

ELECTRICITY LOAD ANALYTICS FOR LIGHT ENERGY CONSUMPTION IN A HOUSE USING MACHINE LEARNING ALGORITHM

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Abstract - Electricity is one of the greatest gifts to the mankind. It has become a part of human life. Light energy plays a vital role to make the world brighter even in dark periods; electric lights are used in streets, houses, institutions, industries, etc. Light energy consumption varies based on weather patterns. This weather pattern exhibits the constant effects on light energy consuming. In this paper, the analysis is concentrated on the changes in light energy consuming based on seasonal effects. Two different seasons are compared such as winter, spring. In winter season, electrical light energy is high due to high humidity level. Also, in the spring season, the temperature is high, and the electrical light energy consumption is decreased due to high-temperature vice versa.

Keywords - Light energy consumption, electrical load, seasonal energy, lighting, winter, spring, energy consumption

1. INTRODUCTION

Light energy is the form of energy visible to human eyes. Sun and moon lights are renewable source of light energy which is free from eco-friendly. Sun light, Flame etc., are Primary source of light energy. Electricity is a secondary source of light energy because it is different from natural lights. Light energy consumption in the house is an important part of total electricity demand. Occupants used electricity for lighting, heating, cooling, refrigeration and other operating appliances. Lighting is essential for visibility of objects in dark places or situations and lights are turned on at house outside temperatures decrease as the sun sets. Electricity use increases through the daytime as outside temperature increase. Light energy consumption increases or decreases depending on the daily temperature and humidity from the normal (average) values.

In this paper an analysis is made on light energy consumption with respect to weather condition. The purpose of this analysis is to understand the relationships between light energy consumption with outside temperature, and humidity. Section 2 shows the related work of the research, followed by section 3 describes the house description and experimental setup, and the section 4 shows analysis for season-wise and ends with Section 5 shows results and conclusion.

2. LITERATURE REVIEW

Energy is a vital resource and its demand is growing day-by-day. Energy analysis is the method of assessing the way energy is used in the house. Good amount of literature collected to light energy consumption for lighting purposes analyzed thoroughly and presented this section. Shushi Sugiura et al [1] proposed the article based on the analysis of energy consumption levels of heating, lighting and electric appliances together account for a large portion of total household energy consumption. Saša Jovanović et al [2] showed the location and the climate zone affect the overall of electric power consumption on different weather conditions. Han, J et al [3] proposed the ZigBee controller and monitor the energy usage of energy saving and reduce the energy consumption. The Several controlling and monitoring system have been proposed [4]- [6]. F.Wahid et al [7] proposed the Energy consumption data of home appliances and the analysis process consists of five stages followed by data source, data collection, feature extraction, prediction, and performance evaluation.

3. HOUSE DESCRIPTION AND EXPERIMENTAL SETUP

The analysis of this energy data is done in one house is located in Stambruges- City of Mons in Belgium. The electrical light energy metering was done with the M-Bus energy counter. The energy information collected and reported by e-mail every 12hours. The light energy consumption (watts) in a house has been studied by every 10 minutes. The 10 min interval was to capture quick changes in energy consumption. The use of lights in the house depends upon the outside building temperature (Celsius) and humidity (%). Humidity and temperature are monitored by a wireless sensor network.

The combined dataset is 137days (4.5months). Outside of the house temperature and humidity is merged by date and time. Complete dataset energy consumed from 11, January until 27, May is split into winter (81days) and spring (56days) season-wise. Four occupants in the house, two adults and two teenagers. One of the adult works regularly in the home office. The energy consumed by light is measured by the unit kilowatts and humidity measured by percentage and the temperature measured by Celsius. This analysis is done by matlab because it is the best tool.Following steps are involved into the analysis process

- 1. Importing and exploring the data
- 2. Aggregating the data for monthly consumption

4. ANALYSIS AND RESULT

Data analysis is a process of discovering useful information. Light Energy Consumption range from 1% to 4% of the house. In stambruges weather report not at the same location as the house, Google shows Stambruges humidity condition is reached 100% in the winter season and that time of temperature level is minimum. As Fig:4.1gives the graphical representation of light energy consumption for monthly wise, the usage of light energy consuming in stambruges Least amount of light energy is consumed May(8.79watts) and high amount of energy is consumed in February (26.49 watts).

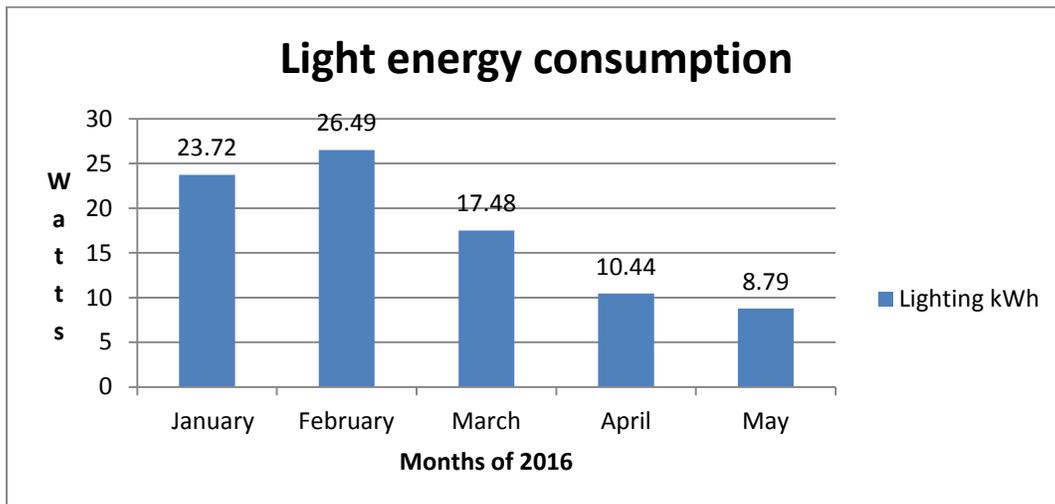


Fig:4.1 Aggregation of light energy consumption per month

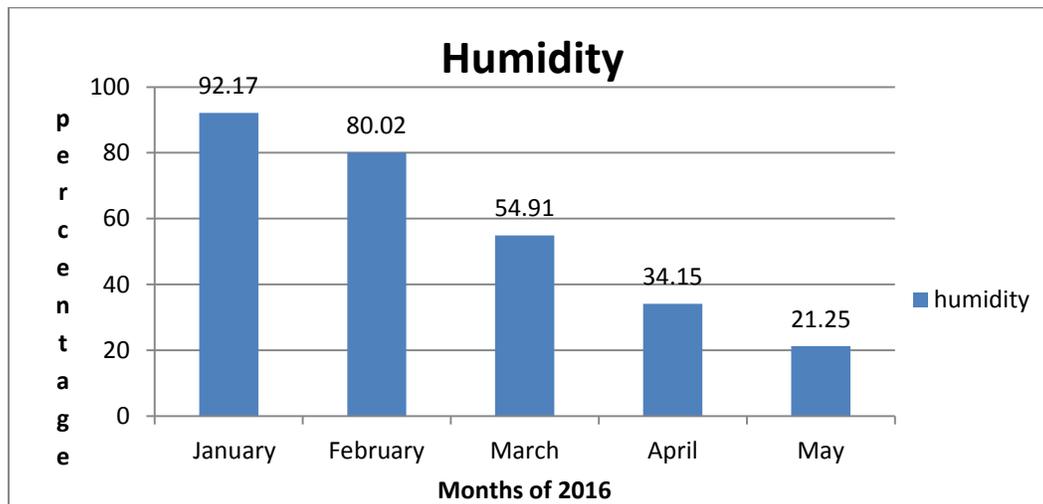


Fig:4.2 Aggregation of humidity(%) per month

As shown in Fig: 4.2 shows humidity level in monthly wise, the Least amount of humidity is consumed May (21.25%) and high amount of humidity is consumed in January (92.17%).

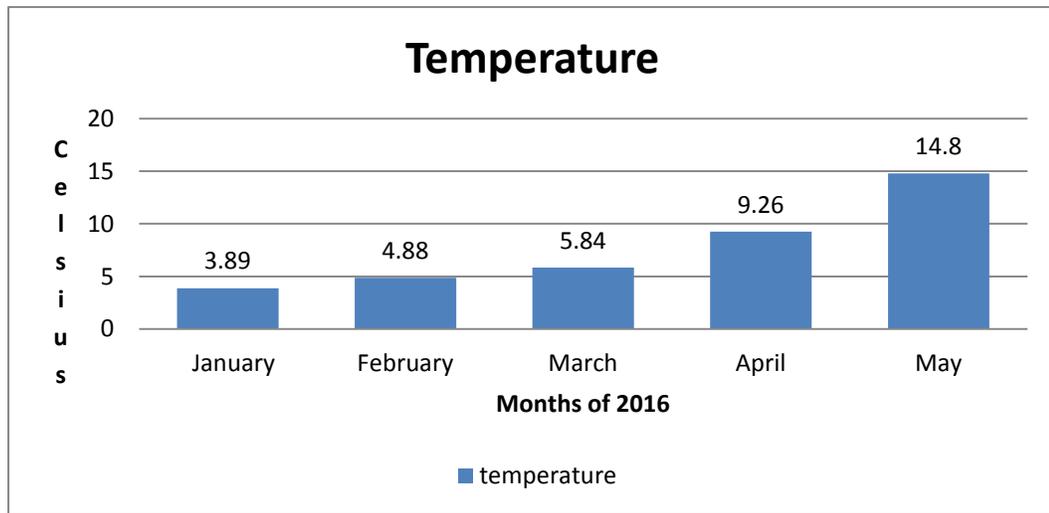


Fig: 4.3 Aggregation of Temperature (°C) per month

As shown in Fig: 4.3 shows temperature level in monthly wise, the Least amount of humidity is consumed January (3.89°C) and high amount of temperature is consumed in May (14.8°C).

Case 1: Light Energy Consumption in winter

Four months belongs to winter season such as December, through to January, February and March. During winter season, humidity level must be high; and there is a usage of light is increased in a house. Indoor humidity in a house is related to outdoor temperatures. Lighting energy should be sufficient to enable to work safely and without eye strain and other ill health effects. Every house has suitable and sufficient lighting and it shall, as far as it is reasonably by natural lighting.

Light Energy Consumption in winter:

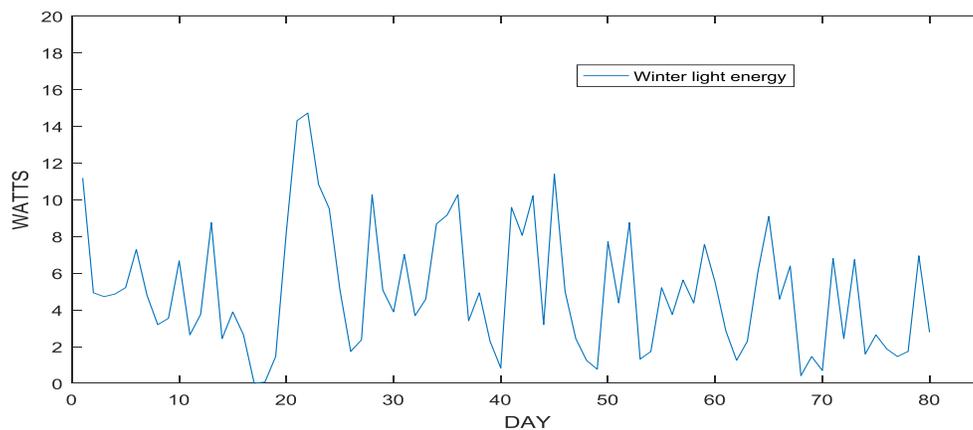


Fig: 4.4 Winter Light Energy

As shown in Fig: 4.4 the usage of light energy consuming in a house for the entire season of winter. Least amount of light energy is consumed in 17th day (0 watts) and high amount of energy is consumed in 22nd day (14.72 watts).

Temperature level in winter:

Sunshine is rare in the winter season; Temperature in colder season staying warm at home. An occupant in the house wants to stay warm, but keeping the temperature reasonable to save light energy is important. Following graph shows the temperature of the winter season

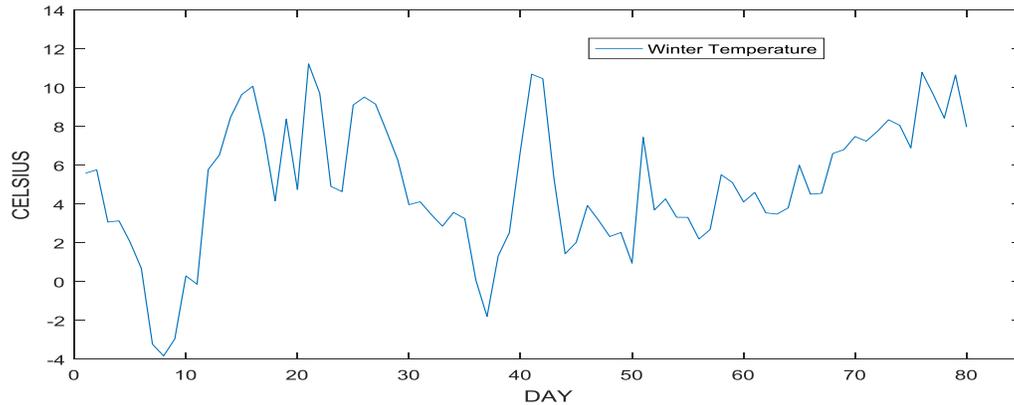


Fig: 4.5 Winter Temperature

as shown in Fig:4.5 Winter season has the least temperature in general, occupants are in the house during the day or evening in that least amount of temperature level is recorded as -1.79°C in 7th day of winter. High amount of temperature good starting level is recorded as 10.79 °C in 76th day of winter, the temperature balance between heating the house, and energy savings.

Humidity in winter:

Humidity level is depends upon the building outside temperature and outside o humid level is calculated by outdoor environmental situation. Winter air is naturally dry, and Warmer temperatures can hold more humid than colder temperatures.

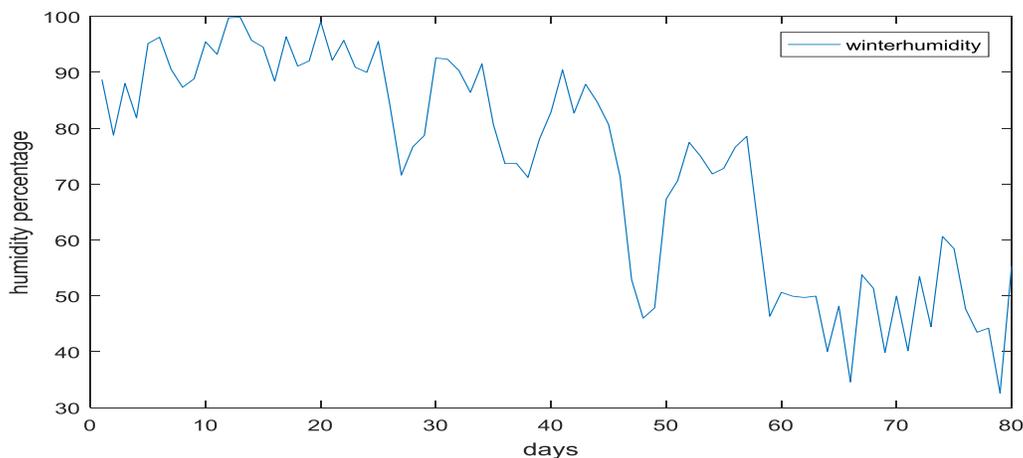


Fig: 4.6 Winter Humidity

As shown in Fig 4.6 Winter season has the highest humidity in general, in that least amount of humidity level is recorded as 99.9% in 13th day of winter. High amount of humidity level is recorded as 32.58% in 79th day of winter.

Case 2: Light Energy Consumption in spring

In spring season, winter and summer which temperatures gradually increase. Three months are belongs to spring season such as March, April and May. During spring season temperature level must be high; meanwhile usage of light is decreased in a house.

Light Energy Consumption in spring:

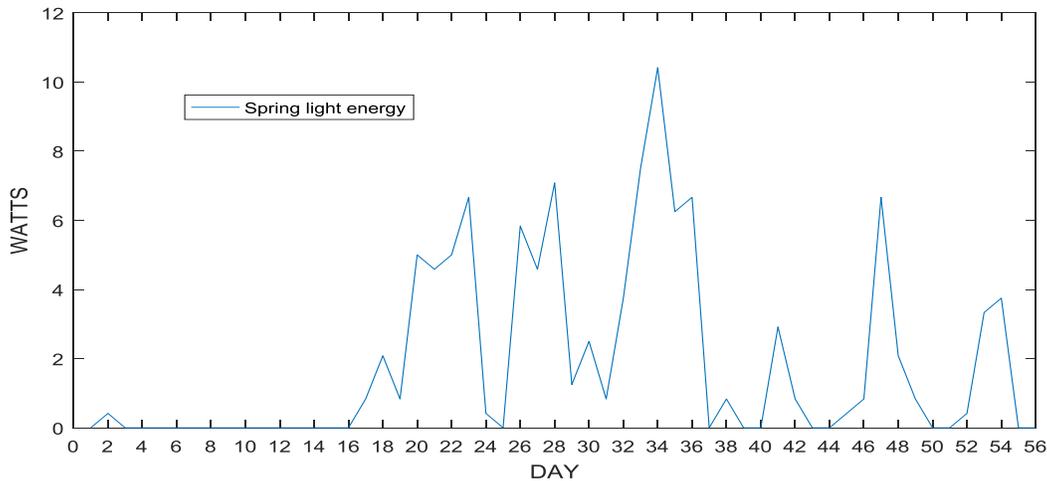


Fig: 4.7 Spring Light Energy

As shown in Fig 4.7 the usage of light energy in a house for the entire season of spring. Least amount of light energy is consumed first week of April and high amount of energy is consumed in 34th day.

Temperature level in spring:

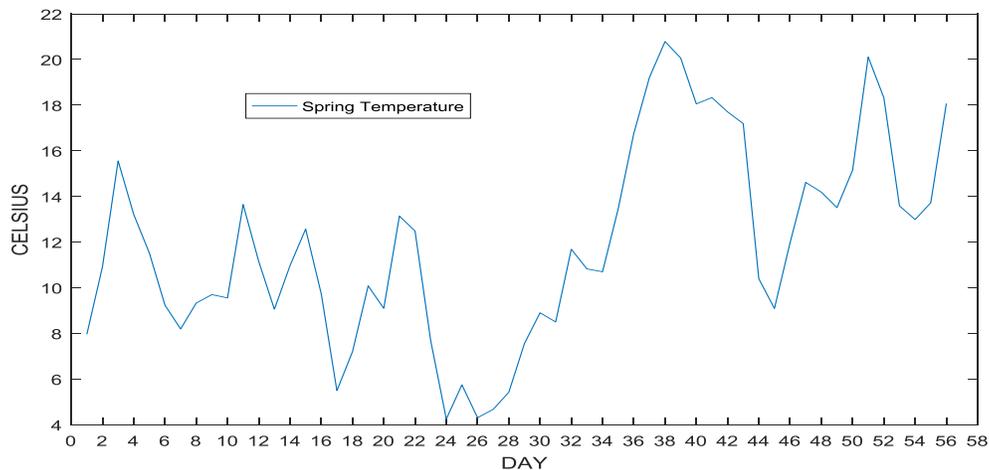


Fig: 4.8 Spring Temperature

as shown in Fig:4.8 spring season has the least temperature in general When humidity levels are low, commonly during winter and spring, temperature has daily swings in that least amount of temperature level is recorded as 24th day of spring. High amount of temperature level is recorded as 39th day of spring.

Humidity in spring:

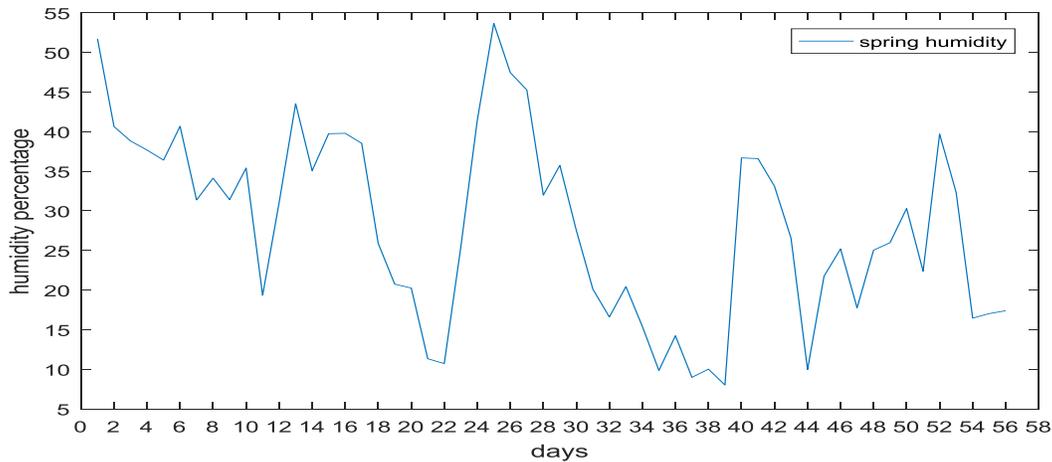


Fig: 4.9 Spring Humidity

As shown in Fig: 4.9 humidity levels in home varies according to the temperature outdoors. Winter season has the highest humidity in general; in that least amount of humidity level is recorded as 39th day of spring. High amount of humidity level is recorded as 26th day of winter.

5. CONCLUSION

In this study an attempt has been made to understand the domestic light energy consumption for lighting purposes in Stambruges, city of Mons. The data are analyzed thoroughly and investigation to understand the light energy consumed depends upon the outside humidity and temperature. In the winter season outside humidity level is low and the temperature level is high. In the spring season outside humidity level is high and the temperature level is low. So the usage of light energy in both seasons light energy (watts) consumption is balanced during the daytime.

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BIOGRAPHIES

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