Contacts:

Kazan State Power
Engineering University:

420066, Kazan,
Krasnoselskaya Street,51

Phone/Fax

+7 (843) 519-43-55 – reception
of vice-rector in science
kgeunr@mail.ru

+7 (843) 527-92-04 – department on
science&technology information
onti-kgeu@mail.ru

Contact person

Marat Sadykov,
head of Light engineering and biomedical
electronics department,
+7 (843) 519-42-79, +7 9033075540,
Sadykov@kgeu.ru

Казанский
Государственный
Энергетический
Университет

Kazan State
Power Engineering
University

COMBINED AUTOMATED COMPLEX OF ARTIFICIAL AND HELIO-LIGHTING SYSTEMS

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Combined automated complex of artificial and helio-lighting systems

Fig. 1. Mirrors of heliolighting system

Currently existing and and widely used artificial and combined lighting systems are not economically justified due to their design features and limited power supply and control capacity. Usage of artificial lighting during the daytime results in high power consumption. Classical systems of natural lighting, i.e. a set of window openings, are unable to provide the necessary amount of sun exposure and lighting, because of high-density development of modern cities. Foreign lighting systems designers suggest applying translucent roofs, walls and light tubes in order to improve insolation value and to minimize energy consumption. This can be applicable only during the daytime and only in high-ceilinged pavilions, one-storey buildings and basement facilities. Lighting for multi-storey buildings in the age of overcrowded architecture of modern cities requires new approaches and alternative solutions.

We have developed an experimental complex containing an intelligent artificial lighting system. Its design and software provides for application of neural network technologies allowing the system to make decisions within the framework of its tasks. The designed complex also contains an automatic helio-lighting system capable of transmitting solar irradiance into facilities. This will increase insolation in densely developed areas of big cities.

Fig. 2. Front view of mirrors of the experimental system of automated sunlight redistribution inside the facilities

Fig. 3. Block diagram of the demonstration and laboratory complex of the intelligent artificial lighting systems and alternative energy

This R&D was designed to solve energy saving issues and to assure comfort. Street heliostats (see Fig. 1) direct sunlight into the room, where the mirrored wall with moving mirrors (see Fig. 2) redistributes the light inside the room and the intelligent artificial lighting system (see Fig. 3) switches on all necessary lamps using the results of video processing and neural network algorithm.

Thus, the experimental complex consists of: an experimental unit of helio-lighting (see Fig.1), an automated lighting and technical installation of light redistribution indoors (see Fig. 2), a demonstration and laboratory complex of the intelligent artificial lighting systems and alternative energy (see Fig. 3).