Energy management in the newspaper production process

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Abstract. The print media has proven to be a powerful communication medium on issues such as climate change, depletion of energy resources, use of renewable and conventional energy sources and their impact on the quality of life of society, biodiversity and ecosystems, serving as a means of raising awareness. Additionally, the energy consumption of print media facilities contributes to these changes, as a result of greenhouse gas emissions from the consumption of electricity in its newsroom processes and in the printing of copies, in the case of paper newspapers. This paper shows the results obtained from the analysis of the electric energy consumption of a newspaper printing company obtained from an energy audit. The results show that with measures on the air conditioning equipment systems, benefits are reflected as a better redistribution of the energy matrix and a reduction in energy consumption, which is reflected in the estimated energy efficiency indexes based on the number of printed copies, employees and construction area.

Keywords: Anthropocene; energy management; energy efficiency index; newspaper industry.

Introduction

The Anthropocene is still a scientific concept under construction, being shocking the present debate about its existence, with its arguments and reflections (Zamora et al., 2016; Benitez et al., 2019; Anzoátegui, 2020; and Bonneuil & Fressoz, 2020), but today is the era of the anthropos (Arias, 2020), where human societies have impacted the climate, inducing global warming and climate change (Torres, 2019). These changes, not experienced since the last ice age, are reflected as the increase in the average temperature of the planet (Arias, 2020), as a result of the concentration of greenhouse gases (GHG) in the earth's atmosphere. This concentration traps the heat of the sun's rays, behaving like the boxes used to grow tropical plants in cold climates.

There is a 95% certainty that the cause of the increase in GHG concentrations is anthropogenic (IPCC, 2013), i.e., the consumption of fossil fuels for electricity generation, transportation, industrial activity and other sectors, deforestation and other causes. According to this so-called 5th report, "the warming of the climate system is unequivocal and, since the 1950s, many of the observed changes have been unprecedented in recent decades and millennia. The atmosphere and ocean are warming, snow and ice volumes have decreased, sea levels have risen and greenhouse gas concentrations have increased" (p. 4).

According to Salas & Maldonado, 2019, in the world there is also a group of skeptics who claim that climate changes have historically occurred during life on the planet. Although this is true, what is observed about the current climatic variables, the current transformation is more vertiginous and profound (IPCC, op. cit.). The loss of biodiversity recorded since the last century and the impact on ecosystems are significant.

The debate and awareness that has taken place around the global threat in several aspects has been enriched by the written press and other media. For example, the topic on the use of non-conventional renewable energies in countries such as Costa Rica (Chavarría, 2016) and Chile (Bill, Urquiza, & Feres, 2017). According to Chavarría (2016), this has been presented as a political and economic debate that incorporates within the national discourse the issue of the use of renewable energy sources, from two (2) points of view: the energy crisis and the impacts on the environment. On the other hand, Bill et al. (2017) state that within the framework of the media reality that is able to build bridges between social rationality and its relationship with the environment.

Recently, García-Carmona (2020), after analyzing publications in the digital press on the issues of climate change, the depletion of energy resources, the use of renewable and conventional energy sources and their impact on the quality of life of society, found that they are published daily in Spain. These news items allow to reflectively address current and future problems and the need to achieve sustainable development, which is the responsibility of citizens in this context.

The press has favored the communication about energy alternatives to behave in order to reduce environmental problems. Additionally, its equipment and facilities are responsible for the phenomenon of GHG emissions and other effects. In this framework, the purpose of this work is to propose alternatives to reduce energy consumption according to the guidelines of the ISO 50.001:2018 (ISO, 2018) and ISO 50.002:2014 (ISO, Energy Audits-Requirements for their use, 2014) standards, to ensure its effectiveness and be a reference in the culture of sustainable development. In this work, based on the energy audit conducted in an industry dedicated to the printed press, its energy matrix and efficiency indexes are analyzed to serve as a basis for comparison with other similar companies that publish under the same format.

Method and Resources

One of the first steps to achieve the implementation of an energy management system under the guidelines of ISO 50.001:2018 (ISO, 2018) is to perform an energy audit (ISO, Energy Audits-Requirements for its use, 2014). Energy efficiency can be considered as a source of energy, since it seeks to reduce the demand and energy in a facility without affecting productivity, comfort and quality of life of the facility (Vásquez et al., 2015). The energy audit consists of a series of steps that allow analyzing the consumption of electrical energy from the sources of electricity supply, the consumption of electrical equipment and other variables that define the actions to be taken to ensure rational consumption (López, 2020).

In the print media sector, there are important challenges and elements that are directly related to energy consumption, among these are the rotary presses and newsrooms, whose comfort depends on elements such as air conditioning and lighting.

Results and analysis

The results of the energy audit analysis are shown below (ISO, Energy Audits-Requirements for their use, 2014), the sources of information come from the billing performed by the local electric company and the measurement in its main boards and other facilities with equipment (Crespo et al., 2015). Finally, energy efficiency indexes are shown to compare consumption and assess the benefits of the implemented actions (Achkar et al., 2019).

Figure 1 shows the demand profile of the main panels of the facility whose measurements have been made with a network analyzer (Crespo et al., 2015), where the red color represents the demand of the administrative areas, the blue of the rotating machines and the green the sum of both, to obtain the total electrical demand. It can be observed that the maximum demand of the facility occurs between 8 pm and 2:30 am, approximately. Between 8 to 10 pm coincides with the time of maximum national demand (Quinatoa et al., 2020).

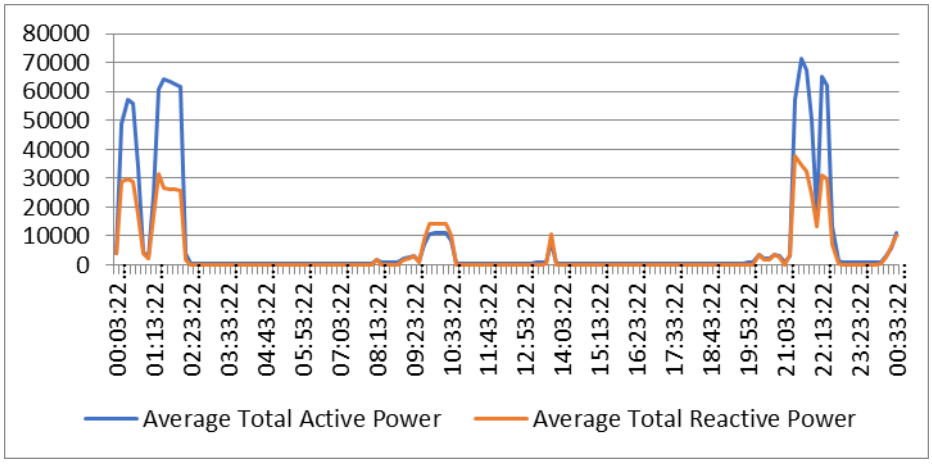

Fig. 1. Distribution of electricity consumption by administrative and office area

Figures 2 and 3 show the energy matrix and the distribution of consumption by administrative area and equipment for this facility, respectively. As can be seen, the highest percentage of electricity consumption is for cold air conditioning equipment, and this is mostly reflected in the areas of press editors, despite the fact that the rotary machines are its main asset. Thus, the proposed actions are focused on control measures and adjustment of this equipment.

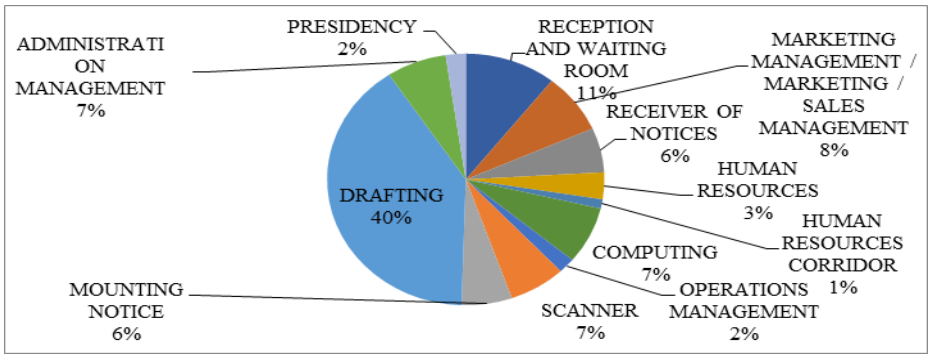

Fig. 2. Distribution of electricity consumption by administrative and office area

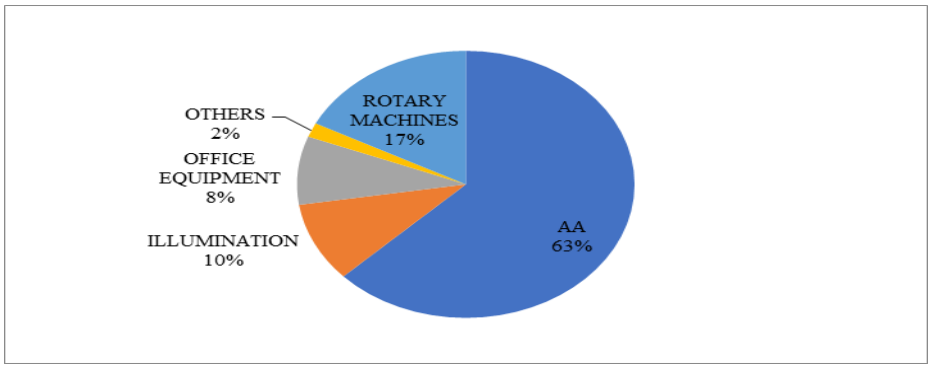

Fig. 3. Distribution of electric power consumption by equipment

Figure 4 shows, as an example, the effect on the demand profile of not turning off the air conditioning equipment during staff absence hours in the newsroom, between 12 noon and 2 pm. The blue figure represents the demand profile of one (1) day without the equipment being turned off. On the other hand, the red one is the demand measured the following day when the air conditioning equipment is turned off during this period. It can be seen that there is approximately a 12% reduction in energy consumption, despite the fact that there is a maximum consumption at the start-up time, due to the start-up of the equipment.

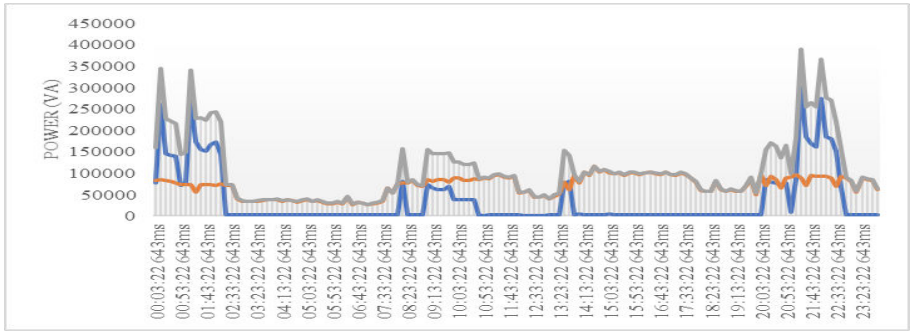

Fig. 4. Demand profile in the administrative areas of the company with measures to turn off air conditioning equipment between 12 m and 2 pm.

Based on this analysis, there is a reduction of electricity consumption by adjusting the thermostats of the equipment according to the thermal sensation and comfort of the personnel and with controlled switch-on and switch-off schedules. It is to say that they are turned on at 9 am (one hour after the time of entry according to working hours) and turned off between 12 noon and 2 pm. Finally, they are left operating until 5 pm, one hour before departure. Based on these measures, the energy matrix by equipment is shown in Figure 5, where it can be seen that the consumption of air conditioning equipment was reduced from 63% to 56%, that is, by 7 percentage points.

Finally, to follow up on the actions implemented, Table 1 shows the energy efficiency indexes (Achkar et al., 2019) estimated based on the total electric energy billed to the company and the number of copies sold and employees and the surface area of construction. It is highlighted that the number of copies used for the calculation are those sold, since there is a significant number of copies given by courtesy or consignment.

Table 1. Energy efficiency index for the print media industry.

INDEX	**UNIT**	**YEAR**		
		2016	**2017**	**2018**
Production function	Number of copies/kWh	18,74	21,81	25,80
Function of the number of employees	Per 100 employees/kWh	0,2952	0,3243	0,3460
Function of the surface of the constructed area.	100 ^{m2} /kWh	0,4230	0,4618	0,4909

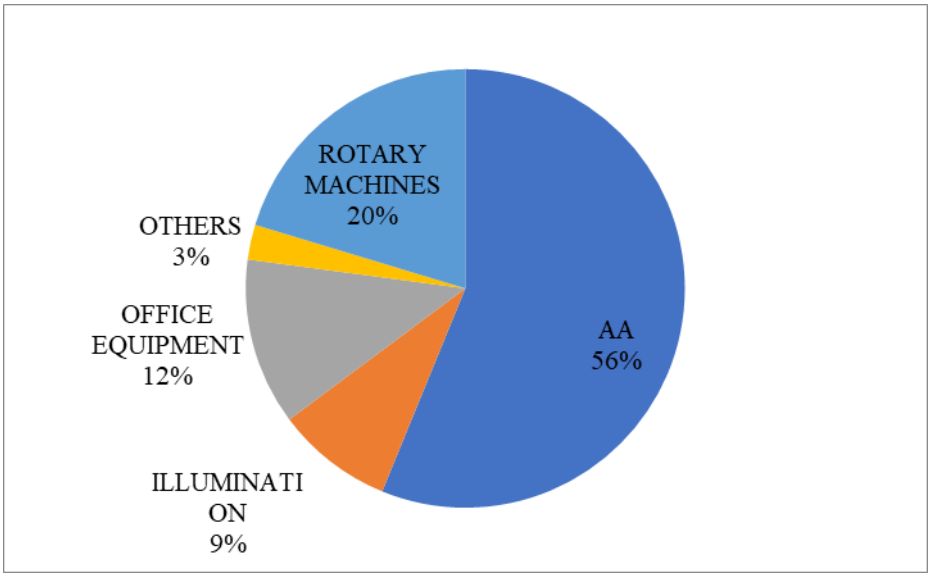

Fig. 5. Estimated energy matrix with thermostat adjustment actions and on/off measures in air conditioning equipment.

Conclusions

In this era of the Anthropocene, humans have managed to change the climate, affecting biodiversity and ecosystems. The concentrations of greenhouse gases have increased as a result of the consumption of fossil fuel-based electrical energy, transportation, industry and other processes. At the same time, the phenomenon of global warming is observed with the increase in the planet's temperature, sea level and other phenomena. In this context, the written press plays an important role, as it is able to inform the general public about the impacts on society and modify the way of consumption. At the same time, this industry is a consumer of natural resources for its production, including electricity. From an Energy Audit, it was observed that for the printed press sector, its maximum demand requirements depend on the operation of the presses, which coincides with the demands of the electrical systems. In addition, the air conditioning of the administrative areas is an important source of energy consumption. Within this framework, the implementation of two (2) important actions: adequate adjustment of thermostats to thermal sensations close to 24oC and control of equipment switching on and off, have managed to reduce the energy efficiency of the installation, which has been observed in the indexes carried by the company during a period of three (3) years.

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