

Presentation of automation and control devices for saving energy in building units

K. Sakkas

Aristotle University of Thessaloniki, Greece

ABSTRACT

In the modern society term 'energy consumer' refers in small scale consumers. This is a quick conclusion that leads to erroneous categorisation of consumers of electric energy. The suitable segregation of energy requirements leads to a right gradation of consumers and allows us a more essential and analytic approach. The categorisation of consumers of electric energy gives us the possibility of approaching separately each category depending on her requirements and applying suitable automation and control devices in order to have the best possible saving of energy. Automation and control devices are systems which allow us to check environmental space and adapt the operation of appliances for optimal result with minimal consumption of energy (Use of thermostat in system of heating or cooling). Depending on the category of consumers in which they are applied (industrial units, exhibition spaces, domestic spaces...) automation and control devices vary in cost, complexity and difficulty of application.

The work that will be presented includes a categorisation of consumers-buildings in combination with their energy needs. While follows a presentation of automation and control devices for saving of energy in building units, with base the category in which they belong.

1. INTRODUCTION

The continuous increase of consumption of electric energy in all the spaces is a reality. Increase of consumption of electric energy means also increase of cost, while in the long run it leads to reduction of mining sources that are

used today as main source of energy. The last years it becomes a continuous effort of saving of energy. To this direction helps the optimization of operation of appliances as well as the reject of pointless consumption of energy. Substantially what can limit the over consumption of energy is the possibility of checking the operation of appliances. This control can be realized manually or with the use of suitably regulated sensors that will give commands in the appliances.

2. WHAT IS AUTOMATIONS AND CONTROL DEVICES?

These appliances are sensors which have the possibility of checking the conditions of environment. The manual control is realized when intervenes the human factor for control of appliances. For example the use of switch from the person for the control of radiator in a system of heating. The automated control is realized when the control of appliances becomes with the use of suitably regulated appliances of control. The existence of photocell in a room, that gives the command to turn on lights when becomes perceptible the presence of individual. The use of simple automatisms is a movement that was generalized by the moment where it was realized that it can lead to essential reduction of cost. In the effort to pursue further saving of energy became effort of improvement of existing sensory appliances of control as well as combination of these. At the same time becomes effort are created intelligent appliances of control that will autonomously manage the data that they receive. The extra control of data leads to decreased faults of operation of appliances and

can decrease even more the consumed energy. Big sums of electric energy in a building group it consumes also the air conditioning and ventilation system. Decisive role in the consumption of energy of system of air conditioning it has also the system of automatism of installation. The systems of automatism are distinguished in systems of direct control and in systems of indirect control. The direct control presupposes that the provided thermal or cooling energy in the spaces covers with big precision the forwarded thermal or cooling instructs. This control is achieved with appliances of control in each space of building with different behavior of instruct (thermal area), still better in each space of building separately. The appliances of control usually watch the temperature of spaces but in a lot of cases and the relative humidity or the quality of air. In the indirect control the provided thermal or cooling energy in the spaces is usually determined by the temperature of exterior environment in connection with the temperature of building in some central point. This way usually leads to the benefit more thermal or cooling energy from the one that is required with consequence bigger consumption of energy. Naturally, the system of automatism which is installed in a building depends also from the type of system of air conditioning. There are systems of air conditioning in which it can install itself system of direct control and other in which it is not feasible. (Papakostas, Apart from the air conditioning of buildings big quantity of energy is used for the lighting of buildings. The control of lighting can be realized with detectors of movement. Detectors of movement are appliances what have the possibility of conceiving the movement of persons in the space which they supervise. Occupancy sensors have long been used for control of various devices (like artificial light, HVAC devices, etc.). Occupancy sensors have a potential to significantly reduce energy use by switching off electric loads when a normally occupied area is vacated. While occupancy sensors can be used to control a variety of load types, their most popular use has been to control lighting in commercial buildings. Past research has shown that use of occupancy sensors for control of lighting can save up to 30% electrical energy used for lighting. However, most of the sensors, which are currently being put to use, have a pre-

set sometimes user adjustable time delay TD the time after which the lights or any other load will be switched "off" after the last motion is detected by the sensor. If this TD is long then, it will have less energy savings, as the load will remain "on" during unoccupied period also. At the same time, if the TD is kept short then it may result in unwanted switching "off". False Off of the lights when no motion is detected during periods of occupancy. It has been observed by researchers that the activity level of a user changes over the time of the day. Also, it is seen that activity level of different users is different. Hence, single TD for all the users and for all times of the day is not desirable. The commonly used sensors do not adapt to changing activity levels. Smart occupancy sensor can learn the variation in activity level of the occupants with respect to time of the day. With this information, it can change the TD with time of the day. Experiments conducted have shown that about 5% more energy can be saved by using smart occupancy sensor as compared to non-adapting fixed TD sensors.

3. CATEGORIZATION OF BUILDING UNITS

The cost of installation, maintenance as well as the possibility of saving of energy differs from building to building, depending on the size, the operation and his planning. In the old days the bigger consumer of electric energy was the industry. The consumption of electric energy from the industry presents a continuous increase, which is tripped up by the bigger increase of consumption of electric energy from household (The intense increase is owed in the improvement of conditions of lifetime, which had as result the use of continuously more electric appliances, air conditioners, washing-machines etc.) The segregation of building installations leads us to three (3) basic categories, depending on the use of buildings.

Categories

First Category: Built-up totals-residence Buildings which are used for accommodation. Exists big variety in size. This variety leads to big differences to the automatisms that can be implemented as well as in the saving of energy that can be achieved. Automatisms which can be

used in this category are thermostats for the control of temperature of spaces where we wish to regulate the temperature with air-conditioning instruments.

Second Category: Commercial & public services. Buildings which are used for commercial aims, as commercial centres, as well as buildings that are used for the benefit of services, characteristic examples are the hospitals. The total of almost automatisms they are offered for implementation in buildings of this category. As detectors of movement for control of lighting and meters of humidity for determination of humidity via the system of air conditioning.

Third Category: Industrial units. The basic difference of this category from remainder is the way of use of electric energy. In the industrial units the energy is used, in the bigger degree, from the instruments for the productive process. Here it can be achieved saving of energy mainly with improvement of instruments and least with appliances of control of environment of space.

4. CONCLUSIONS

It is obvious that the continuously increasing use of automatisms leads to important saving of energy. However the number of electric appliances that is used increases continuously, accordingly and the required energy. With this datum becomes effort of improvement of operation of appliances of control. This can be achieved with combination of appliances of control and common processing unit. Example of such combination is the use of photocell with sound detector of movement. The common control allows us to decrease the time delays while at the same time decreasing the erroneous signals from the processing unit. We understand that the use of automations is necessary. We come to the conclusion that the right use of variant automations can help us to achieve economic profits.

REFERENCES

- Papakostas, T. Energy saving in systems of air conditioning Magazine KTIRIO, 117 pp. 27.
- Garg, V. and N.K. Bansal, 2000. Smart occupancy sensors to reduce energy consumption. Magazine Energy and Buildings 32 pp.81-87.