Position Statement on Colour Rendering Index

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Position

The Global Lighting Association (GLA) cautions against the establishment of regulatory or other minimum performance requirements for a colour rendering index (R_a) of greater than 80 for indoor lighting applications. For Europe, the GLA supports retention of legal minimum requirements on colour rendering (R_a) at the current level as defined in the EU Eco-design Regulations (EC 244/2009, EC 245/2009, EC 1194/2012). In the United States, the GLA supports the Environmental Protection Agency's Energy Star Program's current minimum requirement of 80 CRI.

The flexibility afforded by this allowance permits further innovation in the field of colour quality, colour acceptance and colour preference, while promoting energy efficiency and consumer satisfaction at competitive prices. This will facilitate the continued evolution and adoption of LED lighting worldwide.

The Global Lighting Association supports the need for an additional colour quality metric - for example, a colour saturation metric, in conjunction with the well-established fidelity metric R_a.

Reasoning

Higher legal minimum requirements for the colour rendering index (R_a) will not result in improved colour quality or acceptance, as R_a (representing colour fidelity) is only one aspect of colour quality. Colour saturation or 'colourfulness' is another important factor contributing to colour quality which - at least for LED lighting - is not captured in R_a. Hence consumer acceptance of lighting products will not necessarily be increased by higher R_a values (e.g. above 80 for indoor applications).

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Higher legal minimum requirements for R_a will impede innovation in these other aspects of colour quality, such as colour saturation, white light perception and personal preference. Moreover, higher legal minimum requirements for R_a can, in general, result in less energy efficient light sources and therefore are contrary to the objective of minimising energy use.

The Colour Rendering Index (R_a) debate

There are numerous performance features which consumers focus on when selecting lighting products and in determining their satisfaction with them. Colour rendering index is only one of these factors. The colour rendering index is a measure of how well the light source reproduces eight specific colours in comparison to an artificial reference light source. The maximum R_a value of 100 is achieved when the eight colours are rendered identically (for the test and reference light sources), with decreasing R_a values for increasing colour differences between the test light source and the artificial reference light source.

R_a and its applicability have received much attention in recent years within standardisation groups, as well as from regulators. It is sometimes wrongly assumed that the higher the R_a value, the greater the appreciation of consumers. Some of the literature points to the contrary, because other factors such as colour saturation, colour temperature and the precise position of the colour point in the chromaticity diagram are also appreciated by consumers, perhaps to a greater extent than colour fidelity.

Colour saturation, a different metric, can also be defined relative to the reference light source. Therefore, colour saturation can only be changed by increasing the difference between the reference source and the test source, which unavoidably lowers the R_a value. Manufacturers should be able to carefully balance colour saturation with the R_a value to optimise consumer preference. Limiting R_a to values above 80 for indoor applications simply blocks the development of light sources that have other attractive aspects, like increased colour saturation.

Regulations and Colour Rendering Index

Many national and regional governments globally are adopting lighting regulations, including minimum performance requirements. Many of these regulations also include requirements relating to the colour rendering index R_a. In such regulations, the R_a is often the only metric for colour quality.

Standardisation

Currently the colour rendering index R_a is the internationally accepted and standardised metric for colour fidelity[1]. With the transition from conventional lighting to LED lighting debate arose on whether R_a is still an appropriate metric for colour fidelity or captures the consumer's interest in other attributes of colour such as saturation or temperature.

Some manufacturers have already identified the shortcomings of the current R_a metric as the one-dimensional method of describing colour quality. They have started to use what amounts to an 'extended version' of R_a, by supplementing R_a with $R9$, or using R_a 14 (which uses 14 colours instead of eight), and even alternative metrics like CQS.

Significant research effort over the past years on colour fidelity, however, has failed to deliver a single new meaningful metric for fidelity that can be used by the lighting industry and replace the existing R_a metric.

Two committees of the International Commission on Illumination (CIE) with globally recognised specialists are currently working on a better description of colour quality. One of these committees has the objective of defining a new colour fidelity measure. The other is investigating colour quality measures beyond colour fidelity, including those related to colour saturation (sometimes also called 'vividness').

It is the view of the Global Lighting Association that in the near future an additional colour quality metric should be adopted that represents a significant and meaningful improvement in conjunction with the currently used fidelity metric R_a.

About the Global Lighting Association

The Global Lighting Association is a grouping of peak national and regional lighting associations representing over 5,000 lighting manufacturers and US $75 billion annual sales.

[1] Recommendations for CRI (Ra) for many indoor work environments are defined in ISO 8995 (CIE S 088/E) 2002-05-15 - see: http://www.iso.org/iso/catalogue_detail.htm?csnumber=28857