Automation of Domotic Unit of Postgraduate Studies and Research UDEPI

The Tecnológico de Estudios Superiores de Coacalco, TESCo, was created in order to satisfy the need to train professionals able to provide the town and country of technological and scientific advances necessary for development.

As a result TESCo is committed to education and training of these professionals and they have developed various plans for updating and continuous improvement.

Resulting in the creation of the UEPI (Unit of Postgraduate Studies and Research) to form Masters of Science in Industrial Engineering, but not the only support that is offered to students in Tesco, also gives them the opportunity to participate improvement projects for university facilities.

As an example of the above it has been created the UDEPI project (Unit of Postgraduate Studies and Research), which consists in updating UEPI building facilities to make a smart move to improve the image of the university as well as provide better quality of work for the faculty, staff and students of the same staff.

UDEPI The project's main objective is to reduce the environmental and economic impact of implementing UEPI operation systems required for control, safety, comfort, energy management and communications. Improve efficiency of existing facilities or replace these facilities with ones that reduce losses through: the installation of a solar system, restructuring the electricity system, restructuring the hydraulic system, a pneumatic system installation and installation of sensors, temperature pressure and flow.

This project was developed by Aguayo Mendoza Kristell, Fuentes Olivan José Antonio Garnica Navarro Zaira Dinorah, Guadarrama Sánchez Rodrigo, Sagaón Moreno Elene Bertha and Villasana Zurita Elizabeth students studying Mechatronics Engineering and Members of IEEE (Institute of Electrical and Electronics Engineers).

Definition

The project is named after UDEPI, to adopt the term Automation citing this discipline. The UDEPI aims to be energy efficient and convenient for the user, this means:

- **Energy efficient**. Aims to introduce one of the main objectives of the Smart House: that is energy saving. This is possible through optimization of energy consuming equipment, for example, heating or hot water generation.
- **Convenient for the user**. Aims to introduce another objective of Smart House: user comfort. This is possible by increasing the possibilities for control of equipment and facilities themselves. Thus, the comfort is easily translated into an increase in the quality of life.

Therefore building a home automation can be defined as: One building that delivers a better quality of work through technology, offering a reduction of labor, increased welfare and safety of its inhabitants and a rationalization of the various consumptions (water, light, air, etc.).

Applications of home automation.

The main applications of Automation often framed within the following functional areas:

- The technical energy management
- Comfort
- Security

The Project consists of the following six basic steps:

1. Hydraulic system
2. System wastewater
3. electrical System
4. Photovoltaic system,
5. Illuminated,
6. Access Control
7. Integral Control

According to the fundamental applications of Automation systems develop the following:

APLICATION	DEVELOPMENT SYSTEM
Technical management of energy	Photovoltaic and electrical
Confort	Replacing climates cleaner technologies as radiant floors, the change of lighting by new technologies
Security	Reinforce existing security systems cameras in strategic areas in the building, access control, fire alarm systems.

PHASES OF THE PROJECT

I. HYDRAULIC SYSTEM

Based on the study and analysis of the current hydraulic system of the building, its hydro-health restructuring is proposed, thereby maximizing the currently installed capacity (pumps).

Similarly, it is proposed to change the infrastructure of the pipeline, the current optimum flow design prevents the passage of water causing loss of service efficiency.

II. SYSTEM WASTEWATER TREATMENT

The UEPI does not currently have a system of wastewater treatment, design and installation of one aims to reduce the environmental impact caused by the disposal of this water and reuse in activities such as sanitary downloads, or watering planters research in the area of process chemistry or environmental engineering.

III. ELECTRICAL SYSTEM

During the project the following limitations were identified in the electrical system:

1. Capacity insufficient wiring. The gauge of the wiring does not meet current power needs of 28,000 Kw UEPI, sued for computers, laser printers and air conditioning delivery by other devices

2. No physical Earth. It is required for proper operation of computer equipment and damage prevention.

3. Lightning rod. Prevent direct lightning strike of negative polarity. Rays polarity is negative in 95% of cases.

4. Eliminating these gives us the following benefits:

5. Protection of electrical equipment against overloads

6. Increase performance in the electrical system.

IV. PHOTOVOLTAIC SYSTEM

It is feasible to install a photovoltaic system that will allow significant reduction of energy consumption of CFE.

The photovoltaic system can transform solar energy directly into electrical energy, conditioning the latter to the requirements of a particular application.

Eliminating these gives us the following benefits:

- Fast construction and low maintenance that provide a long service life.
- This system offers a continuous power supply operating in low sunlight
- Savings in electricity consumption of CFE.

V. LIGHTING SYSTEM

System data indicate that lighting inside the building is equipped with energy saving lamps both downstairs and upstairs. The currently installed luminaires are brand TECNOLITE model LTL-3280 with electronic ballast of 84 Watts.

Investigating the new trend in lighting, it was found that the lighting based LED is more effective than incandescent, halogen or fluorescent systems, because the LED lamps can transform 98% of energy they receive into light since incandescent, halogen or fluorescent lamps, can be used over 90% of energy consumption which does not generate heat producing visible light.

Currently the institution has 2 lights with LED technology supported with solar cells, together they have given excellent benefits to having a scheduled basis on and off of them, a clear, bright lighting, and considering it is a self-sustaining system gives us greater economic benefits.

The lighting circuit can be controlled by a sensor in each room of the building. Detecting the presence of someone in the place, the lamps will automatically activate and the absence of staff, cutting the electricity supply of such luminaries deactivating occurs.

Eliminating these gives us the following benefits:

- Increased user comfort.
- User convenience at ensure that lighting is disabled on exit, avoiding any human intervention and probable failure.

- Energy at ensure that the supply is only useful when there is someone using it savings.

VI. ACCESS CONTROL

Currently the building does not have a system of checks to ensure that only authorized personnel can access, since the only thing that counts is a vigilante, which is insufficient demand for building work.

Hence it is proposed to install fingerprint verifiers at the main entrance, to maintain the safety of personnel as well as research conducted within the enclosure, ensuring documentation confidential information.

- With the system of fingerprint verification ensures that only authorized personnel have access to the interior of UEPI.
- Can be used as a record of attendance for teachers and / or assigned to the UEPI researchers.

Duration

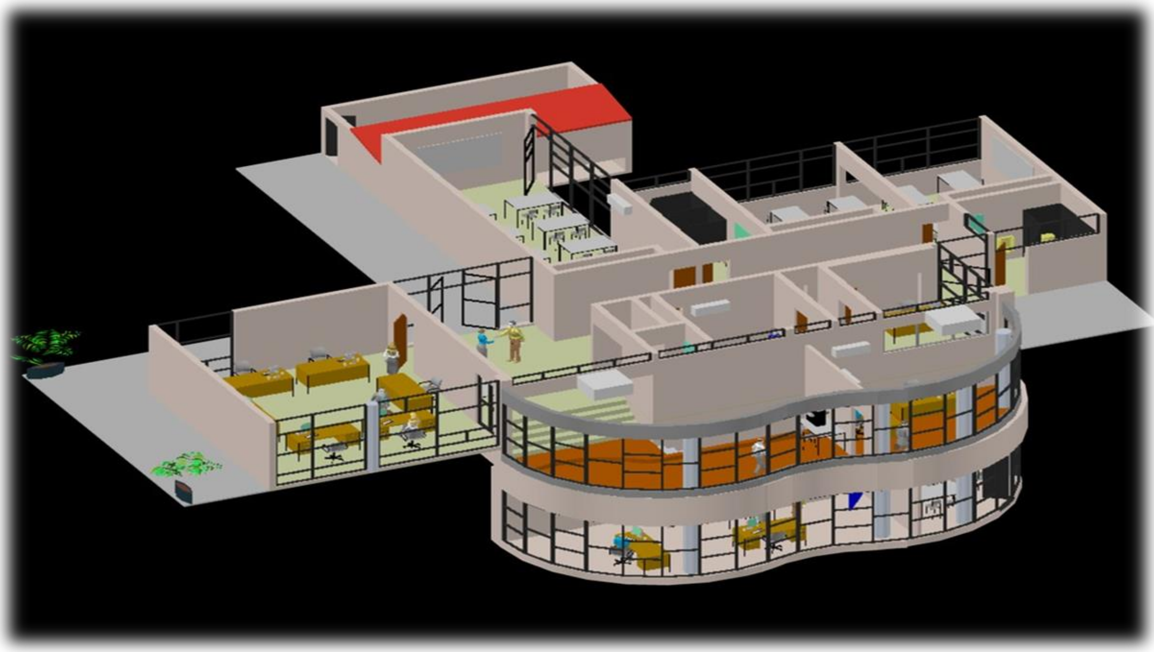
The project has been raised to a year or more, as time also depends on the supplier performance, as mentioned before the project consists of 6 phases, yet is only running a single phase and others are in research and development.

It was decided to start the stage lighting which is required as the first point:

Develop building plans UEPI school because they did not have to be a facility with an age of about 40 years, after finding providers covering all the needs of the project was conducted.

Flats UEPI currently

The building was constructed prior to the creation of Tesco so there were no planes thereof, as part of the initial investigation proceeded to do physical lifting facilities.



Lamps with LED technology initially installed in an office building, in order to evaluate their performance, these results indicate whether or not it is convenient facilities in the remaining offices

Currently installed lamps are brand TECNOLITE model LTL-3280 with electronic ballast of 84 Watts and the color temperature is 4100 K

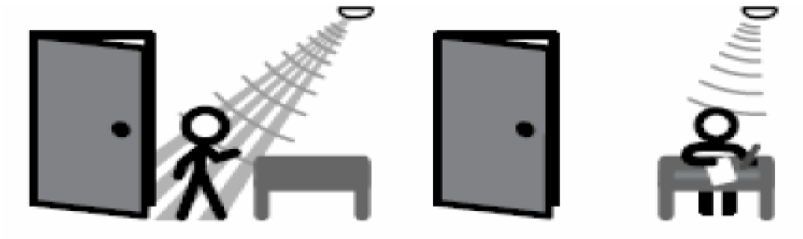
The lamps installed as pilot test are UEPI SOLARLUX brand with a luminous flux of 1125 lm and 15 Watts ballast works, what is much less than the currently installed fluorescent lighting, this lighting consumption is reduced energy up to 40% and increased efficiency will have compared to the current lighting system.

SOLARLUX
ILUMINACIÓN ECOLÓGICA

Three LED lamps were purchased; the first phase project is awaiting the response from provider to begin the installation.

Similarly 3 offices and two classrooms in the building are automated through the installation of occupancy sensors of advanced technology.

The choice of sensor presence was laborious due to the large number of suppliers, but ultimately the LEVITON supplier was chosen, because their presence sensors multi - technology meets all expectations undesirable since the sensor multi-technology combines the benefits of ultrasonic and infrared technology, detecting ultrasonic motion with a maximum sensitivity, but is vulnerable to false triggering due to current flows of air conditioning in the hallways activity and movements of inanimate objects.



Motion detection infrared has immunity to false triggering, but lacks sensitivity over long distances, thus overcomes the shortcomings each other.

Simulation of the benefits

Then a simulation of improved lighting of office software free lighting design "DIALux v.4.7" is displayed.

The DIALux software allows rapid quantitative analysis and hassle of a project has a simple 3D rendering functionality. ULD format data for luminaires comprising the 3D geometry of the luminaire, light intensity distribution and description.