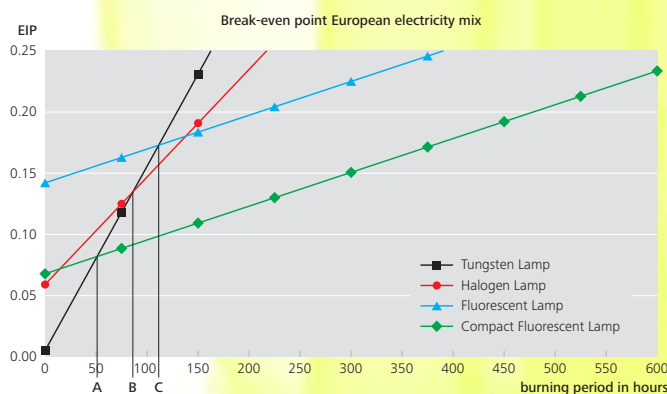


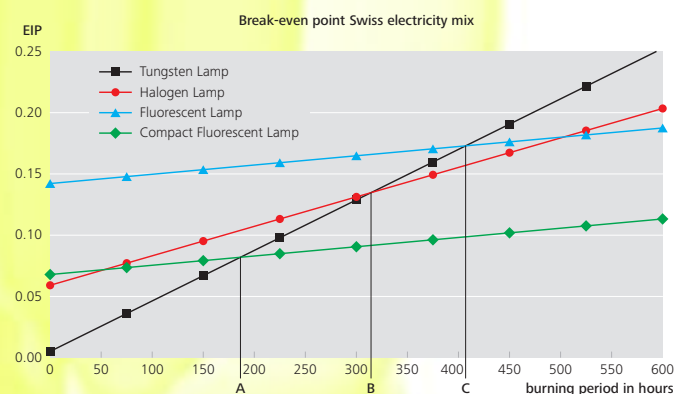
Energy-saving lamp wins

Empa researchers have investigated the eco-balance of various lighting technologies. They considered not only the lamps' own energy consumption using different electricity mixes, but also aspects related to their manufacture and disposal. The clear-cut result: the energy-saving lamp comes out ahead.

TEXT: Peter Merz / PHOTOS: SecretDisc, Wikipedia



In the first 50 operating hours (European electricity mix, left) to the first 180 operating hours (Swiss mix), the tungsten lamp is, ecologically seen, still superior to its competitors. However, as the lamps burn longer, the relationship quickly changes because of the tungsten lamp's high power consumption; then the compact fluorescent lamp produces the best results. (Illustrations: André Niederer)



Intersection A: Tungsten/Compact Fluorescent Lamp
Intersection B: Tungsten/Halogen Lamp
Intersection C: Tungsten/Fluorescent Lamp

Literature reference

“Environmental Impacts of Lighting Technologies – Life Cycle Assessment and Sensitivity Analysis”, T. Welz, R. Hischer, L. Hilty, Environmental Impact Assessment Review
www.elsevier.com/locate/eiar

Since 1 September 2009, sales and import of incandescent light bulbs, or more specifically tungsten lamps, have been banned in Switzerland. In addition, on the same day, the EU's prohibition on incandescent bulbs was adopted, a step-wise elimination of this inefficient method of lighting. This legislation, however, has met with resistance in many places. In particular, the compact fluorescent lamp, often referred to as the energy-saving lamp, has been the focus of much criticism. One of the opponents' main concerns is the mercury they contain.

Roland Hischer, Tobias Welz and Lorenz Hilty of Empa's Technology and Society Laboratory have made a detailed investigation of traditional tungsten lamps as well as halogen lamps, conventional fluorescent lamps and compact fluorescent lamps in order to find out which type of lighting is the most ecologically sound.

Many factors to consider

Using a life cycle assessment (LCA), also known as eco-balance, the researchers took into account the material and energy flow throughout the entire lifetimes of these devices, all the way from production, through use and then disposal. One way to express their total ecological burden is in the form of eco indicator points (EIPs). The number of points is a measure for the total damage to our health and environment as well as the consumption of resources necessary for the manufacture of a product.

The analysis showed that mercury is not at all a great burden on the environment. In fact, the power generation by a coal-fired power plant emits the same amount of mercury into the atmosphere in one hour as is contained in 8,400 to 9,000 compact fluorescent lamps.

A more important factor, on the other hand, is the electricity mix used to operate the lamps. A tungsten lamp lit by hydroelectric power has less environmental impact than does a compact fluorescent lamp which is lit up with the electricity mix prevalent in Europe. “By selecting electricity which is generated in an environmentally friendly way, we can achieve more on an ecological basis than by simply switching over to compact fluorescent lamps,” according to Hischer.

But compact fluorescent lamps do also have an ecological advantage in and by themselves. This is shown when determining the environmental break-even point, which is the time two different lamps must burn while having the same overall environmental impact. With the European electricity mix, which is generated to a large extent with fossil fuels, the tungsten lamp and compact fluorescent lamp reach their environmental break-even point quite quickly, after only about 50 hours. This is because of the tungsten lamp's considerably higher power consumption.

With electricity generated in Switzerland, this point is reached after 187 hours. Given an average operating lifetime for a compact fluorescent lamp of 10,000 hours (compared to 1,000 hours for a tungsten lamp), the purchase of these lamps thus pays off rather quickly from an ecological standpoint. //