

## How can street lighting be made more energy efficient?



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### Introduction:

In times of scarcer and more expensive energy it is quite appropriate to ask the question as to how street lighting can be made more energy efficient? However, since demand for better lighting is increasing year by year, the energy saving must not be the result of lower lighting levels.

This paper wishes to provide an overview as to the available technologies and practices, which each have substantial potential of energy efficiency and saving.

There are a number of technologies available, which aim to reduce energy consumption without reducing the service level.

### Establish the right light.

The **right lighting** has led us to master the various parameters of light:

- the right level using less energy
- the right level using fewer resources
- the right level at a lower cost.

The right lighting enables us to present financial, energy efficient and ecological results which are fully in line with sustainable development objectives.

Today's lighting takes into account the interaction between five parameters:

- the use of the correct lamp
- the use of high-performing reflectors adapted to the light source and the place to be lit
- maintaining performance through time
- the use of electronic devices allowing optimised management
- knowledge of the real characteristics of the surface to be lit.

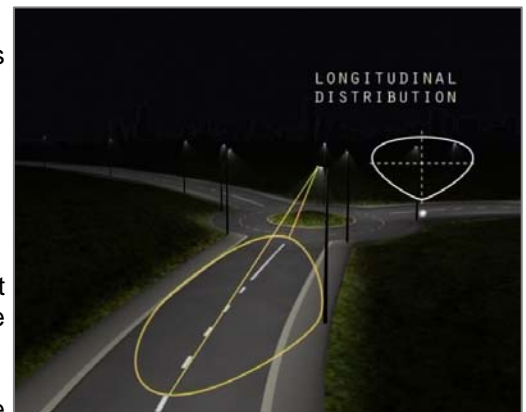
The combination and mastery of all these parameters make it possible to create an installation adapted to the real needs of the place to be lit.

### Lamps:

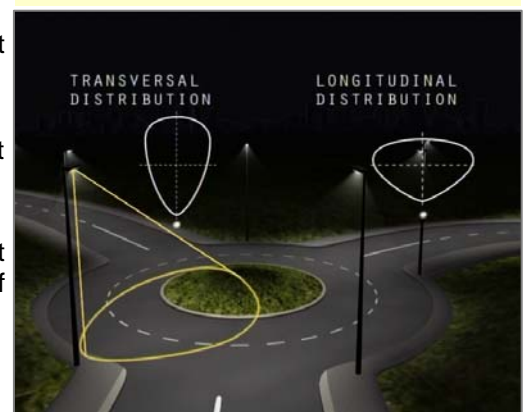
Their size has been reduced, their life span has been extended, and they have gained in efficiency. The geometry of the arc tube and the design of the lamp caps allow a more precise positioning in the reflector.

Furthermore, these latest generation lamps are of highest efficacy, whilst maintaining good colour stability. Their power can be adapted to real needs.

They are perfect for use with white light, better adapted to eye sensitivity and offer a colour rendition which is very close to that of daylight. This 'qualitative white' optimally integrates into the nocturnal landscape while offering improved luminous efficacy.



Reflectors adapted to the place to be lit



## Reflectors:

We have developed the technology, shape and size of reflectors to optimise their performance according to the light source and the area to be lit.

The shape and the structure of the internal surface have become more and more complex.

While reducing the size of the sources, we are also designing increasingly smaller reflectors.

Thanks to our Group's research centre and our extensive experience in this field, we can offer reflectors whose light distribution is adapted to the surface to be lit. Our reflectors provide good lighting while offering light distribution also adapted to the site to be lit.

Our Group were the first in 1953 to offer anodised reflectors. In 1985, we introduced vacuum metallised reflectors.

In 2005, we innovated again by offering a world first in public lighting: High reflectance reflectors with a high reflective coefficient based on multi-layer technology.

Many kilometres of highway- and main road lighting have been realised with the most efficient reflector system, as provided in the range of BEKA products. This has resulted in cost and energy savings of more than 46%, as already presented at the AMEU Conference in Ushlatuze, in 2004.



Reduced sizes of light sources require smaller reflectors.

Due to the Lighting Engineers' increased awareness of energy efficient lighting systems, BEKA has launched its range of BEKALANE-SUPRA luminaires.



The BEKALANE-Supra saves 45% energy

This luminaire offers energy saving solutions for Class B, as well as for Class A4 roads, by utilising the highly efficient Schröder reflector technology.

This technology offers:

- **Increasing lighting levels by up to 130%, without increasing the energy consumption**
- **Reduced energy consumption by 45%, without reducing the lighting levels.**

A typical example would be the increase of lighting levels by 90 % by replacing a standard 125W Mercury Vapour (MV) luminaire with a BEKALANE-SUPRA 100W HPS-T lamp, resulting in a 20% saving of energy.

By substituting a standard 80W MV luminaire with a BEKALANE 70W HPS-T, increases of 125% lighting levels, at a 12% reduced energy consumption can be achieved.

All this can be done without changing the mounting height or spacing in existing installations. Therefore, the BEKALANE-SUPRA is most ideal in upgrading existing installations and saving energy in the process.

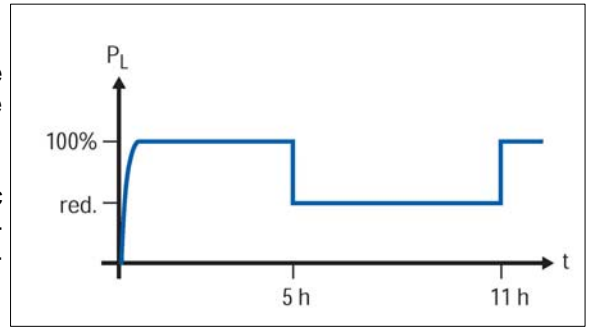
## Power Switch:

The luminaires for 250W and 400W light sources can be equipped with an electronic power switch, which is more energy efficient.

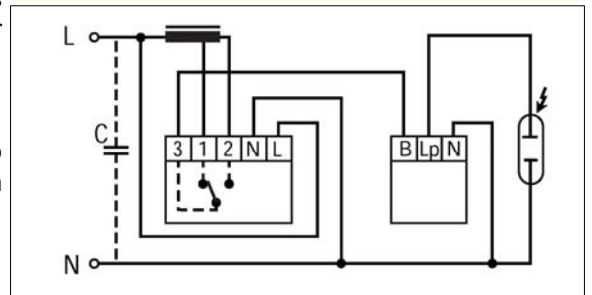
Today's technology provides for the use of an electronic device, the **Timed Power Switch**, which enables a reduction of 55% of light output, saving 46% energy in the process, on a 400W HPS lamp.

This technology is most appropriate in Class A1 to A3 road lighting installations, where the required lighting level is also a function of the traffic flow, expressed in vehicles per hour per lane.

This technology switches, without external intervention, the lighting levels five hours after switch-on from 100% to 50% and again, eleven hours after switch-on, back from 50% to 100%.



Timed Power Switch reduces energy consumption by 46%



## IP 66 lamp compartments:

Electronic devices are sensitive to temperature.

Our company has been breaking ground by separating the control gear compartment from the optical compartment. This facilitates heat evacuation through natural convection.

The use of IP66 sealed lamp compartments guarantees a true and continuous tightness level over time, as certified by national standards laboratories. The absence of dirt inside eliminates any internal depreciation.

## Establishing the correct road surface classification:

The right lighting is only possible with a very precise knowledge of the real reflection level of the surface to be lit. All photometric calculations are based on the theoretical road surface categories R1, R2, R3, R4, C2, etc.

In an effort to obtain more precise measurements, our associated company, Schröder in Belgium, has been using a laboratory surface reflectometer for many years now.



Costly and destructive core sampling of the past

Schröder is the only manufacturer in Europe to own such a reflectometer. By using it, we have been able to establish that the theoretical classification of road surface categories can lead to an error rate of up to 100% between calculation and site measurements. Furthermore, there are even more pronounced differences with the new types of surfaces.

With the laboratory reflectometer, the error rate has fallen to 15%.

The main inconveniences are the destructive and costly core sampling operations and road repairs. This limits its applications.

Furthermore, the samples are not always representative of the entire surface.

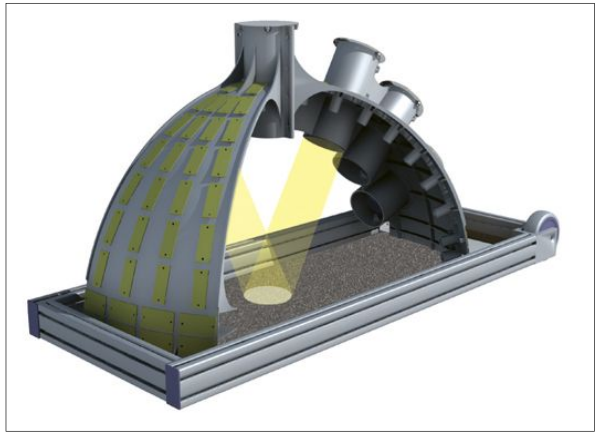


Typical core sample of a road surface

In order to improve performance, Schröder has developed the innovative Memphis system, a portable surface reflectometer allowing on-site measurements.

The opto-electronic technique is non-destructive and quick, and therefore more economical. Five minutes are enough to record the characteristics of a sample of the surface.

The flexibility of the Memphis system enables the number of measurements to be easily increased and so provides a precise image of the reflective characteristics of the surface to be lit. Memphis is a new measurement tool that enables the calculation of the exact quantity of light to be used to provide the 'right lighting' with an error rate of almost zero.



Five minutes are enough to record the characteristics of a sample of the road surface.

**Conclusion:**

It is the combination of all above-stated parameters that allows us to provide better lighting and to use all our expertise to reduce energy consumption without reducing the lighting levels, where and when needed.

However, we wish to make it very clear that the present system of tendering does not promote any of the above mentioned technologies, since, in most cases, only the lowest priced product would be considered.

Only if performance-related criteria are applied, will South African Councils and Power Companies benefit from these energy and cost saving technologies.

**We want you to be able to accept the tools and technologies that will allow us to face the economic and ecological challenges of tomorrow together.**



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