LED light in use

Last year will go down in the history of architectural lighting as the year of the final breakthrough of the LED. The product range presented by ERCO at the Light+Building trade fair in Frankfurt in April 2010 makes LED lighting tools available as a viable alternative for practically every standard task of lighting. But how does the new technology fare in practical applications? This issue presents LED lighting projects from very different fields of architecture.
With the technological change towards digital light in full swing within the luminaire industry, it gives us great pleasure to present an edition of Lichtbericht that solely features LED-based projects. After many years of development work in the field of optoelectronics, it is now exciting for us to see LED technology proving itself in actual projects.

Following extensive examination of the technological, curatorial and preservation aspects, two renowned museums at once have both decided to go for LED lighting: the National Gallery and the National Portrait Gallery in London – a step that is justified not least by the 60%–saving in energy costs and by the reduced maintenance costs due to the long life of LEDs. Many other advantages of LEDs, such as the fact that their light is free of IR and UV components, also provide good reason for the technological change from the preservation point of view.

ERCO’s core capabilities in the field of optoelectronics have laid the necessary technological foundation for this. On pages 16 and following of this Lichtbericht, we reveal exactly what this field of competence known as optoelectronics actually entails. But for now, let’s just say that optoelectronics is the mixture of the specialist areas of optical systems, electronics and information technology. Optical systems are for “producing light”, electronics for “controlling light”, and information technology for “directing light”. The intersection of these specialist areas indicates a company’s profile of capabilities for innovative lighting solutions in the age of digital lighting.

Scenography and efficiency are brought together in the lighting solution of the new Sieben Schwaben chemists in Laupheim. In the evenings, the entire salesroom functions as a massive scenically illuminated shop window. An array of different coloured light scenes is executed here in a certain sequence, attracting the observer’s attention and controlled by the ERCO Light System DALI. Laying quietly in the winter snow amidst a vast open landscape, Kalmar, a private residence in Sweden, appears rather still by comparison. Here, we’ve installed a hybrid lighting system that makes equal use of both digital LED luminaires and classic analogue luminaires. Overall it’s a very coherent and pleasant lighting solution, which tackles the presented task in an appropriate manner.

The facade of the Intercontinental Hotel in Paris is also resplendent in new LED light. Here, the LED luminaires are discreetly integrated into the historical facade. At such difficult-to-access places, maintenance costs naturally play a crucial role and so the long life of LEDs is a decisive plus here.

The host of LED projects presented here is rounded off by the Starbucks Coffee House in Dresden, a mast-mounted pathway lighting in Barcelona and installations at Bath University and the Bonnefanten Museum. In conclusion, it can be said that LED lighting is now suitable for a wide variety of projects of many different kinds and that, in the practical applications shown, its capability is admirably demonstrated.
Shanghai

This ultra-modern public library also provides PuDong, a rapidly growing new district of Shanghai, with a cultural centre that can be used by all residents. Tests in-ground luminaires add scenic lighting to the entrance area, while, inside, the architecture is skilfully emphasised with wallwashing.

PuDong Library, Shanghai
Architect: East China Architecture Design Institute
Lighting design: Shanghai Shenjin Lighting Design Co., Ltd.

Copenhagen

Fantastic views! Swinging to and fro, the clientele of this sushi-bar can enjoy the view of Copenhagen from the 12th floor of the Tivoli Hotel - in the glare-free light of Optec spotlights. The rest of the restaurant is kept in stage-like darkness, with Quintessenze directional luminaires adding accent lighting to the tables.

Stick’n’Sushi, Sky Bar Tivoli Hotel, Copenhagen
Architect: Torben Engaard, Benthin/Dekker Architects, Berlin
Lighting design: Licht Kunst Licht, Berlin
www.sushi.dk

Wiesbaden

The Private Banking department of the Wiesbadener Volksbank has found its home in a historic villa - which is scenically illuminated in prestigious fashion at night using ERCO’s LED technology. The lighting designer Arne Fedler worked using Kuhus facade luminaires and Midipoll bollard luminaires.

Wiesbadener Volksbank Private Banking, Wiesbaden
Lighting design: Arne Fedler, Wiesbaden
www.wvb.de

Castel Gandolfo

The small town of Castel Gandolfo overlooking Albano Lake south-east of Rome is best known as the traditional summer residence of the Pope. Yet the village also has quite a lot to offer “ordinary” visitors. This includes the Ristorante Quintessa, which not only offers good cuisine and a highly select wine list, but also boasts an extraordinary interior and lighting design. Local architect and lighting designer Francesca Storaro used Optec spotlights and Polius projector spotlights to underline the tavern’s atmosphere.

Ristorante Quintessa, Castel Gandolfo
Lighting design: Francesca Storaro, Castel Gandolfo
www.alquintessa.it

Sandvika

The administrative centre for the prospering municipality of Barum near Oslo is located in the City of Sandvika. The outdoor grounds and the richly ornamented facade of the city hall, built in the 1920s, are presented at night to great effect using low energy, thanks to Parco spotlights and Midipoll bollard luminaires.

Barum Rådhus, Sandvika
Architect: Magnus Poulsen
(1881-1951)
Lighting design: Linda Kropf Vigen, Finalized
www.barum.kommune.no

Hamarey

Honoured with a Nobel Prize for Literature yet equally controversial for his stance towards German National Socialism, Knut Hamsun (1859-1952) is seen as Norway’s most important author. It is to this complex figure that architect Steven Holl has dedicated an unwieldy yet equally multifaceted building in the far north of Norway, which contains exhibition galleries and conference rooms. The museum tour is accompanied by a dramatic lighting concept with Optec spotlights and wallwashers.

Knut Hamsun Center, Hamarøy
www.hamsuncenter.no

Diisburg

Opened in 1964, this museum was dedicated by Diisburg to one of the city’s greatest sons - sculptor Wilhelm Lehmbruck. Here too, the museum owners have now decided to go for the lighting technology of the future, equipping the first galleries with Optec LED spotlights.

Lehmbruck Museum, Duisburg
Architect: Maxted Lehmbrock (1913-1992)
www.lehmbruckmuseum.de

Freiburg

Dramatic presentation of the origins of the sandstone sculptures from Freiburg Cathedral. Stella project lighting spotlights illuminate the art treasures of the Augustinian Museum, which was expanded by remodelling an old monastery church.

Augustinian Museum, Freiburg
Architect: Prof. Christoph Mäcker Architekten, Frankfurt am Main
Lighting design: Kress & Adams Atelier für Tages- und Kunstlichtplanung, Cologne
www.augustinermuseum.de

Kelsterbach

The way to a good education is through the stomach. With German school reforms stipulating all-day child care, the trend is for the construction of school canteens. A prime example is in Kelsterbach near Frankfurt. Compass recessed spotlights with HIT lamps add attractive scenic lighting to the meals.

Museo Etnològico. Barcelona
Architect: 1CB (Institut de Cultura de Barcelona)
www.museoetnològic.ub.es

Barcelona

Concrete reliefs taking ethnology as their subject matter adorn the entrance foyer of the Ethnologic Museum in Barcelona. This attractive feature of the museum building, from 1973, is now brought out at night by a new lighting installation, which uses cantilever-mounted Powercast floodlights fitted with efficient metal halide lamps. “Walkways” Spheroïdit reflectors create the asymmetric light distribution which illuminates the facade surface.

Erco Lichtbericht 92
Bright prospects

Office building, Basel

Architect: Gehry Partners, LLP, Santa Monica
Lighting design: L’Observatoire International, New York
Photographer: Thomas Mayer, Neuss
Working at 5 metres, museum technician Tim Knight is once again on his high access platform making adjustments to the lighting. This time he is in Room 14 of the National Portrait Gallery aiming one of the Optec LED spotlights that illuminate 18th century portraits from the heyday of the British Empire. This will presumably be the last maintenance for quite a while though. With the introduction in this exhibition room of long-life LED technology, regular lamp replacement and the associated danger of disturbing a painstakingly positioned lighting arrangement, are set to become problems of the past.

The LED's longevity, the related reduction of maintenance costs and the reduced risk of damaging priceless exhibits when manoeuvring ladders and platforms are important arguments for new lighting technology for museum and gallery operatives like Tim Knight and his colleagues. However, the focus of discussions currently ongoing in museums and galleries around the world is regarding three further questions. How much energy can LED lighting save, is the lighting quality equivalent and, above all, how do LEDs fair in terms of the preservation of exhibits? The museum and gallery community is waiting with bated breath to see how the large and famous establishments, which have the relevant technical, curatorial and preservation expertise, are answering these questions. Two top institutions that are steeped in tradition, the National Gallery on Trafalgar Square and the nearby National Portrait Gallery, are now making steps toward the future and are converting their galleries one by one to LED light.

Findings gleaned by experts at both galleries while in the course of their investigations and product samplings of LED technology, ultimately leading to the decision to specify ERCO’s LED lighting tools, are also of the highest interest to other museums and art galleries. The bar for measuring LED lighting quality was already set high since the existing systems were mainly from ERCO and, at the time of their planning, were state-of-the-art. They included computer-controlled regulation of daylight and artificial light, plus spotlights for low-voltage halogen lamps fitted with UV filters and occasionally with colour correction filters to bring the warm-hued light of incandescent lamps into line with daylight. In terms of energy-saving potential, the figures returned by the National Portrait Gallery are very clear and concise. Since changing to LEDs, the lighting of the galleries now consumes 68% less electricity and that’s without the inclusion of savings made by a reduced thermal load on the air-conditioning.
The issue of exhibit preservation can also be addressed because the light irradiation load on the artworks can be quantified using the respective spectral constitution of the light source. To sum up: while daylight white LED spotlights are not to be recommended for sensitive exhibits due to their stronger peak in the short-wave blue spectrum, the overall load of warm white LED spotlights is less than that of low-voltage halogen spotlights (for details see double-page spread overleaf). A big advantage of LEDs in this respect is that their light is inherently free of the infrared and ultraviolet components that are so undesirable in a museum or art gallery. Halogen spotlights, however, require the appropriate filters and these always reduce the efficiency of a luminaire.

But what about the lighting quality, which after all can only be measured subjectively? Experts agree that, yes LED light has a different effect, but in many respects it is actually even better than that of its predecessor. The light of warm white LEDs, which is slightly cooler in colour than halogen light, is perceived positively as both brighter and fresher, allowing slightly lower illuminances. For the same reason, LED light also mixes favourably with daylight. Red and gold hues are no longer over-emphasised and overall this kind of colour rendition is well suited for most exhibits. Well, that’s what the experts say, but what about the visitors? “We braced ourselves for the reactions, but nothing came! There were no complaints at all,” states Allan Tyrrell, Chief Engineer of the National Portrait Gallery, adding, “believe you me, the visitors do complain about just about everything else.” One question remains, however, should museums and galleries now invest in LED light? The next few years will see further developments in LED lighting, but even now the currently available technology offers big savings in maintenance and running costs without compromising on the reliability and quality of the lighting. In every museum where an update of the lighting is under consideration, ERCO LED technology should therefore also be included in the equation.
LED and efficiency

The improvement in the efficiency of the new spotlight lighting over and against the previous offerings can be measured by the attained illuminance per watt. The National Gallery previously illuminated the artworks using Eclipse spotlights for 100W low-voltage halogen lamps all fitted with flood reflectors. Due to the low luminous efficacy of 22lm/W, the original accent lighting performed at 5 lx/W. Yet, for an almost identical beam angle, the new Optec LED spotlights with Spherolit lenses achieve an efficiency of 23 lx/W. This almost five-fold increase arises as a result of both the higher luminous efficacy of the warm white LEDs at 62lm/W and the high-performance of Spherolit technology. All this is without even considering the UV filter, which is necessary with low-voltage halogen lamps to protect the exhibits but which impairs the efficiency by an additional 8% due to transmission losses.

Top London art galleries switch to LEDs

At 50,000 hours, the functional life of LEDs also contributes, alongside the good luminous efficacy, to the economic efficiency of a lighting solution. For about two decades there will be no maintenance costs for lamp replacement and the associated hiring of access equipment.

Colour rendition and photo spectrum

Colour rendition and preservation aspects are of crucial importance when illuminating paintings. Since warm white LEDs have a higher colour rendition index than daylight white LEDs (Ra85 and Ra70 respectively), warm white LEDs are therefore preferred for colour-sensitive applications such as in museums and art galleries.

To avoid lighting-related damage, such as fading or drying out etc, three factors have to be considered: the photo-spectrum, the illuminance on the object and the duration of irradiation. To assess various light sources, both on their own and in combination with protection filters, a parameter known as the “relative damage factor” is used. This indicates the ratio of the damaging radiation intensity and the illuminance. Short-wave components of light are more harmful because they have higher energy levels. The higher blue component in the photo spectrum of daylight white LEDs makes them unsuitable for sensitive exhibits. Warm white LEDs, on the other hand, have a relative damage factor that is even lower than that of the previous standard of low-voltage halogen lamps with UV filter. This means that LED lighting with warm white LEDs represents the optimum solution for museums and galleries today – even in terms of the preservation of artworks.

With or without UV protection filters, low-voltage halogen lamps have a higher relative damage factor than warm white LEDs. For both preservation and energy efficiency reasons, it is therefore recommended to use warm white LEDs to illuminate sensitive objects. Daylight white LEDs are unsuitable for lighting in museums due to both their poor colour rendition and their higher relative damage factor.
Lighting art with LEDs: Talking to the experts

Hosted and reported by Paul James, Stockport
Photos: Mike St. Maur Sheil, London

Paul James: Good morning gentlemen. Could you start by explaining why and when you converted to the Optex LED system at your galleries?

Steve Spencer: About two years ago Allan Tyrrell asked me to see him about the tungsten lighting in gallery 12 at the National Portrait Gallery, as the old four-circuit track was obsolete. That’s when we looked at the LED solution.

Allan Tyrrell: We were spending so much money on repairing fittings. I’d been looking at LEDs and thought that the time was now right. So we tested it in a small gallery room and I was encouraged enough to say yes, but it was only a small room and there were questions about the colour rendering and the reds.

Steve Vandyke: It was that experiment that made us go for it! We had been looking at the theory too much, but once we saw your system we decided we had to try it as well.

Dawson Carr: We started in gallery 62 in the Sainsbury Wing about a year ago, from there we went on to galleries 2, 4 and hopefully 12.

Paul James: How successful has the changeover to LED been?

Steve Vandyke: We are currently refurbishing rooms 5 and 10, and that will be completed by the end of March. Then we move on to galleries 2, 4 and hopefully 12.

Dawson Carr: The people who are sensitive to what we do (including museum conservators and scientists) like the fact that we can run at a lower lux level that's less energy is hitting the works of art. I understand that measuring lux is a crude device but it’s still useful.

Paul James: Is there anything that you would say the LED lighting does so most of the galleries already have the track installed, so with few modifications we can adapt the system to LED. This means that there is little disruption with high gain and it also means we are future-proofing which is very important.

Allan Tyrrell: The biggest compliment I could make about the LEDs is that in the two years since the initiative, we have not had a comment from the public about the lighting system.

Steve Vandyke: So if you can run lower lux levels it means you can display the pictures for longer.

Dawson Carr: Yes, there’s something about the quality of the light, the crispness. The peak in the blue was a concern for our scientific department but if you look at all the benefits they are very excited about the LEDs.

Allan Tyrrell: Steve Spencer: As it stands, from the same fitting, you can get different elements like quartz in the marble now, when using LED.

Dawson Carr: For us, in addition to the quality of the light that we know will get even better, the part we love the most is the control factor. In particular, the basic physics of LEDs that lets them be dimmed without changing the colour temperature. That fits in with what we’re trying to do in conjunction with using natural light.

Paul James: But if you look at the LEDs is that, in the two years since the initiative, there is little disruption with high gain and it also means we are future-proofing which is very important.

Nigel Sylvester: That’s a powerful statement!

Allan Tyrrell: Yes, that means that what we are doing is acceptable because no-one has complained. Believe me we get a lot of complaints about all sorts of things like the state of the toilets etc, so people would complain if they didn’t like the lighting.

Paul James: That’s why we have taken the light level down by 20% in those rooms but it still looks very good to me.

Allan Tyrrell: Steve Spencer: As it stands, from the same fitting, you can get different elements like quartz in the marble now, when using LED.

Steve Vandyke: Different exhibits need different quantities of light. We were only able to dim down to 80% with the old system (without changing the colour temperature). Now we are able to dim down to 20%. So the beauty of LED lighting is there is no degradation in the quality of light, but it also means we can create more lighting for one exhibit and we can set scenes individually through the ERCO lighting control, which means we can satisfy the curators and conservators whilst using less energy!

Steve Vandyke: So if you can run lower lux levels it means you can display the pictures for longer.

Dawson Carr: In crude terms, yes, it’s interesting though because if I walked into the spaces and you asked me to guess the lux level I would guess that they are much more.

Steve Spencer: Yes, they feel brighter, don’t they? But if you look at all the benefits they are very excited about the LEDs.

Nigel Sylvester: Yes, I saw something that was better than when the halogen was used because it picked out the detail of the sculpture material. The detail came alive.

Paul James: That’s why we have taken the light level down by 20% in those rooms but it still looks very good to me.

Allan Tyrrell: Yes, what I saw was something that was better than when the halogen was used because it picked out the detail of the sculpture material. The detail came alive.

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Dawson Carr: In crude terms, yes, it’s interesting though because if I walked into the spaces and you asked me to guess the lux level I would guess that they are much more.
One of the problems that you’re facing with the acceptance of LED lighting is that we have made people accustomed to seeing works of art blasted with warm spotlights. It’s simply what they are used to.

Steve Vandyke: People don’t like change.

Allan Tyrrell: The biggest criticism I’ve heard is regarding the colour rendering – the fact that it’s not in the 90s and losing the warm effect.

Nigel Sylvester: There are two points to consider with the Colour Rendering Index. The first is that a CRI number cannot guarantee what you are going to see and the second is there is a compromise to be had in terms of luminous efficacy. We want you to have a performing product with a very good illuminance on warm light but the cooler light of the LED is a better representation of daylight and that is the optimum environment for viewing paintings.

Steve Vandyke: In fact, when you move from a tungsten-lit gallery to an LED-lit one the perception is that the LED gallery is brighter. This isn’t the case – it’s the perception. This means you can dim the LED lighting even further to get the same perceived illuminances thus saving more energy.

Allan Tyrrell: I’m also using less air conditioning, based upon our figures, because there is less heat. I’ve actually downsized our chillers because the electric load has gone down so much.

Steve Vandyke: LEDs are also great for our budget because we don’t have to lamp change.

Allan Tyrrell: Oh yes, if we had LED fittings over two floors, which is my aim, I could reduce our maintenance levels enormously because we’re not employing the maintenance contractor to do so much.

Steve Spencer: Don’t you currently change all your tungsten lamps every time you have a new exhibition?

Dawson Carr: In a special exhibition you don’t want any lamps blowing so you just change them all every time.

Steve Spencer: That’s a massive waste!

Steve Vandyke: You’re talking 2–2.5 hours for tungsten to 50,000 hours for LED so it makes a massive difference to our exhibitions.

Nigel Sylvester: And the 50,000 hours represents the time when it gets down to 70% of output and as the degradation is slow you won’t even notice.

Allan Tyrrell: Won’t the problem be that within that, say, twelve-year period, ERCO will be developing new, brighter versions and we’re going to be buying them to supplement the Mark 1 versions we already have?

Nigel Sylvester: Of Technical Services, National Gallery, Nigel Sylvester, ERCO, Paul James, editor mondo*arc magazine and Steve Spencer, ERCO.

Dawson Carr: I like the sound of these! I think we should look at those next…!
ERCO core capability: Optoelectronics

Optical systems
Electronics
Information technology

The rise of LED technology currently being experienced in architectural lighting probably represents the greatest upheaval in lighting engineering for decades. It is comparable with both the transition from analogue vinyl records to digital music on CDs and memory sticks and with the move from analogue to digital photography. Designers and users of lighting systems expect answers from manufacturers in order to enable the potential of LED technology to be fully released. Optoelectronics is a field where elements of optical systems overlap with electronics and information technology, i.e. software. As a result, before entering the world of lighting technology, ERCO now sees a core capability and a focus of its development work as being in the field of optoelectronics. The slogan “tune the light” brings together ERCO’s capabilities in producing, directing and controlling light.

Electronics
LEDs, the light sources of the future, are themselves electronic components and, as with current conventional lamp types, require electronics in the form of control gear. The development of electronic modules in-house gives ERCO freedom in designing the form and function of innovative lighting tools.

Information technology
The networking of information technology on the software level turns individual luminaires into an intelligent lighting network. It was only with their depiction as a control element in the Light Studio software that the development of multifunctional luminaires was made complete.

Optical systems
Regardless of how light is created in a luminaire, it is its optical elements that dictate how efficiently and exactly it produces the desired light. In ERCO’s laboratories, LED lens systems are developed that ensure that the fundamental efficiency advantage of projected light, as opposed to reflected light, can actually be put to practical use. It is especially for accent light and vertical illuminance that the patented Spherolit lens technology has proven to be the ideal system to produce very efficiently a wide variety of characteristics, whether standard or new and abstract.

Development
Technical innovations like the LED spotlights with Spherolit lens not only have to prove their worth against conventional luminaires in terms of their metrological specifications, they also need to be seen to be better, since the trained eye of an experienced technician is decisive when judging the lighting quality.

Tool-making
The production of moulds for optical elements made of polymer materials requires an extremely high level of technical expertise, experience and precision. ERCO has its own state-of-the-art tool-making shop to ensure that the ideas of the designers are translated into production-ready products.

Injection-moulded polymer
State-of-the-art injection moulding machines, qualified employees, high-quality raw materials and careful controls all contribute to the perfect quality of the moulds and Spherolit lenses.

Spherolit lenses
The principle of guiding the light with collimators and Spherolit lenses has proven itself so well at ERCO in terms of efficiency and lighting quality that it is now used in a number of products for indoor and outdoor areas. With Spherolit lenses, a large lens surface is divided into individual, three-dimensionally domed facets that direct the light by refraction. The computer-calculated curvature of the individual facets, or spherolites, determines the beam characteristics of the luminaire.

Light guidance
ERCO’s LED spotlight lens system consists of three components: a primary lens, which is part of the LED sub-assembly, the collimator (drawing) as a secondary lens to align the light into a parallel beam and the Spherolit lens as the tertiary lens to control the light intensity distribution.

Light System DALI
The networking of information technology on the software level turns individual luminaires into an intelligent lighting network. It was only the Light Studio software that the development of multifunctional luminaires was made complete.

Technical innovations like the LED spotlights with Spherolit lens not only have to prove their worth against conventional luminaires in terms of their metrological specifications, they also need to be seen to be better, since the trained eye of an experienced technician is decisive when judging the lighting quality.

ERCO has its own state-of-the-art tool-making shop to ensure that the ideas of the designers are translated into production-ready products.
Electronics
It is with the LED, which is itself a semiconductor electronics component, that the focus in the construction of luminaires has finally turned towards electronics. A combination of standard components for control gear and LED modules will, in turn, only result in standard solutions. To make products that are exceptional in terms of their design, function and lighting quality, however, having in-house capabilities in the field of electronics becomes indispensable. ERCO has already been designing electronic components for lighting control for many years, and this experience now forms the basis for the development of the company’s own LED modules and control gear. This guarantees that all the components are optimally tuned towards each other and ensures product characteristics that are far above average.

Information technology
ERCO consciously describes itself as a producer of hardware and software for architectural lighting. In one respect, the immaterial product “light” can be seen to represent the “software” of architectural lighting. In another, actual software tools themselves are gaining increasing significance in the entire process of product development and lighting design. In fact, many of the innovative solutions for ERCO optical systems would not be possible at all without the use of highly specialised CAD software. ERCO programmers and software developers not only write the firmware for the digital controllers in the control gear and lighting control components but also the Light Studio PC software and the user interface of the Light Changer+. They create the data Plug-Ins for design software such as DIALux and program the web applications for ERCO Light Scout at www.erco.com.

LED modules
The LED semiconductor elements themselves are sourced by ERCO from leading providers on the global market. Since the design of the PCBs for LED modules will dictate the further possibilities of light guidance and thermal management, ERCO therefore designs and develops these PCBs itself, following modular principles, and then has them manufactured by experienced quality producers.

Thermal management
Electronic components, whether LED modules or control gears, require defined ambient conditions for reliable operation. Constructional measures in the housings are designed to promote good thermal management, ensuring that the electronics in ERCO luminaires operate under optimum working conditions.

EMC
Experiments are conducted in the ERCO test laboratory to measure the electromagnetic compatibility (EMC). These ensure that the influence of the luminaires’ electronic components on any other nearby components or devices through electromagnetic radiation does not exceed a certain standard level.

Light Studio
The user-friendly Light Studio PC software is an integral part of the Light System DALI lighting control. It enables an easy configuration of Light System DALI installations and the interactive creation of light scenes.

CAD tools
In lighting laboratories highly specialised software tools assist the ERCO lighting engineers in the development of innovative solutions for light guidance. Using intricate computer simulations, they were able to translate the principle of Spherolit lenses into mass-produced products.
Measuring and evaluating LED luminaires

It is understandable if, during periods of technological upheaval, there is a desire for succinct measurements enabling the comparison of measurement results and measuring processes. This can be applied to luminaires with LED: Advanced LED modules or better heat management will lead to increased luminous flux for the same power consumption. Furthermore, the light output ratio and precision of the optical systems have a great influence on overall efficiency. This makes it recommendable to have an observation method that not only presents the general photometric specifications, but also relates the effect of the lighting in a space to the power consumption.

The luminous flux is a measure of the emitted radiant power. When this is related to the expended electrical power, it gives the luminous efficacy [lm/W], a value that makes it possible to compare the efficiency of lamps. A quantity that is often used as a criterion for the comparison of lighting technology is the light output ratio (abbreviated as LOR). A high LOR, however, only allows limited conclusions to be drawn about the suitability of a luminaire, since it does not consider either visual comfort or the manner in which the luminous flux is emitted.

Accuracy and luminous efficacy

A quantity that is often used as a criterion for the comparison of lighting technology is the light output ratio (abbreviated as LOR). A high LOR, however, only allows limited conclusions to be drawn about the suitability of a luminaire, since it does not consider either visual comfort or the manner in which the luminous flux is emitted.

When it comes to wallwashing, the average illuminance on the wall, assuming good uniformity, is of interest. The prerequisite for any meaningful comparison is to have a regular luminaire arrangement. The values for a 3m-high wall and for a 1m offset and luminaire spacing of 1m are obtained by consulting the product documentation, such as the relevant tables in the ERCO catalogue. For a given lighting distance, the spotlights can now be compared by way of their lx/W values.

Two spotlights with similar light intensity distributions can be differentiated from each other by the fact that LED luminaires deliver a better light output ratio.

Three aspects essentially determine the efficiency of lighting. Firstly and secondly, on the quantitative side are the luminous efficacy of the lamp and the light output ratio. Thirdly, on the qualitative side, there is the issue of how effectively a luminaire fulfills its lighting task.

Thomas Schießke

Focus

LED lighting technology in the lx/W analysis

The efficiency of specific luminaires can only be meaningfully considered in connection with their parameters. The criterion for accent light is the illuminance on the target surface. For wallwashing and for horizontal general lighting arranged in a grid formation, there is the additional criterion of uniformity. The calculated or measured lx/W values are not absolute values, but only apply to luminaires with a similar light intensity distribution in a defined spatial situation. In this context they allow the direct comparison between different technologies of light production and beam control.

For a comparison between LED spotlights and spotlights for HIT lamps, two spotlights with the “spot” characteristic would be selected. Illuminance levels and beam diameters dependent on the distance can be obtained from the product documentation, such as the relevant tables in the ERCO catalogue. For a given lighting distance, the spotlights can now be compared by way of their lx/W values.

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The comparison made on the basis of the documented product data can be better understood using a simulation program (DAVlux) or by measurement in a mock-up scenario. This comparison also verifies the inherent advantages of projected LED light over and against the reflected light of conventional luminaires.

Thomas Schießke

The higher efficiency of transmission with LEDs means that LED luminaires with Spherolit lenses deliver a better light output ratio than those relying on reflection with reflector systems. ERCO Spherolit lenses are made of optical polymer with a special surface structure (shown here: “wallwash” Spherolit lens).
The Sieben Schwaben (Seven Swabians) chemist in the town of Laupheim near Ulm is a chemist like no other. Established in 1872, it became the nucleus of today’s Rentschler Biotechnologie GmbH, a pharmaceutical business with an international reputation. To this day it is still owned by the Rentschler family and this means that high requirements are also placed on aesthetics and design; understandable when you get to know Dr. Friedrich E. Rentschler, long-term head of the business and an avid art collector. His FER collection containing important works by contemporary artists is exhibited in a private gallery in Ulm and illuminated by ERCO.

Although the chemist store was given a makeover with clean-lined modern furnishings not long ago, the lighting installed at that time, featuring a stretch ceiling backlit with coloured light, proved to be high-maintenance and developed too much heat when switched on. In the context of a corrective conversion, ERCO assisted the designers in developing a lighting concept with the latest LED and control technology. The recommendation was a hybrid combination of LED light for both the general lighting and colour effects while high-pressure discharge lamps were incorporated for economical accent lighting and wallwashing; a concept completely in keeping with the principle of efficient visual comfort. Light System DALI controls the entire installation. The ceiling-integrated luminaires are from the Quintessence range. The result was a unified lighting system whose hardware and software components work together flawlessly. During the day, glare-free and attractive light suited to human perception, is provided for customers, staff and product displays; while at night, the intensively coloured, dynamic scenic lighting of the rear wall and dispensary converts the chemist into an architectural eye-catcher.

**LED light for salesrooms:**

Sieben Schwaben chemist, Laupheim
A rural house like this on a beautiful, park-like plot of land in the Swedish coastal town of Kalmar does of course offer many particularly attractive possibilities for the use of lighting tools from ERCO’s range of outdoor luminaires.

However, when we talk about the lighting design of outdoor parks, gardens and landscapes, fundamental possibilities arise for the use of LED luminaires, regardless of project size and with special benefits for private building owners. First of all, how LEDs react to temperature is itself a valid argument, because unlike fluorescent lamps, for instance, the luminous flux of LEDs does not decrease at low temperatures, like those that are often experienced at night in outdoor areas. Quite the opposite in fact, a cool environment has an additional positive effect on the already long functional life of LEDs. This brings us to another, important advantage. The enormous functional life of approx. 50,000 operating hours makes lamp replacement redundant. Paired with the savings in energy costs due to the high efficiency of LED luminaires, this enables the amortisation of the higher initial investment in future-proof technology. A frequent request in the private area is to link outdoor luminaires with devices such as timers, twilight switches or motion sensors. Once again, the LED excels here too with its optimum switching behaviour delivering full and immediate luminous flux. ERCO’s powerful lighting technology ensures that the lighting quality and lighting design capabilities of LED luminaires are no different from that of conventional luminaires and in some cases, such as with the Axis Walklight, they are the only real alternative.

LED light for garden and landscape: Private residence, Kalmar (Sweden)

A rural house like this on a beautiful, park-like plot of land in the Swedish coastal town of Kalmar does of course offer many particularly attractive possibilities for the use of lighting tools from ERCO’s range of outdoor luminaires. However, when we talk about the lighting design of outdoor parks, gardens and landscapes, fundamental possibilities arise for the use of LED luminaires, regardless of project size and with special benefits for private building owners. First of all, how LEDs react to temperature is itself a valid argument, because unlike fluorescent lamps, for instance, the luminous flux of LEDs does not decrease at low temperatures, like those that are often experienced at night in outdoor areas. Quite the opposite in fact, a cool environment has an additional positive effect on the already long functional life of LEDs. This brings us to another, important advantage. The enormous functional life of approx. 50,000 operating hours makes lamp replacement redundant. Paired with the savings in energy costs due to the high efficiency of LED luminaires, this enables the amortisation of the higher initial investment in future-proof technology. A frequent request in the private area is to link outdoor luminaires with devices such as timers, twilight switches or motion sensors. Once again, the LED excels here too with its optimum switching behaviour delivering full and immediate luminous flux. ERCO’s powerful lighting technology ensures that the lighting quality and lighting design capabilities of LED luminaires are no different from that of conventional luminaires and in some cases, such as with the Axis Walklight, they are the only real alternative.
A facade is the public face of a hotel. Whether historic or modern, it allows the owner an opportunity to express the establishment’s style and image. It is precisely for this reason that in today’s major cities, which are pulsating with life 24-7, illuminated facades ensure a hotel presents an impressive image at night time as well. The recently renovated “Intercontinental Paris Avenue Marceau” is self-styled as a 5-star boutique hotel. Situated in a prestigious quarter of Paris near to the Arc de Triomphe, the hotel boasts the attractive historic facade of a 19th-century townhouse. Working together with ERCO Paris, the hotel management designed a sensitive yet dramatic concept for the facade lighting. The lighting approach fuses historic splendour with a high-tech look, creating a solution that is environmentally friendly and reduces the running and maintenance costs.

The lighting concept uses the latest energy-efficient ERCO LED lighting tools for the outdoor area: Kubus, Focalflood facade luminaires and Grasshopper. The lighting designers made deliberate use of the contrast between warm-white and daylight-white LEDs in different zones of the facade.

LED light for facades: Intercontinental Hotel, Paris

Photos: Dirk Vogel, Dortmund
www.ic-marceau.com

Outside post-modern, inside classic. In 1995, the Bonnefanten Museum in Maastricht relocated into a new building designed by architect Aldo Rossi. This striking building leaves an indelible mark on the cityscape. The galleries inside are as timeless and neutral as the outside is contemporary and impressive. White walls, a skylight for diffuse general lighting, an all-round track at the correct wall offset for accent lighting or wallwashing, this is what curators want as the ideal spatial framework for scenically presenting artworks old and new. ERCO lighting tracks have been used in the Maastricht museum for 15 years. Today, another advantage of their versatility has become apparent. Retrofitting the tracks with state-of-the-art LED spotlights from the Optec range has allowed the lighting system to be simply and economically updated to the latest technical standard of efficiency. This was undertaken in the context of restyling the permanent collection under the title “Augenspiel”, curated by Alexander van Grevenstein. The museum management in Maastricht was won over by the advantages of LED light. Namely the conservation of resources and reduced running costs due to lower energy consumption, optimum preservation of the exhibits thanks to low UV and IR components. What particularly stood out in favour of the ERCO spotlights was the excellent colour rendition of their warm-white LED modules and the ability to regulate the luminous flux of each individual spotlight separately using the integrated dimmers.

LED light in the museum: Bonnefanten Museum, Maastricht

Lighting design: John van Tongeren, Bonnefanten Museum, Maastricht
Photos: Dirk Vogel, Dortmund
www.bonnefanten.nl

The Bonnefanten Museum’s exhibits include excellent pieces of Flemish ecclesiastical art. The new presentation concept of the permanent collection contrasts such ancient masterpieces over and against modern and contemporary art. Whether figurines in the targeted beam of an Optec LED “spot” or large-format paintings discreetly accentuated with “flood” characteristics, the new light underscores the freshness of the presentation.
Starbucks, the global brand for the laid-back American way to enjoy coffee, gets serious with the subject of sustainability. Not just for the contents poured into the coffee cup, which are now largely brewed from fairly traded raw products, but also for the worldwide design of the coffee houses. The first of these new and environmentally conscious coffee bars in Germany was established last summer at the Altmarkt in Dresden, on the ground floor of a new hotel building designed by the Dresden design offices Pfau Architekten for the Spanish NH group. “We chose the city as a location for this special coffee house because of the region’s rich cultural heritage. As of 2011, all our new coffee houses will be built according to the same environmental and design standards that we are presenting to our guests for the first time here,” states Ross Shadix, Managing Director of Starbucks Coffee Deutschland, explaining the new design concept, which takes up the colours of the coffee world and makes liberal use of wood to create a pleasant and quiet atmosphere for enjoying coffee. Modern elements are combined with vintage pieces such as recycled barstools or old oak beams – preferably using local sources and materials. Important elements in the new strategy are energy efficiency and environmental compatibility. “It is not just in the producer countries, but also here in Germany that we go for sustainability. The Dresden outlet is the first coffee house in Germany to be registered for LEED certification,” comments Ross Shadix. LEED (Leadership in Energy and Environmental Design) was developed by the U.S. Green Building Council and stands for ecological construction. It is within this framework that Starbucks uses environmentally friendly materials that are kind to resources as well as local materials and also reduces the site’s consumption of energy and water. In Dresden for instance, the coffee dregs are composted and the employees have a dedicated parking space for their bicycles. When it comes to the lighting, ERCO’s LED technology and its lighting concept following the principles of efficient visual comfort both contribute to meeting the criteria for sustainability. In addition to the longevity and high luminous efficacy of the LEDs themselves, there is the precision and effectiveness of the lighting tools that direct the light exactly onto the desired target surfaces, avoiding any wasted energy. Quintessence LED wallwashers illuminate the wall surfaces and vertical goods displays. The serving bar receives brilliant yet glare-free light from Cantax LED spotlights mounted on a track suspended above this counter. The pleasant lighting quality of the warm-white LEDs underlines the relaxed atmosphere that is so typical of Starbucks.

Hissing steam, creamy milk froth, fragrant expresso and shining stainless steel: making coffee à la Starbucks is an experience for all the senses. The brilliant LED light from Cantax LED spotlights in the counter area optimally brings out the visual side of this setting.

The lighting concept for the serving counter in the coffee house can be transferred to many similar situations in the catering and retail trades: narrow-beam light from spotlights accentuates the counter surface, where it creates the optimum visual conditions for guests and staff without causing glare. The rear wall behind the counter is illuminated with vertical light from wallwashers and together with its product displays, acts as a beacon, assisting orientation in the coffee bar and intensifying the brand experience.

Wallwashing is a crucial factor of efficient visual comfort because it is the illuminance on the vertical surfaces delineating an area that determines the subjective impression of brightness. Especially, when combined with LED technology, wallwashing is a key element of sustainable lighting design.

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LED light for education and administration: Students’ Union, University of Bath

Architects: Stubbs Rich, Bath
Lighting designer: Hoare Lea Lighting, Bristol
Photos: Rudi Menzel, Berlin
www.bathstudent.com

The 5.5-million-pound building was built within 11 months and in close cooperation with the students. A declared planning objective for the project was to have a minimum carbon footprint. At British universities, the Students’ Union is a self-managed entity that represents the interests of the student body and looks after a number of their concerns: study groups and the mediation of accounts, modulation and jobs to the organisation of parties, clubs and bars of the Students’ Union. Material and uncomplicated.

casual lounge furniture, plasma info-screens and a ubiquitous WiFi network set the tone for the Students’ Union in Bath and are all simply taken for granted. The students at this South West of England university belong to a generation for whom digital technology and networking are everyday matters. So they probably also take it for granted that the recently opened Students’ Union building is fitted with innovative LED lighting technology to help combine high visual comfort with efficient use of energy. Outwardly, the Quintessence LED downlights installed in the corridors and foyers hardly appear any different from the pendants with conventional lamps. With their precise mounting detail, glare-free Darklight reflector and a frosted-glass diffuser, they have the same features as all Quintessence downlights and also deliver a similarly high lighting quality. The size-3 downlights have 14W LED modules and also compact, maintenance-free, offer high stability under switching and using the appropriate control gear. Their beams of light are directed in a deliberately irregular pattern, creating a lively impression.

Efficient visual comfort: Quintessence LED downlights as general lighting are supplemented by Optec LED spotlights in warm white with “flood” Spherolit lenses as flexible components for accent lighting. The entire installation is DALI controlled to suit the level of demand.

LED light for pathways and open areas: Vial UAB Bellaterra, Barcelona

An unusual lighting task was presented to the staff of the Spanish ERCO subsidiary in Molins del Rey near Barcelona. It came in the form of this pedestrian road at the new Research Park, which is adjoined to the campus of the Universitat Autònoma de Barcelona (UAB). The university site lies in Bellaterra, a suburb on the northern city limits of the Catalan capital. In the framework of its “Agenda 21 UAB”, the large university with its 30,000-plus students is striving for sustainability in many areas. These range from the reduction of laboratory waste and the conservation of biotopes on the campus to the conscious consideration of energy aspects when planning construction projects. Consequently, the use of LEDs as energy-saving light sources was rightly included in the specific classification sheets for the new lighting of the pedestrian road. At almost 100m-long, this road runs between two new buildings in which institute and technology companies are resident. The Powercast range of projectors with their sleek profiles, demonstrate a universal versatility here even when mast-mounted. Fourteen Powercast LED projectors with “wide Flood” Spherolit lenses and 20W warm-white LED modules illuminate the road surface from a height of about 4.50m. The contribution towards sustainability is obvious: safe, low-maintenance lighting with minimum energy consumption, high visual comfort for the pedestrians and in the interest of Dark Sky, no spill light whatsoever above the horizontal plane.

Powercast projectors with Spherolit lenses “wide flood” are a very attractive option as mast luminaries. Their beams of light are directed in a deliberately irregular pattern, creating a lively impression.

With their minimalist, clean lines, Powercast projectors are a high-quality detail and combine well with modern architecture, irrespective of which of many different mounting types is selected for this universal luminaire group.

Vial UAB Bellaterra, Barcelona
Photos: Andreu Adrover, Barcelona
http://parc.uab.es
Backlights

EuroShop 2011, Düsseldorf
International experts from the world of retail trade met in Düsseldorf from the 26th of February to the 2nd of March 2011, at the EuroShop, the world’s largest trade fair for capital goods from the retail sector. Amongst the providers of lighting solutions who were concentrated in Hall 11, LED light was the central theme and ERCO was one of the main attractions. On the 240sqm-trade-fair stand, the relevant lighting tools were available for inspection and also shown in use in typical shop situations. The stand was scenically illuminated solely by LED lighting tools, allowing the connected load of the lighting to be reduced by 80%, compared with our last EuroShop stand three years ago.

www.euroshop.de

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www.euroshop.de

Award-winning ERCO projects
Once again in 2010, lighting projects with ERCO lighting tools have won important awards. Our warmest thanks go to all those involved – the jury, lighting designers and building owners. We would like to briefly present three, interesting, award-winning projects here.

Original Levi’s Store, Regent Street, London
At the renowned “Interior Awards 2010” of the English technical publication “Retail Week”, the inventors of blue jeans scooped up three awards, including the award for Best Use of Lighting. Optec HIT spotlights and wallwashers are the tools in a concept that takes the factors of efficient visual comfort into consideration.

Architecture: Checkland Kindleysides Retail Design, London
Photos: Rudi Meisel, Berlin

National Portrait Gallery, Canberra
The International Association of Lighting Designers (IALD) presented 23 projects from twelve countries with an IALD award on the 13th of May 2010. Lighting designer Mirjam Roos, IALD Associate, received an IALD Award of Merit for the National Portrait Gallery in the Australian capital of Canberra. Optec spotlights and wallwashers are also used here to highlight exhibits and architectural elements.

Architecture: Johnson Pilton Walker, Sydney
Lighting design: Mirjam Roos, Steensen Varming Australia, Sydney/Canberra
www.portrait.gov.au

Matildelunds Förskola, Kumla
The Swedish Lighting Award (Svenska Ljuspriset) for building projects from 2009 was presented to the Matildelunds Nursery School in Kumla in October 2010. The jury particularly praised the efficiency of the lighting and the successful use of light in creating a stimulating visual environment for the children. In addition to decorative luminaires, Optec spotlights and wallwashers mounted on 3-circuit track were used for accent lighting and vertical illuminance.

Architecture and lighting design: Jonas Kjellander, Sweco Architects AB, Örebro
Photos: Ulf Celander, Gothenburg

Logotec LED: with its striking design, this new release at the trade fair is omnipresent, not only featuring in the graphic artwork, but also acting as the backbone of the entire stand lighting. The unrivalled “narrow spot” version of the LED spotlight met with particular interest.

Material samples invited visitors to test the brilliance and colour rendition. ERCO lighting consultants explained the workings of the innovative LED optical systems with collimators and Spherolit lenses.

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Interesting guests, thrilling conversations: we would like to thank all visitors and staff for helping to make the EuroShop 2011 such a big success!
Centre for International Light Art, Unna: “Light 21” exhibition

Lighting design: LDE Kober, Dortmund
Photos: Alexander Ring
www.lichtkunst-unna.de

The “Light 21” exhibition from 04.12.2010 to 27.03.2011 presented three exceptional perspectives of contemporary light art. In the context of historical, industrial architecture, which gives the exhibition galleries of the Centre for International Light Art Unna their unmistakable framework, the works of HC Berg, Brigitte Kowanz and Christina Benz were pooled together to create an energy-charged tour through imaginary spaces of light and shadow. Where necessary, ERCO spotlights added precise accents to the exhibits – perfectly measured and without glare.