

Speaking up for SOX

While acknowledging its downsides, John Gorse of Philips Lighting offers a spirited defence of the much-reviled low pressure sodium lamp – and argues that there is life in the old SOX yet



The distinctive shape and colour of SOX in action – but it could be a day burner

With the ever increasing emphasis in all areas of society on reduction in CO₂ emissions and improving energy efficiency, it is natural that the tendency has been to look to ever new products and concepts to fulfil these demanding aims, across many industries.

As we all know, the lighting industry is at the forefront of improving energy efficiency and contributing to society's obligations to meet national and international CO₂ reduction targets. We are already working hard to provide ever more economically attractive and sustainable solutions. Indeed, as those working in commercial interiors, and who have studied the demands of Part L 2010, will attest, lighting is often the only way to achieve significant overall energy efficiency improvements. Arguably other building services, such as energy-hungry HVAC, are nearing their maximum efficiency potential, certainly within the confines of today's available technology – yet lighting can still offer ever greater savings.

Understandably, there is an enormous desire to accelerate the renovation of lighting, to encompass the undoubted efficiencies of LED systems and/ or high efficiency HID systems. With the debate about Energy Related Products Directive (ERP) and the phase outs under the Domestic Implementing Measures 1 and 2, plus the desire to introduce white light and CMS in public lighting, it is easy to overlook the continued contribution of one of the most efficient artificial light sources ever developed... low pressure sodium.

The lighting industry has always been committed to the development of more

efficient and effective light sources, control gear and optics. So it was back in December 1932, when Philips inaugurated the first public installation of low pressure sodium (LPS) lighting in the UK, with lamps made on Purley Way, Croydon. Far less efficient than SOX systems of today, the 1930s LPS lamps delivered around 50lm/W and were, for the time, truly ground-breaking in their efficiency. It would be another 15 years before its sister, low pressure mercury, in the form of the fluorescent lamp, could deliver similar efficiencies, but by then LPS had also moved onwards and upwards. For the record, LPS only became known as SOX (Sodium Extra) many years later.

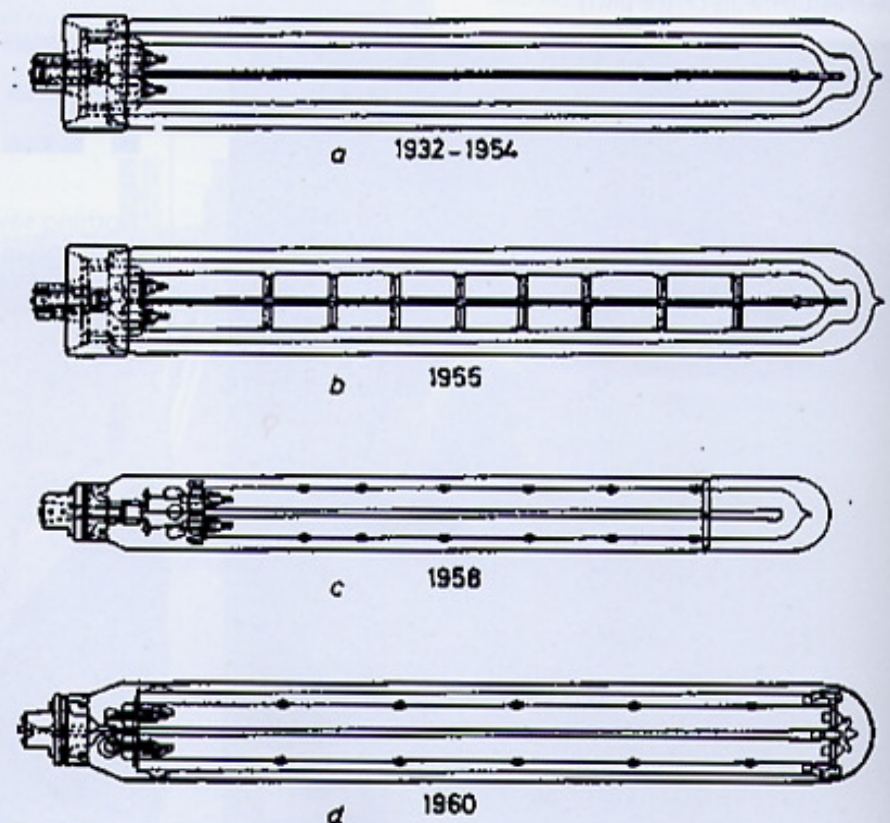
Primary UK Source

So, let's spare a thought for the humble SOX lamp – and its pros and cons – and acknowledge that this lamp was once Britain's primary outdoor light source. Surprisingly, perhaps, it still makes up around 45% of the installed lighting stock,

so we need to dispel some of the myths and misconceptions about SOX lighting and its future.

Unlike that initial 1930s 50lm/W package, today's SOX-E lamp can produce over 200lm/W, while a 180W lamp can deliver 32,000 lumens – almost the same as a 250W SON Plus, but for 70W less energy (nominal lamp). In addition, the familiar orange light produced is an almost pure monochromatic light, with a wavelength of 589nm, which is close to the peak sensitivity of the human eye (555nm). This adds to the lamp's effectiveness and also coincidentally provides excellent conditions for visual acuity, or overall speed of visual response.

This means that in night-time traffic conditions, sudden movements caused by pedestrians, overtaking vehicles or other road hazards, are more easily detected. Furthermore a much forgotten benefit of monochromatic light is that in rain, mist and fog conditions, there are no other parts of



Different SOX lamp designs from 1932 to 1960



The monochromatic colour of SOX is not highly popular

the spectrum which can be scattered by the prism-like water droplets, so illumination remains almost glare free. This is much more effective at 'cutting through' the difficult conditions and delivering light to the road surface. These positive values were never really absorbed into lighting standards, even at the peak of SOX's popularity, which meant that SOX installations were often overlit. A totally different approach has been adopted for white lighting, which has been subject to ongoing studies into true perception under white light, in order to optimise installations.

Although there is often criticism of the environmental impact of the orange glow which characterises the UK night-time sky, it should be remembered that scattering of light from SOX is less pronounced. As an article in this publication ('White Light: the Downsides', *Lighting Journal*, April 2011, p. 42) points out, the brightness of the sky glow produced by (some) artificial lighting can appear up to 15 times as bright compared to SOX. In California SOX lighting is welcomed by astronomers, as radio telescopes can be set to filter out the 589nm wavelengths, creating a virtual dark sky for unobstructed view.

Unpopular Orange

However, despite for all the benefits of orange light, its actual appearance is not popular with many users. Scientific research shows that people feel more secure and comfortable under whiter light sources. Research at FuDan University in Shanghai, in 2007, compared visual perception under 250W SON and 140W Philips MASTER Cosmo White lamps. Even though SON, with a much whiter light than SOX, was used, 92.3% of respondents felt the Cosmo lit road 'offered a better and more comfortable environment in general'.

It is known that the visually 'flattening effect' of monochromatic light does not enhance positive feelings of security, with even the emergency services favouring whiter light environments. For example, crime victims find it difficult to describe the colour of criminal's clothing under SOX – and firemen and medical staff can't distinguish blood from oil or other liquids at the scene of an accident.

One recent SOX myth that needs dispelling is a suggested end-of-life scenario which results in very high energy consumption – in one case it was suggested that a 55W system actually consumed 400W! This is fundamentally impossible. While lamp power can increase with life (a typical discharge lamp characteristic) it is only by a few watts and is best countered by a planned lamp maintenance programme. Under no circumstances do end-of-life consumption increases represent anything more than a small percentage of installed power.

Poor Lifetime Costs

While the previously mentioned high efficacies still make SOX an attractive proposition, in terms of energy use, the reality is that the lifetimes of SOX lamps don't figure so well when it comes to whole life costs of ownership. For example, SON (HPS) is now stretching to a six-year maintenance cycle, as opposed to three for SOX; and with high efficiency HID, such as Philips Cosmo, pushing the 150lm/W barrier, even the efficiency story is starting to be matched by white light sources. Add to this the rapid adoption of LED lighting, with its super-long maintenance cycles, rapidly improving efficiencies, colour variability, CMS and dimming control, plus other undeniable sustainability benefits, and there can be little doubt that SOX is past its hay-day.

However it would be very wrong to suggest that SOX won't be with us for much longer. Each year several thousand SOX lanterns are still sold in the UK. Although most, if not all, are for replacements and repairs, a conservative estimate of the total installed SOX lanterns in the UK is around 3m to 3.5m points.

Worldwide, SOX is still a significant contributor to public lighting in Belgium and Holland and for many years has been used for tunnel lighting in the Asia Pacific



The humble SOX lamp – bedrock of UK public lighting for years



SOX lamps on test in a Chinese laboratory

region, especially Korea and Japan. In fact, the emerging economies of Brazil, Russia, India and China (BRIC) have all turned to SOX for its energy-saving benefits. Despite the UK's continued widespread use of SOX, our domestic stock accounts for just one-third of the total worldwide SOX market.

Misleading Messages

With ERP legislation and the growth of new white light sources, the industry has seen some confusing, and not always accurate, messages about the future of SOX. However, to paraphrase Mark Twain, 'reports of SOX's death are greatly exaggerated'.

Firstly, it is important that forthcoming ERP directives on energy efficient lighting will not impact on SOX lamps, as its scope clearly places SOX outside the legislation. Similarly wire-wound SOX gear also falls outside the legislation, in that the ERP directive deals with HID systems – and strictly speaking SOX is not an HID system. It is often grouped with HID lamps but in reality it is a low pressure system, much more closely aligned with fluorescent technology than sources such as SON or metal halide. It worth noting that with ERP 2017 and HID systems, although many electromagnetic ballasts will need to be upgraded or removed from the market, the directive does not prescribe against electromagnetic ballasts *per se*.

With an existing worldwide estate of over 8.5 million pieces the market can rest assured that Philips will continue to commit to the manufacture of lamps and gear for SOX systems, as part of its portfolio of sustainable products, for many years to come. Upcoming legislation will not derail continued production and, despite technology changes, we see a robust and continuing market for SOX. Whether on electromagnetic circuits or electronic circuits, SOX remains one of the most energy-efficient light sources in existence, and will continue to be an important contributor to the UK public lighting estate well into the future.