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Owlet smart control application installed in the public lighting system of Resita

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The telemanagement system application allows intelligent control of the operation of the ten LED lighting units. Remote operation is done through GSM and through a user-friendly web interface. The dimming levels can be adjusted both manually and automatically. The system is efficient and allows both automatic adjustment of road lighting to predefined levels and savings in electricity consumption. The application also informs the user online about the status of the luminaires it serves, displays the technical parameters and allows to obtain graphs and situations regarding the electricity consumption achieved within a time period chosen by the user. In the application installed in Resita and after one year's monitoring, a 40% saving was obtained compared to ten other lighting fixtures and is not controlled by such a system.

Keywords: dimming, *LED, owlet, control, telemanagement system*

1. Introduction

In the city of Resita, in a pilot project in 2013, a telemanagement system was installed for the smart control of the functioning of the ten lighting units equipped with LED modules with a power absorbed of 139 W and equipped with dimimng, appliances that replaced the HPS with the absorbed power of 171 W and mounted on the avenue of the Republic of Resita. This system comes as an alternative to the optimization solutions proposed in the context of some point analysis [1-5].

The research paper presents a tele-management application for street lighting, carried out in 2013, as part of a pilot project deployed in Republic Avenue of Resita City, Caras-Severin County (Figure 1).

Figure 1. Republic Avenue lighting pillars No. 32-36.

2. Description of the application.

For this purpose, the Owlet Nightshift control system [6] was used. The Owlet Nightshift system is a remote control system for monitoring, metering and managing a lighting network (Figure 2). All these are necessary to meet the lighting and energy efficiency requirements [7-10]

It is a unique combination of state-of-the-art technology and an easy-to-use web interface control each luminaire at anytime from anywhere in the world. Thanks to bi-directional communication, operating status, energy consumption and possible failures can be monitored. This advanced solution provides:

- Secured data storage and a back-up;
- Pre-defined or customized reports to focus on the information you want;
- Third party ERP integration through data bridges
- Fall-back scenario;
- Data management (energy analysis, problem detection);
- Instant alarm management (via sms, mail or mobile);
- Easy progressive enlargement of network;
- Easy integration of external sensors;
- Absolute compatibility with any type of lamp, ballast or LED driver.

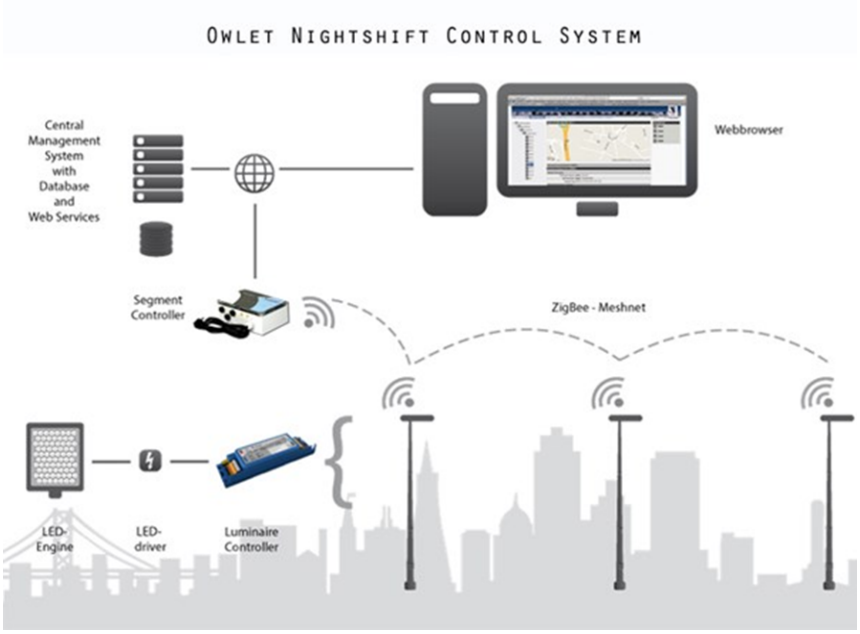


Figure 2. The Owlet Nighting sytem.

For the implementation of the application, on the pillars no. 32-36 were replaced with HPS luminaires with 171 Watts power absorbed with bodies equipped with LED modules, with a power absorbed of 139 Watts, which are each controlled by a local controller (lighting controller) according to Figure 2.

This device allows the light to be emitted by the luminaire (dimming) both in automatic (programmable) and manually by the human operator. The control system communicates with the operator through a friendly web interface and can also be accessed from a laptop, tablet, or cellular phone, provided that the device is connected to the Internet.

The images of the application obtained through the web interface are represented in Figures 3-7.

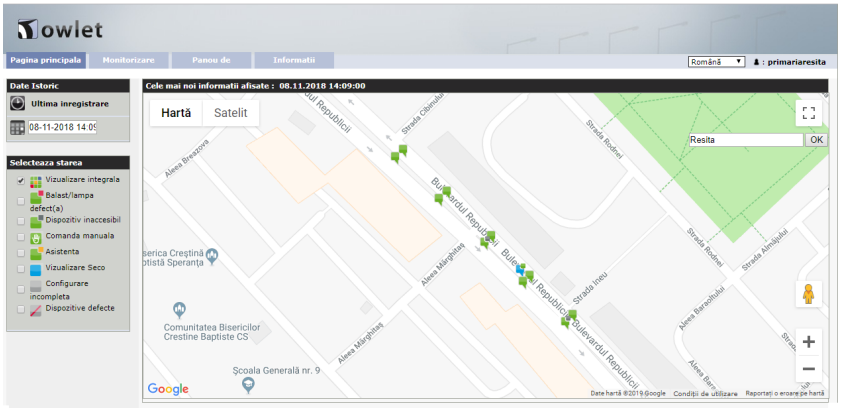


Figure 3. Application area.

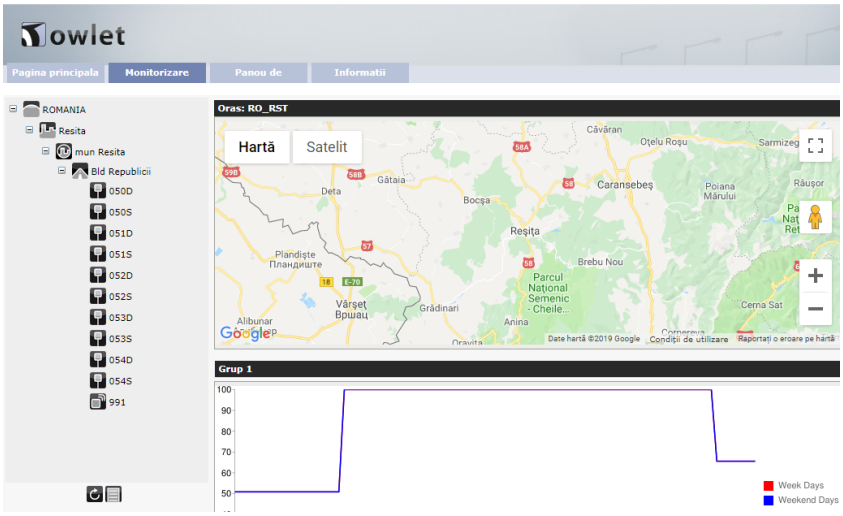
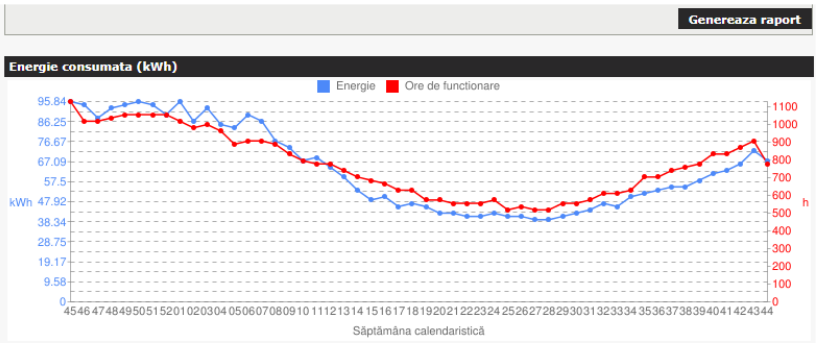


Figure 4. Viewing operating data at the level of a luminaire.

Figure 5. Electricity consumed by a luminaire and dimming in the period 7-8 November, 2018.

Figure 6. Electricity consumed by a luminaire and dimming in the period 1-31 October 2018.



Raport energie consumata — Arata/Ascunde detaliile

Nivel	Nume	Start Time	Pana la	Parametru	Zile	Number of Lamps	Energy Consumption	Runhour
Oras	Resita	08.11.2017	08.11.2018	FEC	366	10	3,305.6780 kWh	40146 h

Valori totale	Valori interpolate	Dispozitive inlocuite
3651	0	0

Cartier	Zona/strada	Nume	Energie	Ore de functionare
08.11.2017 [45]			12.0958 kWh	140 h
mun Resita			12.0958 kWh	140 h
	Bld Republicii		12.0958 kWh	140 h
09.11.2017 [45]			12.2397 kWh	140 h
mun Resita			12.2397 kWh	140 h
	Bld Republicii		12.2397 kWh	140 h
10.11.2017 [45]			12.0133 kWh	150 h
mun Resita			12.0133 kWh	150 h
	Bld Republicii		12.0133 kWh	150 h
11.11.2017 [45]			11.7670 kWh	140 h

Figure 7. Electricity consumed by a luminaire over the period of time 08.11.2017 – 08.11.2018.

3. Calculation and results.

The electricity consumption recorded between 8.11.2017 and 8.11.2018 by a Eurostreet type luminaire (ET25) equipped with a Lucalox 150 W HPS lamp was:

$$W = P \cdot h = 0.171 \cdot 4059 = 694.089 \quad \text{kWh} \tag{1}$$

where 0.171 kW represents the active electrical power absorbed by the lamp, ballast and igniter together.

The power consumption recorded in the same period of time (8.11.2017 - 8.11.2018) by a TCEO 2 LED 139 W, specified in the report obtained with the Owlet Nightshift system, is: 403.73 kWh.

This reduced energy consumption was obtained thanks to the three dimming steps of the luminous flux programmed as follows:

- From the time of connecting the public lighting, until 22:00: 100%;
- Between 22.00 and 24.00: 66%;
- From 24.00 until 5.00 in the morning: 50%;

- From 5.00 in the morning, until the public lighting is switched off: 100%.

Following the calculations, energy efficiency [7] and, implicitly, savings of 41.833% are achieved. For the public lighting installation made up of 10 x TCEO 2 LED 139 W luminaires and the Owlet Nightshift tele-management system, during the analyzed period, a reduction in electric energy consumption was achieved by 2,903.59 kWh and 2.903 MWh respectively. Based on the cost-benefit analysis of the investment, it results that the depreciation achieved to date is approx. 25%.

4. Conclusion

The still high cost of this modern equipment does not lead to a damping in a relatively short period of investment. However, the system implemented experimentally at Resita is efficient, economical and provides a number of advantages that have already been presented in my research paper.

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