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***ANALYSIS OF THE DESIGN OF CEILING LAMPS
WITH DIFFERENT LIGHT SOURCES AND THE CONCEPT OF DESIGNING
THEIR LED-PANEL VERSION***

The purpose of this work is to study the development of concepts and technologies for the manufacture of ceiling lights for interior lighting - office, public and administrative, etc.

It is known that fluorescent lamps have long been used for interior lighting tasks. Massive diffusers made of matte polycarbonate sheet metal were used to align the light intensity curve of such lights and bring it to the cosine light distribution. Due to the matte surface of the diffuser, the luminous part of the light acquired a fairly good approximation of the properties of an evenly bright surface. Such surfaces are known to have a cosine light distribution and are very convenient for lighting.

In the early 2000s, the problem of energy saving worsened, leading to a reduction in much of the existing light fleet. These changes have also affected the approaches to the design of indoor lighting fixtures. The first significant difference of the updated modifications of fluorescent lamps of the new generation was the absence of a matte reflector, which is very uneconomical, in terms of energy saving, it delayed a significant part of the light flux. Failure of the diffuser led to the emergence of fluorescent lamps with a mirror reflective system and shading, which limited the dazzling effect of such lamps.

However, with the parallel development of LED technology, the concept of choosing a light source in indoor lighting fixtures began to change. The first replacements of already haven raster lamps with LED ones have appeared. Nowadays, manufacturers' websites offer a fairly large selection of LED lamps. Lights differ in price, quality of used LEDs, design and technological solutions. Recently, the volume of production and range of LED panel lights is increasing.

The aim of this article is to try to understand which lights offered on the modern market are the most balanced in terms of engineering solution in the context of lighting, operational, pricing, technological and certification characteristics. Based on the analysis of lights of different types and modifications, the authors came to the conclusion that the most optimal engineering solution is ceiling panel LED-lights and developed a method of their design and certification. As you know, industrial lighting in Ukraine is a fairly large segment of the market for lighting products. At the same time, as the analysis carried out by the staff of OJSC "Vatra" has shown, a significant proportion of industrial lamps are lamps of the searchlight class with a concentrated luminous intensity in a narrow range of angles. The basis for the industrial production of such luminaires is engineering calculation, which establishes the relationship between the reflector profile of the luminaire, the type and power of the used light source, and the light distribution required for specific lighting tasks.

The evolution of the development of ceiling lights over the last 20 years is considered. The gradual change of the design concept of raster lamps in the conditions of transition from fluorescent lamps to LEDs is shown. The method of design and attestation tests of panel lights is presented, also the results of theoretical calculation in comparison with the result of photometric testing of a

similar light on a goniophotometer GO-2000H Research Center for Lighting Measurements KNUMG named after O.M. Beketov. There is a good agreement between theory and experiment.

***АНАЛИЗ КОНСТРУКЦИЙ ПОТОЛОЧНЫХ СВЕТИЛЬНИКОВ С РАЗНЫМИ
ИСТОЧНИКАМИ СВЕТА И КОНЦЕПЦИЯ ПРОЕКТИРОВАНИЯ ИХ LED-
ПАНЕЛЬНОГО ВАРИАНТА***

Е. Э. Лобанов, Г.А. Петченко

***АНАЛІЗ КОНСТРУКЦІЙ СТЕЛЬОВИХ СВІТИЛЬНИКІВ З РІЗНИМИ
ДЖЕРЕЛАМИ СВІТЛА І КОНЦЕПЦІЯ ПРОЕКТУВАННЯ ЇХ LED-ПАНЕЛЬНОГО
ВАРІАНТУ***

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***ANALYSIS OF TWO DIFFERENT APPROACHES TO THE DESIGN OF
INDUSTRIAL LIGHTING EQUIPMENT***

Nowadays optoelectronic devices with two different types of light sources are used to solve the problem of lighting industrial facilities for different purposes. The first type - lights with discharge lamps of approximately cylindrical shape - mainly sodium gas discharge lamp (arc sodium tubular lamps) and metal halide lamps (arc mercury metal halide lamps). The second type is LED devices. Lights with traditional discharge lamps have long been used as the only option for lighting industrial facilities, their design has a solid theoretical basis, the practical component of the design is also well studied. At one time, lights with such lamps were the most progressive and energy efficient, as light sources such as sodium gas discharge lamps (arc sodium tubular lamps) and metal halide lamps (arc mercury metal halide lamps) were unalterable in terms of high light output, long service life and satisfactory retention of lighting characteristics in different climatic conditions, in particular, when working in a fairly wide temperature range. After the serious entry of LED products into the market of lighting equipment in Ukraine and the EU, the position of traditional lights with discharge lamps gradually began to lose. LEDs began to occupy a leading position first in the market of local lighting fixtures and exclusive decorative lighting, then they strongly supplanted traditional lights used for interior lighting and exterior decoration (using fluorescent lamps of various modifications), then - transport and street lights, including light signaling equipment (traffic lights and beacons) and at present it can be firmly stated that LED lighting has become the main tool in the design of devices for various purposes - from lighting devices and systems to precision scientific equipment (medical equipment, interferometers, devices for scanning surface roughness, etc.).

Our analysis of the sites of modern manufacturers of lighting equipment in Ukraine, for example, showed that the lion's share of industrial lighting fixtures are LED devices. The only well-known manufacturer of lighting products that still pays significant attention to the development of industrial lamps with discharge lamps is JSC "Vatra.

This paper aims to consider the essence of both approaches to the design of industrial lighting, impartially consider the pros and cons of such approaches and draw some conclusions about the feasibility of the transition from traditional lighting to LED-technology.