

## PWDAS-2

### HOW TO IMPROVE VISUAL CLARITY?

Katalin Tóth<sup>1</sup>, László Balázs<sup>1</sup>, Klára Wenzel<sup>2</sup>, Balázs Vince Nagy<sup>2</sup>  
and György Ábrahám<sup>2</sup>

<sup>1</sup>*Lighting Innovation, GE Consumer & Industrial, Budapest, Hungary*

<sup>2</sup>*Department of Mechatronics, Optics and Information Engineering,  
BUTE, Budapest, Hungary*

In recent years more and more attention has been given to the color quality of light sources in order to offer better quality of light and improved quality of life to customers. However, there is a big debate over the definition of "quality of light". What is more important: color fidelity (i.e. excellent color rendering) or enhanced visual clarity achieved by improved color contrasts?

In this paper we discuss color contrast improvement by eliminating the yellow part of the emission spectrum and adjusting the spectral power distribution (SPD) of the light sources. We draw an analogy between color correction for color deficient patients and increased color contrast.

It is known from the literature that a certain type of color deficiency, which is caused by the shift of the sensitivity curve of at least one of the three types of photoreceptors, can be corrected by applying appropriately designed color filters. Those filters modify the incoming light, creating an effect equivalent to the shift of the deficient photoreceptor's sensitivity curve to the normal position.

A similar virtual shift can be achieved by modifying the emission spectrum of the light source. An improved red-green color contrast can be reached by suppressing the yellow part of the SPD. One commercially available lighting solution is a light bulb produced by GE, where neodymium, a rare earth additive of the glass envelope filters out part of the yellow light emitted by the tungsten filament. Neodymium has the same role as the color filter in the special glasses developed for color deficient patients. Absorption of the yellow light results in an overall light intensity reduction. This drawback can be minimized by the appropriate SPD design of discharge lamps or LED's.

Improved color contrast is valuable not only to people suffering from color deficiency. More vivid, more saturated colors imply an overall improvement of light quality and at certain color temperatures, enhanced perceived brightness.