Energy Efficiency and Sustainability and a Productive Industry in Manaus

Odson Costa de Almeida
odson_guitar@hotmail.com
FAMETRO University Center – Brazil

Juliana da Cruz Brilhante
juliana_brilhante_95@hotmail.com
FAMETRO University Center – Brazil

Fabiana Rocha Pinto
fabiana.floresta@gmail.com
Engineering Coordination at FAMETRO University Center – Brazil

David Barbosa de Alencar
david002870@hotmail.com
Galileo Institute of Technology and Education of the Amazon – ITEGAM

Manoel Henrique Reis Nascimento
hreys@bol.com.br
Galileo Institute of Technology and Education of the Amazon – ITEGAM

Abstract

O presente trabalho apresenta um estudo de caso em uma indústria de Manaus, localizada no Polo Industrial, com vistas a uma economia energética. Um potencial dessa eficiência no setor industrial é bastante significativo, tendo em vista o alto consumo de energia dentro de diferentes setores. O objetivo do presente estudo foi proporcional à melhoria da reeducação do consumo de energia elétrica de uma indústria de Manaus / AM, a partir de palestras e empresas de sensibilização e conscientização sobre a necessidade de uso adequado da energia elétrica e dos recursos ambientais de forma sustentável, além de descrever como mudanças ocorridas para esse novo processo. Os procedimentos metodológicos consideraram os aspectos da pesquisa com abordagem qualitativa do caráter bibliográfico, seguindo a construção do referencial teórico e o delineamento do objeto de estudo a partir de referências relacionadas ao assunto em questão. Foi realizada a implementação de palestras ministradas aos funcionários que disponibilizaram a participação de forma espontânea do projeto, relatados como resultados que tiveram a sensibilização de funcionários e corpo gestor para o processo inicial de mudanças enquanto as despesas gastas, tendo como suporte a minimização do uso do recurso, promoção da conscientização sobre a necessidade de fazer uso eficiente da energia.

Keywords: Manaus Industrial Pole; Sustainability; Industry.

1. Introduction

In the city of Manaus, the socioeconomic development vector is based on the Industrial Pole - PIM, where industries aim to increase their competitiveness, as well as improving their production process, based on the reduction of energy losses and costs, taking into account the relationship between energy efficiency, sustainability and production base.

Among current concepts, the Ministry of Environment [1] defines energy efficiency as a ratio between the amount of energy employed in an activity and that available for its performance.

The promotion of energy efficiency encompasses the optimization of transformations, transportation and use of energy resources, from their primary sources to their utilization, in which they adopt, as basic assumptions, the maintenance of comfort, safety and productivity conditions of users. , contributing in addition to improving the quality of energy services and mitigating environmental impacts [1].

For this purpose, energy efficiency became part of the world agenda, since the increase of oil prices in 1970, when it became evident that the use of fossil resources reserves would have increasing costs, given the equipment. and consumption habits would be analyzed at the expense of energy conservation [2].

Moreover, when the increase in energy consumption was proved, new arguments emerged through [3] that justify highlighting energy efficiency from the perspective of supply and consumption.

According to [2] the author argues that one of the alternatives for obtaining energy is energy efficiency, and not only the expansion of production supply. In this line of thought, [4] also recommends the implementation of policies to encourage energy efficiency, as well as for renewable generation, as well as allowing the reduction of energy consumption to perform the same service.

Investing in energy efficiency should be seen as a strategic option, as it can be an alternative in meeting the evolution of energy demand, promoting energy efficiency, which can be considered the most economical and safest way for sustainability [3].

Given the above, it is important to highlight that electric energy is essential for human survival given the technological conditions, where quality of life is increasingly linked to energy availability. Thus, electricity becomes indispensable not only for human development, but also for the economic development of any region, where today, from construction to industries, they are looking for savings in the consumption of electricity.

Many companies eventually develop appliances that achieve better energy efficiency with low consumption, in addition to the technological benefits, along with programs implemented by the government, requiring the management of environments that promote improvements and increase energy efficiency [5].

Thus, it is perceived in the current scenario, a great concern about the excessive consumption of electricity, or even an emphatic problematization about this condition, by the industrial systems that provide the heating, cooling or operation process necessary for the conversion of electricity. raw material and manufacture of final products, causing serious damage to the environment, given by the use of resources, against sustainability [6].

Not only does the waste of electricity imply the needs of the entire population, but it can also incur crises

related to the shortage of these sources that correspond to most of the country's energy supply.

It is a fact, the importance of saving electricity, in which the creation of initiatives to ensure environmental awareness is essential. According to [5] the current social concern, also describes the need for new models for this production, triggered by the substantial increase in consumption, promoted by the population increase, besides the lack of public policies focused on the energy matrix in Brazil.

The Brazilian government has been pursuing a policy of conserving energy in industrial, commercial and public lighting areas in order to reduce waste in order to obtain a better use of the energy consumed.

In order to promote the conscious use of energy rationing, the National Program for the Conservation of Electric Energy, PROCEL, was created through Eletrobrás, aiming at combating waste and having as its main symbol the PROCEL Seal. According to [7] in Brazil, electricity is mostly generated from river water, so in order to preserve natural resources and save our energy bill, we must consciously use electricity.

To this end, a bill was presented the following year, which aimed to compensate the electric utilities, based on the commitment to invest in energy conservation and to propose minimum energy efficiency limits in appliances sold in Brazil. From a study by [8] he stated that "this project was only approved after the severe electricity supply crisis of 2001, leading to [9] on energy efficiency.

However, [10] indicate that energy efficiency reduces waste and energy loss, without reducing the compromise of its supply, and can state that energy efficiency activities represent benefits for an institution, in addition to reducing the monthly bill, being strategies for meeting global warming emission reduction targets, enabling energy efficiency to be achieved using energy without compromising daily comfort.

Energy conservation by maintaining or improving the standard of services and quality of life, with lower cost of energy consumption. With the reduction or elimination of waste or from behavioral changes (education) administrative improvement, corrective actions and introduction of new technologies, it is possible to achieve competitive differentials [10].

If the company presents actions aimed at energy efficiency, it can also balance the comfort of the company, environmental awareness, cost reduction, and provide the growth of production with new investments, coupled with its technological development.

According to [11] analyze the waste potential of the different types of installed loads and also implement actions that seek the rationalization of energy use, consequently, there is a saving in the monthly electricity bill, where such actions should and can be practiced in various consumer segments.

Given the context it is clear that there are several ways to apply the energy efficiency actions that can be performed: in lighting, using the appropriate lamp for each type of environment, as well as making use of translucent tiles, presence sensors cells photoelectric or time devices in external illumination.

In recent years, according to [12] a greater concern for sustainable development has been triggered, through the changes that man has caused to the environment, corroborating the increased efforts to save energy in industries, and analyzes of the financial return of medium and long term. It soon appears that, through behavioral changes, minor renovations and equipment changes, a significant financial gain is possible, in addition to the environmental gain.

Also, according to [12] sustainable development is defined as development that seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs in accordance with the available (ecological) means of the planet. Thus, the issue of sustainability assumes in

this new century a central role in the reflection on the dimensions of development and the alternatives that are configured.

The socioenvironmental framework that characterizes contemporary societies reveals that the impact of man on the environment has had increasingly complex consequences, both in quantitative and qualitative terms, especially in the energy context. The notion of sustainable development based on energy efficiency therefore implies a break with the current pattern of development of industrial tracking [13].

For the author cited energy efficiency can be applied in various segments of the industrial sector, in various ways, from power generation to the consumer source. An energy efficiency industry should invest in its maintenance through modern technology that is adequate to the structure, since a large part of energy losses and wastes can be reduced through appropriate maintenance actions, not only corrective, but above all preventive, thus avoiding the high waste of electricity.

Given this reflection, it is important to highlight that there are several strategies to make the use of energy efficient, especially in the industrial sector. [14] tells us that "one of them is, through an energy management program that includes energy auditing, staff awareness and training."

It is notorious that besides this format there are also others, one of them being the adoption of technologies, in view of the great advance of industrial production, and may also count on the help of government policies, since several strategies have been adopted to encourage the use of these technologies. resources effectively, such as: agreements with industries with energy efficiency targets; standards with minimum indices; tax incentives, from credit to financing; energy audit programs and industry guidance for best practice adoption.

However, decision makers must watch over companies so that they do not fall into traps. As an argument in a water reuse system and yet as a major investment keep a productive process full of waste. Given this perspective, it is necessary to bring the necessary information into the industries, so that everyone is socialized about consumption.

[15] clarifies that the decision depends on the decision maker's level of information and hierarchical position in the organizational structure. It is therefore essential that the process of awareness and information on energy efficiency occurs at all hierarchical levels of the organization.

Therefore, it is necessary that the good performance of this system is associated with the care to be taken from the beginning of the electrical project, seeking methods that involve important information about luminaires and usage profile, so that it can ensure a less harmful system.

According to the Ministry of Mines and Energy [16], Brazil has shown a great evolution in recent years, both in legislation, as well as in the knowledge acquired in capacity building, in the awareness of energy needs and their efficiency in the most different areas, which makes an excellent savings plan explicit.

Thus, the objective of this study is to propose improvements in the re-education of electricity consumption of an industry in Manaus / AM, based on lectures and awareness raising about the need for proper use of electricity and environmental resources in a sustainable manner. , and describe the changes that have occurred to this new process.

2. Materials and Method

The present work was carried out in an industry of Manaus Industrial Pole. Initially, the bibliographic

survey was used to support the development of the research, in order to subsidize information and strengthen the debate around the theme in question.

As described [17] "bibliographic research puts the researcher in direct contact with everything that has been written, said or filmed on a given subject, including conferences followed by debates that have been transcribed in some way, published or recorded."

As for the approach it was used the qualitative research that [18] works with the universe of meanings, motives, aspirations, beliefs, values and attitudes, which corresponds to a deeper space of relationships, processes and phenomena that cannot reduced to the operationalization of variables

After bibliographic research, we opted for an applied research that according to [19] focuses around the problems present in the activities of institutions, organizations, groups or social actors, being committed to the elaboration of diagnoses, problem identification and search for solutions. . They respond to a demand formulated by “clients, social actors or institutions”, where it aims to generate knowledge for practical application, directed at solving specific problems, involving local truths and interests.

Therefore, a case study was carried out in a factory located in the Manaus Industrial Pole - PIM, operating in the city for over ten years, with a total built area of 35.35 m². The company is classified as large, has a total of 140 employees working in 3 shifts, working ninety-five hours per week, being divided into two areas, the production part and the administrative area. At the time, a lecture on energy efficiency and sustainability was given (Figure 1).

Figure 1 - Lecture with employees
Source: Own author, 2019

Continuing the project proposal, a survey of the company for employees was read with the objective of identifying their profile regarding the consumption of electricity within the industry and the reality of the company (Figure 2).

Figure 2 - Reading about the company survey
Source: Own author, 2019

In addition, information was distributed to assist in this process of understanding the conscious consumption of electricity, with their fixation in all sectors of the industry.

3. Results and Discussion

In the 1957s, electronic products migrated to the so-called Industrial District, a place intended for products manufactured and sold through the Manaus Free Zone, with the purpose of serving the Brazilian domestic market. However, the companies were predominantly multinational producers of consumer goods, in which the process was reduced only to assembly and imported components, not yet requiring as much electricity consumption.

The need for electricity in the industry is unquestionable, and from this condition arises the need to build a team that becomes responsible for the issue of energy management, for the continuous improvement of its energy performance, including at this level energy efficiency, use and energy consumption.

Given this scenario, the PIM industries have been seeking alternatives to make their employees aware of energy consumption and the adoption of the practice of sustainability. In this sense, it is important to reinforce that the measurement of indicators through the management of this efficiency process, which is becoming increasingly essential in industries, regardless of the area of activity.

The development and presentation of more practical, cost-effective and well-planned energy consumption reduction solutions in the industry concerned for managers and employees has become paramount so that they understand the importance of efficiency and sustainable use. This study has high relevance for industry, especially regarding the application in the industrial hub, responsible for the economic development of the Amazon, indicating where the appropriate and efficient use of energy should be present in the planning of industries integrating the consumption sectors of the energy manager. efficiency (Figure 3).

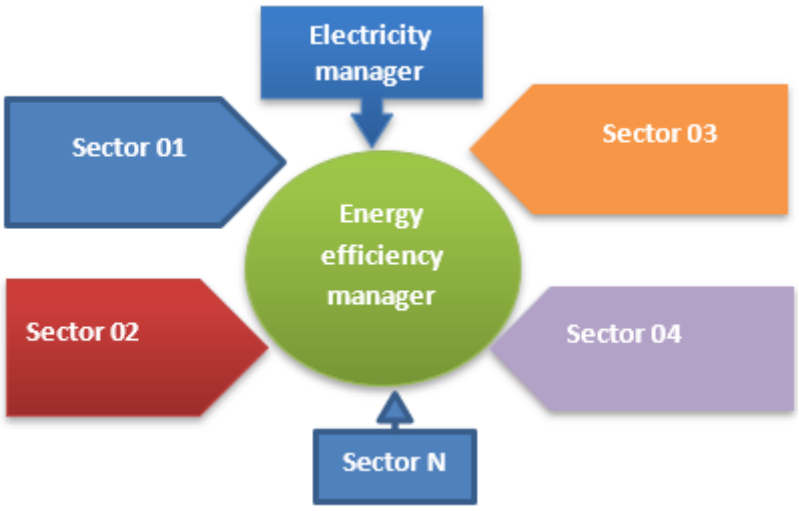

Figure 3 - Analysis of the industry's energy consumption sectors
Source: Own author, 2019

Each industry chosen for analysis has shown that energy-consuming systems have had significant energy consumption within the company, with some potential for energy conservation or need for energy efficiency improvements.

Based on the consumption sectors, the following characteristics are presented: use of electricity use identified the sectors responsible for the highest energy consumption, with proposals for control and elimination of consumption waste; presentation of the importance of strategic planning as a tool to reduce waste and better use of energy; proposals to combat losses and waste. The presentation of the savings achieved after the implementation of the actions, namely:

Lighting control management consisting of luminaires and reflectors. The proposal was directed to the managers of the sectors responsible for the maintenance for the exchange of luminaires for LED lamps, considered at the moment the most economical, accepted by the managers. At the time of its implementation, at the end of the activities related to the industry workers, they were asked to leave the lights when they left their environment, as there was no need to access them.

Much has been addressed about energy efficiency programs, but little is known about its performance as an energy management system added to the control, as a tool to reduce consumption, presenting as an effective result, efficiency, seeking to achieve cost reduction and productivity, making it competitive in the PIM industries.

Energy efficiency can be applied in a variety of ways in various segments of the industrial sector, from power generation to the consumer source. An industry that has energy efficiency as its pillar must invest in its maintenance by means of technology that is adequate to its structure, since a large part of energy losses and wastes can be reduced through appropriate actions in the maintenance area, not only corrective, but above all preventive, thus avoiding the high waste of electricity [11].

The intention within this process is always to raise awareness among all involved, recommending the need to make efficient use of energy and environmental resources available in our environment. In addition, encourage society as a whole to undertake actions aimed at energy efficiency, changing if possible, their daily habits regarding the use of energy.

Continuously the use of the resource should use the process of environmental awareness and awareness of individuals, having as a presupposition the decision making, since daily the population makes use of numerous resources that generate processes and products, which must be focused on conscious consumption and responsible [12].

Thus, the application of these measures seeking to achieve a sustainability model should be present in the habit of their working life, within the industry, putting into practice the guidelines on the proper use of electricity not only in the workplace, but also to multiply. in society, passing on the knowledge acquired in order not only to reduce expenses, but also to reduce the environmental impact caused. It should be noted that this study showed the real needs of the company and the engagement of its employees.

4. Conclusion

The present work presented the importance of studying energy efficiency, increasing its yields, and thus contributing to the electricity sector to meet the energy demand without necessarily increasing the generation of electricity.

Among the various manageable costs for a company in the industrial sector, energy has been assuming a growing interest every day, motivated by the reduction of costs resulting from energy availability or even by environmental restrictions. Whatever the motivation, promoting energy efficiency is critical. For this, knowledge must be applied in an applied way, employing the concept of electrical engineering to energy systems to reduce losses in energy distribution.

Given this scenario, it is essential that before carrying out any activity related to energy consumption, it is necessary to know the energy reality of the company, in order to situate the priorities and implement projects for improvement and reduction of losses, following this process continuously.

The results obtained in the study show that, for lighting, replacing incandescent light bulbs with 9w LED bulbs would provide a reduction in energy expenditure. The LED is made up of a series of layers of semiconductor material and is capable of converting electricity directly into light. Due to its low power consumption and long durability, it is an interesting option for better energy efficiency and is also interesting from an environmental point of view.

Currently the energy waste due to inefficient lighting is very large. Good lighting is still a prime factor for human well-being and can be provided by raising awareness of the cost of energy. Furthermore, the use of LED technology contributes directly to the preservation of the environment, where the efficient use of energy happens differently, and with various tools that can facilitate the achievement of excellent results.

Through this study it was possible to identify information about the energy efficiency of the industry and its energy consumption, which concludes that the energy efficiency indicators are essential instruments to identify the potentialities in the industrial sector, helping to improve the company's energy performance. .

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