

теплотехническим параметрам. Например, гибридная осветительная система на основе ПТС торгового центра имеет следующие преимущества перед типовыми светопроемами: соотношение площадей светопроемов для заданной освещенности – 1/52; соотношение мощностей кондиционирования торговых залов – 1/158; соотношение тепловых потерь – 1/170; дисконтированный срок окупаемости инвестиций в ГОК при сравнении с типовыми светопроемами – менее 3-х лет. С учетом экономии на приобретение климатической техники окупаемость достигается на стадии проектирования [5].

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## Modern energy-saving technologies in lighting

Yaroslav V. Antsupov<sup>1</sup>, Vasilii Ya. Ushakov<sup>1</sup>, Alexander T. Ovcharov<sup>2</sup>

<sup>1</sup> *National Research Tomsk Polytechnic University, 634050, Tomsk,  
Lenin Avenue, 30*

<sup>2</sup> *Tomsk State University of Architecture and Building, 634003, Tomsk,  
Solyanaya sq., 2*

antsupov.yv@gmail.com

In recent years, the metropolis city-planning policy of megacities has confirmed the trend of building large areas with rooms with limited natural lighting, as well as underground construction [1]. This fact have gave the

rise to problems of forming a comfortable and safe light environment and to the creation of highly efficient lighting systems [2].

The solution of this problem is the implementation combined lighting systems, the technical embodiment of which is a hybrid lighting facilities (HLF). There are three main components in HLF such as hollow light tube (the source of natural light), new generation LEDs (the source of artificial light) and automatic control system [3, 4]. The product line is represented by five modifications of HLF *Solar LED-S*. All of them was produced in Russia. Due to original construction and creative technical solutions, domestic products surpasses lighting, energy and operational parameters of foreign analogues. HLF being an alternative solution to typical light aperture areas (windows, clerestories and rooflight) surpasses their lighting and thermos parameters. For example, HLF of the mall has following advantages over typical light aperture areas: the correlations of light aperture areas for a given light – 1/52; the correlation of trading floors conditioning capacities – 1/158; the correlation of thermal losses – 1/170. Discounted payback period of investments in the HLF is less than 3 years. Taking into account saving for the purchase of climatic equipment, the payback period can be achieved at the design stage [5].

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