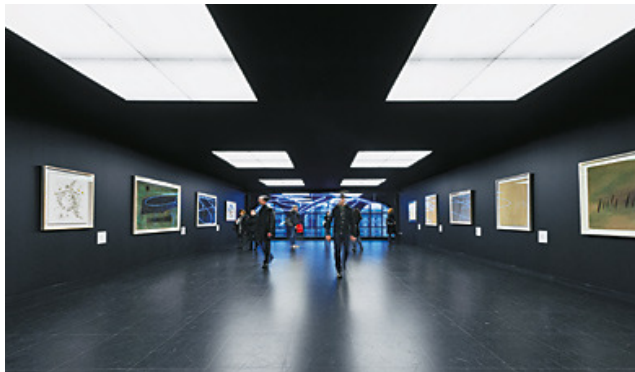


Press release

Dornbirn, November 2011

New Zumtobel study: LEDs create less harmful impact

Benefits of LED lighting solutions for art & culture



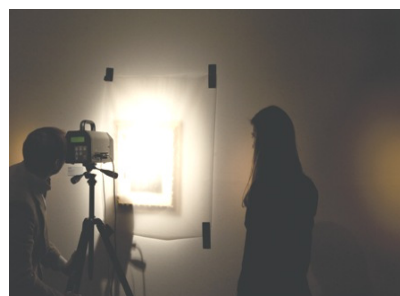
Museums and galleries house precious exhibits which must be set centre-stage perfectly. This entails meeting not only architectural and artistic requirements, but also taking into account conservation requirements. Using light

incorrectly can even damage items that are on display under some circumstances. This makes it even more important to use an appropriate lighting solution that provides adequate illumination and sets the scene for objects gently but highly effectively. The test report recently published on behalf of Zumtobel by the Lighting Technology Faculty of Darmstadt University of Applied Sciences (TU) provides fresh evidence of this. As part of this study, the quality of various light sources was tested using predefined assessment parameters.

Main study results

Thanks to its special characteristics, using modern LED technology reduces UV and infrared radiation, keeps colour temperatures constant during dimming, improves energy efficiency and, at the same time, poses little risk of damage to works of art.

Peter Dehoff, Zumtobel's Lighting Application Manager, explains: "This study provides a valuable basis that underpins previous arguments in favour of LED lighting. It provides a better basis for decision-making by clients and curators in particular. Research projects like this



are very important to us because they underscore our ambitious aspirations – providing customers with the right advice, thereby enabling them to realise great lighting solutions that are appropriate to their needs.”

The Picasso drawing entitled “Harlequin” dating from 1916 was chosen as the object that was to be investigated during the study. This drawing was part of the “Master drawings of a genius of a century” Picasso exhibition that took place in the Stadtmuseum in Lindau on Lake Constance in summer 2011.

Approach adopted for the study

For the purposes of the investigation, two different light sources pointed at the drawings were installed one after the other. Two spotlights were compared: one that used conventional lamp technology (tungsten-halogen lamp) and another that used LEDs. Assessment parameters that are especially relevant to art objects were defined in order to test the various characteristics of the light sources. They included both the electrical and photometric characteristics of the luminaires, such as:

- light colour
- spectral radiation distribution
- colour rendering
- illuminance
- uniformity with which the painting is illuminated, and which is therefore also a measure of the quality of centre-stage setting
- damage potential
- installed electrical load

The dimmable Zumtobel Xeno spotlight was used to assess conventional lighting technology. The Arcos spotlight with Tunable White functionality was used as the LED light source. A DALI control system was used to adjust the light colour and brightness of the LED luminaire continuously over a range from 2700 K to 6500 K. Zumtobel investigated the assessment parameters starting from different initial situations in order to ensure that the influences of the light sources were comparable. The halogen spotlight was tested in its dimmed and non-dimmed

state. For the LED spotlight, various colour temperature settings, ranging from warm white to cool white, were chosen.

Damage potential was considered to be one of the most important assessment parameters. This is the extent of the potential to cause damage to an object and can be described by the spectral radiation distribution of the light source and the spectral sensitivity of the art object. Besides infrared radiation which, due to the emission of radiant heat, can result in drying out and cracking of an object and light that is visible to the human eye, UV radiation plays a crucial role in causing damage. The more short-wave radiation is, the more damaging it is to artefacts. The viewer observes such damage mostly in the form of a colour change, e.g. an image fades due to the effect of daylight which, as a rule, has a large UV component. Depending on the substrate of the work of art, characteristic values of materials defined in CIE Standard 157:2004 are used as a basis for assessing spectral sensitivity.

The material used in the case of the “Harlequin” drawing is thin, slightly corrugated paper applied on a heavy backing paper and, in terms of its definitive consistency, is most similar to rag paper. This is why the properties of this type of paper were used in order to evaluate the light source's damage potential.

Study results at a glance

- For comparable colour temperatures, the LED spotlight essentially exhibited significantly less damage potential in the laboratory when all the materials stated in the CIE Standard were exposed to it, ranging



from rag paper, textiles, watercolours on rag paper through to oil paints on canvas and newsprint. Due to the lesser damage potential of LED spotlights, the possible exposure duration for most materials can be increased by

approximately 50%, and even 300% in the case of newsprint. Measurements carried out using the Picasso drawing also confirmed these results. Only at relatively high colour temperatures (beyond 3250 K) were exposure times using halogen lighting at 2050 K comparable.

- Dimming the halogen spotlight down to the desired illuminance shifted the light colour from 2900 K to 2000 K. This inadvertent shift has an adverse effect on how the object on display is perceived. With the LED spotlight, illuminance can be dimmed without altering or adversely affecting the light colour. LEDs are therefore an excellent tool for curators who want optimum illumination for their exhibitions.
- When it comes to colour rendering, both the halogen and LED spotlights achieved very good figures ($R_a > 90$). Only at higher colour temperatures, such as 6500 K, did colour rendering drop off to $R_a 84$ in the case of the LED spotlight. Both lamp technologies therefore achieved similar, good colour rendering.
- Electricity consumption in the case of the LED spotlight was roughly 50% of that of the halogen spotlight and, in the non-dimmed range, only 30% of that figure, thus providing scope for significant potential energy savings.

In conclusion, the results show that because of LEDs' spectral radiation distribution, it is no longer sufficient to simply measure illuminance on an art object, as was the case in the past. It is the damage potential of a specific combination of light source and art object that has to be determined. This makes it possible to make substantive statements regarding the risk of an artwork being damaged by visible light (e.g. daylight) and the invisible radiation emitted by the light source.

Ultimately, this study not only provides architects and designers with valuable information that supports the customer benefits provided by LED lighting. It also emphasises just how vital well thought-out lighting, tailored to suit the requirements of curators, is to the preservation of art objects.

Conclusion

In art and culture applications, the overriding objective is to ensure that harmful infrared and ultraviolet radiation and illuminance levels are kept as low as possible. When these factors are taken into account, the risk of colours fading or sensitive materials being



damaged is considerably reduced. For the objects on display to be presented to optimum effect, glare should be avoided as well. Moreover, a lighting system boasting high energy efficiency and long maintenance intervals ensures smooth operation of the museum.



In this respect, LED technology provides numerous benefits: even without a special filter, suitably well-chosen LEDs emit less UV and IR radiation than other light sources fitted with a filter. With their precisely focussed lighting and high colour

rendition index of $Ra > 90$, they are perfectly suitable for accent lighting. In addition, the particularly long service life of these light sources cuts expenditure on maintenance. Due to their outstanding energy efficiency, LEDs are gentle not only on the exhibits, but also on the environment and the user's budget. Zumtobel's LED technology with Tunable White has the particular advantage of being able to use a variety of colour temperatures – ranging from warm to intermediate and cool white – without any need for relamping or luminaire replacement. Thus, the colour temperature can be perfectly adjusted to the exhibit's material, in order to produce subtle shades and enhance particular qualities in an emotional way. The colour temperature remains consistent even when the luminaire is dimmed, enhancing visitors' appreciation of the exhibits.

Zumtobel. The Light.

Brief profile

The Zumtobel brand is a leading international supplier of integral lighting solutions that enable people to experience the interplay of light and architecture. As a leader in innovation, the luminaire manufacturer provides a comprehensive range of high-quality luminaires and lighting management systems for the most varied application areas of professional interior lighting – including offices and educational facilities, retail and presentation, hotels and wellness, health and care, art and culture as well as industry and engineering. Zumtobel is a brand of the Zumtobel AG group with its head office in Dornbirn, Vorarlberg (Austria).

Captions:

- Photo 1: Museo del Novecento in Milan
- Photo 2: Picasso's "Harlequin" drawing in the Stadtmuseum in Lindau on Lake Constance
- Photo 3: Test method used for the "Harlequin" drawing in the Zumtobel study
- Photo 4: LED spotlights and the Supersystem LED lighting system illuminate details in the throne room in Neuschwanstein Castle in a multifaceted, yet gentle manner
- Photo 5: Neuschwanstein Castle: It is especially important to gently illuminate the art objects on display to preserve them for future generations. LED light is free of UV and thermal radiation, thus protecting the valuable exhibits

For more information,
please contact:



Zumtobel Lighting GmbH
Nadja Frank
PR Manager
Schweizer Strasse 30
A-6850 Dornbirn

Tel. +43-5572-390-1303
Fax. +43-5572-390-91303
nadja.frank@zumtobel.com
www.zumtobel.com