Quality pays off

Efficient lighting in public buildings
Since 1 January 2011 the capacities and long-standing experience of DED, GTZ and InWEnt have been brought together in the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

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The true cost of cheap products

The city hall employees had put up with poor lighting at their workplace for far too long: gloomy corridors, flickering fluorescent lamps, and no emergency lighting or outdoor lighting. And the monthly electricity bills were enormous.

Finally, it was decided that the building has to be renovated. A lighting expert analysed the status quo, produced a new lighting strategy, and drew up a plan to implement this. Once workplaces, corridors and access paths were fitted out with new energy-saving lights the situation improved markedly – until problems arose some three years later.

- One after another, the energy-saving lamps, which had a purported lifetime ten times that of traditional lamps, simply went out.
- The remaining lamps grew dimmer and dimmer.

And although the strategy had promised lower costs (over the entire lifetime of the lights), the overall costs were so high that they threatened to more than outstrip savings made by cuts in power consumption.

What had gone wrong?

Modernising a city hall

‘Buy cheap, buy twice’. The well-known saying proved to be true in this instance. Contracts for planning and renovation work were placed with the lowest bidder. It emerged, however, that the bidder had used poor quality imitations rather than products that genuinely complied with quality standards – and even they were poorly installed. No warranty had been granted on either the products or the work performed. Subsequently, even the strategy proved to be substandard.

The initial investment would have been higher if expert lighting engineers had been contracted to plan and install the lighting, and if high-quality products had been used. But short-term savings often prove more expensive in the long run. Higher quality pays off quickly, as the following example demonstrates.
Economic efficiency of energy-saving lamps of different qualities.
Operation period: 10,000 hours

<table>
<thead>
<tr>
<th>Illuminant</th>
<th>Compact Fluorescent Lamp (CFL)</th>
<th>High-quality product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>20 watt</td>
<td>20 watt</td>
</tr>
<tr>
<td>Lifetime</td>
<td>2,000 hours</td>
<td>10,000 hours</td>
</tr>
<tr>
<td>Cost per lamp</td>
<td>1.99 €</td>
<td>3.50 €</td>
</tr>
<tr>
<td>Number of lamps</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Total cost of lamps</td>
<td>9.95 €</td>
<td>3.50 €</td>
</tr>
<tr>
<td>Costs of replacing lamp</td>
<td></td>
<td>0.50 €</td>
</tr>
<tr>
<td>Total maintenance costs</td>
<td>2.50 €</td>
<td>0.50 €</td>
</tr>
<tr>
<td>TOTAL COSTS</td>
<td>12.45 €</td>
<td>4.00 €</td>
</tr>
<tr>
<td>DIFFERENCE</td>
<td></td>
<td>8.45 €</td>
</tr>
</tbody>
</table>

An energy-saving lamp produced by a brand-name manufacturer was compared with a cheap energy-saving lamp that did not comply with any quality requirements and for which no warranty was given. The cheap product had an actual lifetime of only 2,000 hours, while the brand-name product delivered the 10,000 hours promised. Clearly, it is significantly cheaper to buy the slightly more expensive brand-name product, if we look at the entire Lifetime of the products.

Cost comparison over a operation period of 10,000 hours (cheap product versus high-quality product)
Lamp quality
How to select high-quality products

Bear in mind that the economic efficiency of a lighting system depends to a very great extent on the quality of the products used. Generally, the lifetime of substandard products is significantly lower than that of high-quality products. The additional investment and maintenance costs of replacing substandard products render the entire modernisation process uneconomical. It pays off to look in some detail at the quality and maintenance costs of the products used.

Lighting quality
The quality of lighting at the workplace impacts on our concentration and well-being, and thus directly affects the quality of our work. This means that the quality of lighting can contribute to the economic efficiency of the organisation or company as a whole. The following factors must be taken into account:

- **Illuminance**
  The illuminance is the amount of light falling on a given area, and is measured in lux. The standard for office lighting is 500 lux.

- **Colour rendering**
  The quality of colour rendering is measured using the Colour Rendering Index (CRI) or Ra Index. A Ra reading of 100 is ideal. The level should not be lower than 80 indoors.

- **Colour temperature**
  The colour temperature tells us about the tone of the light emitted and is measured in kelvin. Offices generally look for a value of around 4,000 kelvin.

Overview of colour temperature

<table>
<thead>
<tr>
<th></th>
<th>warm white</th>
<th>natural white</th>
<th>daylight white</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3,300 kelvin</td>
<td></td>
<td>3,300-5,300 kelvin</td>
<td>&gt; 5,300 kelvin</td>
</tr>
</tbody>
</table>

Understanding the label on products and packaging

The three-digit number tells you about colour rendering and colour temperature: The first digit is the Ra value. The 8 in this case means a value of between 80 and 89. The second and third digits tell you about the colour temperature. The 27 shown here means 2,700 kelvin or warm white.
**Lighting duration**
The durability of a lamp, one of the major factors that determine whether or not it is economical, depends first and foremost on the quality of the product. High-quality lamps not only have a longer life from the outset. They are also better equipped to survive vibrations, voltage fluctuations, different ambient temperatures and being frequently switched on and off. The average lamp life is given on the EU label.

*We recommend* that you select products with a lamp life of at least 10,000 hours.

**Lamp efficiency**
The efficiency of a lamp is another important factor when determining whether it is an economical option. The efficiency tells us how much electricity (in watts) is needed to generate a certain light output (measured in lumen). While a conventional 100 W light bulb has an efficiency rating of around 10 lumens per watt, a highly efficient fluorescent lamp with electronic ballast can rate over 90 lumens per watt. You can see how efficient a lamp is by consulting the energy efficiency class on the energy label which must, by law, be printed on all fluorescent lamps and electronic ballast sold in the EU.

*We recommend* that you use only lamps classed as A or B.

The energy label also provides information on the light output (in lumen), the power consumption (in watt) and the lifetime of the lamp (in hours).

**Maintenance**
Maintenance work on a lighting system costs money. The system has to be cleaned, lamps have to be checked and replaced and spare parts stored. High-quality lamps and fittings can help keep these costs down.

It is also important to ensure that the lights are easily accessible and easy to clean. Low-hanging lights, for instance, not only enhance the quality of the workplace, but also make it easier to clean the light and replace lamps. It is easier to replace energy-saving lamps than halogen lights that are integrated into the ceiling. Their lifetime is also three times longer.

*We recommend* that you plan your lighting system to keep maintenance easy and to a minimum.

**Environmental factors**
Environmental factors also have an economic impact, because environmentally sound lamps are good for the national economy. The entire life cycle of a product must be taken into account, from manufacture to disposal. Remember that energy-saving lamps contain mercury and must be properly disposed of.

*We recommend* that you choose products that carry the EU Ecolabel.
Public procurement
Criteria for tendering, comparing bids and making the final decision

To ensure an ideal balance between product quality and cost ratio, the procurement process must take both these aspects into account, and must be as transparent as possible. The first step is to draw up a detailed invitation to tender.

Include quality criteria in your invitation to tender

The invitation to tender should lay out clear quality requirements for the products in line with the use to which they will be put, and should specify that only bids meeting these requirements will be considered. The following table provides some guidelines for the necessary product quality.

Less input for more output

<table>
<thead>
<tr>
<th></th>
<th>Energy-saving lamp</th>
<th>Fluorescent lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption (watt)</td>
<td>&lt; 10</td>
<td>&lt; 36</td>
</tr>
<tr>
<td></td>
<td>10 – 18</td>
<td>10 – 18</td>
</tr>
<tr>
<td></td>
<td>&gt; 18</td>
<td>≥ 36</td>
</tr>
<tr>
<td>Lamp efficiency (lumen per watt)</td>
<td>at least 40</td>
<td>at least 45</td>
</tr>
<tr>
<td></td>
<td>at least 55</td>
<td>at least 70</td>
</tr>
<tr>
<td>Lifetime (hours)</td>
<td>at least 8,000</td>
<td>at least 10,000</td>
</tr>
<tr>
<td>Mercury content (mg)</td>
<td>maximum 3.5 mg*</td>
<td>maximum 7.5 mg</td>
</tr>
</tbody>
</table>

* As of 1 January 2013 there will be a ceiling of 2.5 mg on the amount of mercury that may be used in a lamp in the EU.

The table gives the minimum and maximum requirements for two different energy efficient lamp types.

Electronic ballast

Electronic ballast is already incorporated in compact fluorescent lamps. In fluorescent tubes ballasts are a separate component in the lighting system. They should be able to withstand at least 20,000 on/off switchings.
Fittings
A fitting or luminaire is any component used to hold a light source or lamp. One fitting can hold several lamps. The operating efficiency of the fitting thus gives us the ratio of the lumen value of the fitting itself to the lumen value of the lamps it holds. It should be at least 80 per cent.

Making the economical choice
Before you make your decision, ensure that the bidder is reputable and that you will get the quality you have specified.

• Go through the bids point by point and check whether or not the technical specifications in the bid correspond exactly to those in the invitation to tender.
• Check whether or not the bid contains exclusion clauses.
• Check for quality symbols such as the CE symbol and ecolabels.
• Buy only tried and tested systems with standard products. Ask for parts of the building to be fitted approved out on a trial basis.
• Find out about product tests already conducted and ask for references from systems already installed or request a demonstration.
• Obtain written confirmation of specifications including harmful substances contained in the product, luminous flux and lifecycle of the products ordered.
• Demand comprehensive warranties on both the lighting system and the work performed.

The lighting system should only be installed by qualified electricians. Ask the manufacturer to recommend a suitable company. You should place your order with the bidder who meets all your requirements, i.e. who offers the highest quality at the lowest cost over the entire lifetime of the system.

TIP
Specimen invitations to tender are available online in several languages at http://www.buy-smart.info/downloads/downloads3
How to recognise cheap imitations

Although the producers of pirate products go to a great deal of trouble to make their products look like the real thing, if you look carefully it is not usually too difficult to identify cheap imitations.

• The logo
  Check whether or not the logo corresponds one hundred per cent to the original brand logo.

• Product information and designation
  The packaging is easy to copy. Check the product information given on the product itself, at the base of the lamp for instance. Ensure that the information is complete, i.e. that it also contains the disposal information.

• Size and shape
  Compare the size of the base and the shape with an original lamp.

• Workmanship
  Check that the base and the glass tubes are properly worked. Any joins between the tubes are a sign that the lamp is a copy.

• Price
  Quality comes at a price. Any bid that is too low should arouse your suspicion.

• Manufacturer
  Ask where the products come from and how they are transported. Any reputable manufacturer will be able to answer these questions without difficulty. If you are unsure, pick up the products yourself and check whether or not the manufacturer has an official warehouse at that address. If you have any doubts, do not hesitate to contact the manufacturer directly.
Demand quality, ensure economical efficiency

- Long lamp life
- Low maintenance requirements
- Low power consumption
- Needs-appropriate light quality
- Environmentally sound
- Easy to maintain