level of energy input [8]. In other words, energy efficiency does not mean "freezing in the dark". Energy efficiency is about getting the same, or better, services from less energy. It can be accomplished by simple, cost-effective measures that require little change in lifestyle [9].

Energy management is all about how to make the best use of our present and future energy sources in order to avoid crises, both economic and environmental. It is also a professional occupation that affects the economy, people's security and comfort, their jobs, and the environment. It is not just concerned with saving money, but also with increasing productivity, improving standards of living and saving money [10].

Energy can be managed, it can be controlled, and it can be conserved. Management implies control. It also implies involvement by managers with those business activities and functions that are controllable and measurable [4]. In this regard, energy management can be described from the total quality depending on the P, D, C and A cycles, i.e., cyclic implementations of the plan, do, check and action which can be available on every change of situations [6].

3. STRUCTURE OF THE TURKISH FEED FACTORIES

In Turkey, there were 486 mixed feed factories with a total production capacity of 11724000 tonnes annually in 1999. Of these, 90 factories already stopped their productions due to several reasons, such as wrong marketing policies, the fluctuations in the animal production, etc. The mixed feed production was determined to be 6046106 tonnes by the Feed Manufacturers' Association, representing a partial capacity of 59.2% with 396 mixed feed factories [11,12]. The distribution of the Turkish feed factories is illustrated in Table 1 where the total number of the feed factories reached 486 in 1999 to 506 in 2000. The capacities of the mixed feed factories range from 0.8 to 60 ton/h [12,13]. There are two factories with a maximum capacity of 60 t/h, located in the Marmara and Southeast Anatolia regions of the country. The most important demand on the mixed feed results from cattle and sheep, goat farms. Therefore, some effective activities should be done for operating these factories at the full load and efficiently in Turkey.

In the plant selected as an application place, 226 kinds of mixed feeds in various forms and varieties are processed in six production lines with two different raw material.

Table 2. Turkish industrial energy efficiency regulation [5,15]

Issue date and no. appeared in Official Bulletin	11 October 1995 (22460)
Explanation	Required precautions to increase the energy consumption efficiency of the industrial establishments.
Purpose	Providing the necessary regulations to increase energy efficiency in industrial sector, which consume large amount of energy.
Scope	Industry, establishments making industrial facilities in both public and private sectors, big establishments that consume minimum 2000 tons of oil equivalent (toe) energy annually.

Table 3. Energy efficiency announcements [5,16,17]

	Announcement 1	Announcement 2
Issue date and no. of Official Bulletin	3 August 1996 (22743)	08 July 1998 (23396)
Explanation	Fundamentals of energy management lesson and course preparation	Fundamentals of giving an energy audit qualification certificate
Purpose	Arranging a lesson or a course given at engineering faculties to train an energy administrator to be worked at factories.	To reduce energy consumption and to increase the energy efficiency at factories
Scope	Lessons and courses will be given on the basis of the subjects mentioned in the written regulations. If necessary, extra subjects chosen by universities can be involved into the program.	It can be run by both establishments themselves and counselor's expert on energy audit or by the own personnel of the establishment. There are three steps into this study, namely, pre energy audit, detailed energy audit and feasibility studies.

There is not any "*Energy Efficiency Law in Turkey*", yet. There are, however, some studies conducting by the Ministry of Energy and Natural Resources (MENR). In these studies, with leading factor of the NECC, a committee formed by the representatives of several public and private sector and universities prepared "*Energy Efficiency Law Sketch*". If this law is become effective, all the people and the establishments in industry, building and transportation sectors are going to be started working on the energy efficiency subject at the same level with developed countries.

Furthermore, energy consumption and energy efficiency studies of commercial and industrial establishments are going be done under the control, so that efficiency is going to be increased [5].

5. INSTALLATION OF AN ENERGY MANAGEMENT SYSTEM

5.1. GENERAL STRUCTURE OF THE SYSTEM

Energy management begins with the commitment and support of an organization's top management. In the literature [18-20], there are many different flow diagrams presenting a step by step procedure management are the same in principle. However, the following ten key elements are vital for a successful energy management program [9].

- a) Organize energy data and conduct an energy audit.
- b) Build factory board and top level administrative support.
- c) Develop a policy for long-term energy management.
- d) Appoint an energy manager.
- e) Cultivate support from maintenance and operations staff.
- f) Motivate participants with incentives and recognition.
- g) Integrate energy education with energy management.
- h) Track individual factory energy use and provide monthly reports.
- i) Support the committed and innovative individuals at all levels.
- j) Set yearly program goals and energy saving objectives.

Besides this, a systematic approach is needed for effective energy and environmental management program. In some applications, environmental management system is also included in the program as a integrated part of it since an international standard for environmental management, namely ISO 14001, is being published. In this regard, the five-step strategic approach, whose details are described elsewhere [21], involves:

- a) getting commitment from the top level in the organization
- b) understanding the issues
- c) planning and organizing an effective management program
- d) implementing the program
- e) controlling and monitoring performance

The approach is focused on energy, but can equally be applied to environmental management. Moving through each of the five steps, resources are aligned with current needs, and not wasted on premature attempts to force-fit new management processes [21]-

5.2. NECESSITY OF THE ENERGY MANAGEMENT SYSTEM IN THE MIXED FEED INDUSTRY

Based upon the plant studied, the following main results may be drawn:

- a) The factory had an annual energy consumption of 1121 tons of oil equipment (TOE) in 2000. By comparison, according to the Turkish regulation on industrial energy efficiency issued at the end of 1995 [15], industrial establishments that have over 2000 toe energy consumption will set up an energy management system in their plants. Taking into account that the value of 2000 toe will be reduced to 500 toe in the coming years, it may be concluded that the installation of an energy management system is vital in this plant in order to use energy efficiently.

- b) The data used in previous study on the exergy analysis [21] could not be collected easily and even there were no values for specific energy consumptions.

- c) The maintenance and repair manager was also responsible for the evaluation of energy-related issues, as applied in many plants in the country.

- d) Up to date, no energy audits have been performed. In other words, the three golden elements of an energy management system, namely monitoring, energy auditing and targeting, were not functional in this plant.

6. CONCLUSIONS AND FUTURE WORK

In the open literature, there are very limited studies on the application of energy

management systems to Turkish mixed feed industry although the factories are much in numbers in the country. The present study should be evaluated a preliminary study of a mixed feed industry. Nevertheless, it is necessary to perform further and detailed analyses and calculations including the remaining parts of the plan studied.

In summary, it should be noticed that there are no standardized approaches towards energy and management efficiency. There are, however, a few principles worth following, which are sure to result in success. In this regard, based on the lessons learned from other countries, the followings should be taken into account [5].

- a) Full support from key decision makers for any programs that are initiated should be got.
- b) It should be ensured that private sector is closely involved.
- c) An adequate budget should be prepared and ensured that the budget is largely locally funded.

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