How can Technology reduce Cost of Street Lighting?

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1. Introduction:

Street or Road Lighting has gone through a number of technological advances, which offer significant advantages for the operators of these installations. These improved technologies offer reduced capital costs as well as reduced energy and maintenance costs.

However many Local Authorities, who are the custodians of Public Lighting, are not yet embracing the opportunities these technologies offer and therefore are missing the opportunities an efficient Street Lighting installation offers.

This paper wishes to debate these technologies and summarises their economical impact for the operators.

2. The technologies available:

Over the past years significant improvements in technologies have emerged in the field of:

- Reflector designs
- Luminaire designs
- Lamp technologies
- Circuit control technologies or Telemanagement

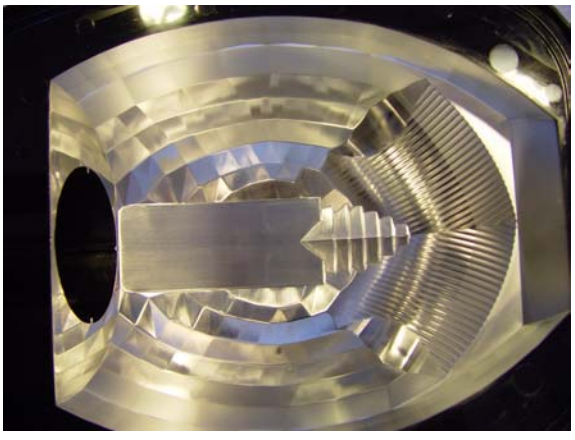
These technologies provide the Public Lighting Engineer with opportunities to operate more efficient public lighting systems. Since the Public Lighting is the visual manifestation of the local authorities' commitment to the wise spending of Public Funds, the Public Lighting Engineers are well advised to apply these cost advantages, which these techniques, offer to the benefit of their Councils.

2.1. Reflector designs within the luminaire

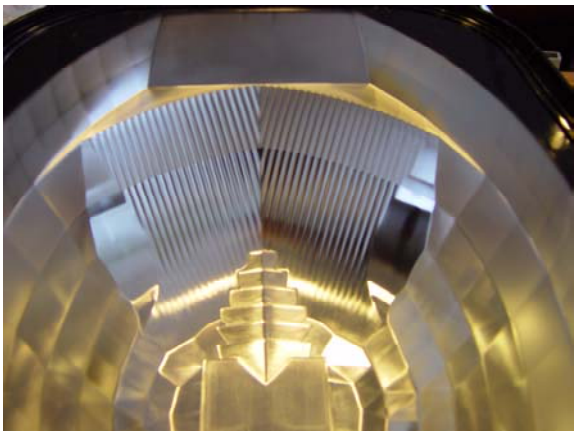
Since the reflector is the heart of the luminaire, it ultimately determines the efficiency of the installation. Modern reflector designs increase efficiencies up to 80 %, therefore increasing the spacing, or lighting levels.

The design of the reflector and the luminaire will determine:

- Whether the physical consistency of the reflector allows distortions under heat or deformations over time
- How well this reflector is protected from long-term dust and humidity ingress, as determined by the IP rating



of the lamp compartment. This is covered by the SABS document ARP 035, which recommends IP ratings of a minimum of IP65 and for coastal areas IP 66.



- The lifetime of its electrical components, as a result of their exposure to dust and dirt. Again, ARP 035 recommends IP ratings of the gear compartment to be not less than IP 65.
- How it survives the mechanical pounding on the pole structure, as caused by passing vehicles, amplified by means of whiplash action to the luminaire body and its components. Therefore aluminium housings for Group A type luminaires are required in terms of ARP 035. This also acts as a safety precaution against heavy luminaire components, such as ballasts, becoming detached in cases of accidents.

2.2. The Lamp

The new generation of High Pressure Sodium has advanced to an average of 132 Lumen/Watt.

It has also increased its lifetime to last in excess of 4 years in Public Lighting installations.

2.3. Circuit Controls

I refer to the available technology of the POWER SWITCH, which enables the reduction of the luminous flux of the lamp, with similar reductions in the electrical power used.

Typically, a 400W High Pressure Sodium lamp, if reduced to 45% of its lumen output, reduces its Power consumption by 46 %. This would enable the operators of the road lighting to reduce at a given time, or at a recorded traffic flow, the lighting levels, and hence the energy costs.

This technology shall be considered particularly for all Class A Road installations of 250W and higher.

3. The effect of the Capital and Energy cost

Reduced Capital and Energy costs result in the facts:

- Increased pole spacing reduces the number of poles and luminaires required per length of road, resulting in lower capital and energy costs.
- Fewer luminaires require less maintenance
- Fewer poles represent fewer obstacles on the road, hence reduced likelihood of damage.

Combined benefits for a A2, **Median Arrangement**, per km:

		Conventional	BEKASTRADA-Supra, with SUPER lamp and POWER SWITCH
Lamp lumen	lm	48,000	55,500
Cost per lighting hardware, inclusive pole and luminaire	R	6,878	9,460
Spacing	m	54	76
No of lighting units		18.5	13.1
Total Capital Cost	R	**127,240**	**123,934**
Total lamp replacement costs	R	2,839	897
Total energy costs	R	22,503	11,933
Total annual operating costs	R	**25,342**	**12,830**

Combined benefits for a A2, **Opposite Arrangement**, per km:

		Conventional	BEKASTRADA-Supra, with SUPER lamp and POWER SWITCH
Lamp lumen	lm	48,000	55,500
Cost per lighting hardware, inclusive pole and luminaire	R	10,806	13,407
Spacing	m	54	76
No of lighting units		18.5	13.1
Total Capital Cost	R	**199,913**	**175,640**
Total lamp replacement costs	R	2,839	897
Total energy costs	R	22,503	11,933
Total annual operating costs	R	**25,342**	**12,830**

4. Policy decisions:

Following from the above, I wish to recommend that Local Authorities take cognisance of these technologies in their Public Lighting Policies, since the following aspects should be reviewed:

- The differentiation between luminaires for:
  - New projects, where pole-spacing can be determined
  - Maintenance, where the benefits of reflector technologies are not necessarily resulting in cost savings.
- Luminaire procurement policies for new projects, by applying Scheme-Price tendering. *The use of the most cost-effective luminaire can be established by means of a Public Procurement process, which is establishing not the lowest cost per luminaire, but the lowest Scheme Price.*
- Lamp standards. – Change policy to only procure long-life lamps and high-output lamps, as available from all major brands,
- Power-switch technologies for all new Group A1, A2 and A3 installation.

5. Applicable standards

It has to be noted that since the 1st of August 2004, the Standard SANS 60598-2-3, has become a compulsory specification. This obliges every street light manufacturer to have their luminaires tested to this international safety standard, which prescribes a rather detailed set of tests. Part of this test procedure is the testing of the IP rating of the lamp and where applicable, the gear compartment. The result of this test shall be recorded on the label of the luminaire.

6. Conclusion

New lighting technologies available in South Africa, offer substantial advantages particularly for new road lighting installations. Policy and Decision makers are encouraged to embrace these technologies for the short and long-term benefit of the operators of these installations.