



CA502 | Solutions for energy efficient lighting [SEEL]

PROJECT CONTRIBUTES TO

Communication	
Automotive and transport	✓
Health and aging society	
Safety and security	
Energy efficiency	✓
Digital lifestyle	
Design technology	
Sensors and actuators	✓
Process development	
Manufacturing science	
More than Moore	✓
More Moore	
Technology node	

ENERGY-EFFICIENT DEVICES AND ENERGY CONTROL SYSTEMS

Partners:

Audi
 B+W
 BAG
 BESI
 BIC
 BJB
 Bochum Uni
 CEA-LETI
 DCD
 Elmos
 Infineon
 IZM
 Modular
 NXP (DE)
 NXP (NL)
 Osram
 Philips Automotive Lighting (DE)
 Philips Lighting (NL)
 Philips PL (FR)
 Philips Research labs Eindhoven
 Philips Turnhout
 TU Delft
 TU/e
 ULIS
 Valeo
 VITO

Project leader:

René de Zwart
 Philips Lighting

Key project dates:

Start: November 2010
 End: October 2013

Countries involved:

Belgium
 France
 Germany
 The Netherlands



The SEEL project is developing energy-efficient and dynamic lighting systems based on high intensity discharge lamps and solid state lighting for general and automotive lighting and specifically for the professional market. The project is focusing on the availability of smart and energy-efficient electronics which are seen as the key enabler to obtain the performance improvement desired. Use of intelligent driving schemes and integration of components will enable miniaturisation at low cost. Standardisation will play a key role to enable high volume applications. SEEL will enable cost reductions for light sources as well as securing a leading position for the European lighting industry.

While offering good light quality, incandescent lamps are inefficient with very short lifetimes. Halogen lamps are a more recent variant of the incandescent lamp, offering enhanced light output and double the lifetime with efficacies of 10 to 25 lumen/W. Tubular fluorescent and high intensity discharge (HID) lamps demonstrate efficacies up to 100 lumen/W. Emerging solid state lighting (SSL) sources have values in the range of 30 to 60 lumen/W but higher efficacies are in reach.

A phase-out timetable has been agreed by European governments to remove all incandescent light bulbs and low-efficiency halogen bulbs from the market by 2012 at the latest. The restrictions were introduced under the energy-using products (EuP) directive and began to take effect in 2009.

EU regulations target lamps with minimal energy efficiency and functionality. In the near future, all bulbs will have to be at least C-class efficiency under the EU energy labelling system. This will exclude traditional incandescent technology and less efficient types of halogen bulbs. Halogen clear lamps reaching class C can remain on the market until 2016; after 2016, only class B and class A can be sold.

Higher efficiency lighting

Lighting companies are continuously seeking to improve the energy efficiency of lamps and looking

for viable alternatives to fulfil current and forthcoming legislation. As a result of the EuP directive, Europe will see a shift toward the use of higher-efficiency bulbs in the short run and to light-emitting diode (LED) lamps once they are a viable alternative. Technologies now under development for HID lamps and SSL sources will boost system efficacy typically by a factor of five. This offers tremendous energy reductions and consequential cuts in CO₂ emissions.

However, existing HID- and SSL-based lighting systems still do not match the operational performance of the halogen systems now used in general lighting and automotive applications. Halogen lamps offer excellent light quality, easy and deep dimming, instant-on light, small system size and low initial cost. High-efficiency systems in development lack some of these characteristics which are essential for future penetration in the general lighting and automotive segments.

The goal of the CATRENE CA502 SEEL project is to develop energy-efficient and dynamic lighting systems based on HID and SSL for general and automotive lighting, particularly for the professional market. SEEL is addressing the challenge of energy-efficient lighting at a systems level. To achieve improved performance here, breakthroughs are required in lamps, drivers and optical, mechanical, control and luminaire – or light fitting – aspects. A strong consortium is

involved to make the desired leap forward in technical expertise.

Smart electronics required

SEEL is focusing on smart and energy-efficient electronics – seen as the key enabler to obtain the desired performance improvements. Development of such energy-efficient electronic systems will enable marked improvements in performance for both HID and SSL systems which are well suited as next generation light sources.

The CATRENE project will use intelligent driving schemes with increased integration of components to obtain miniaturisation at low cost. Chosen application areas for demonstrators are spot lights in retail and hospitality segments and front-end automotive lighting.

To achieve SEEL's goals, European specialists in lighting, automotive, electronics, controls and semiconductors have teamed up with application partners. In this way, the CATRENE project will contribute to reduction of CO₂ emission, strengthening the position of Europe as a worldwide knowledge centre and boosting its competitive position in the world.

High volume production

SEEL will develop appropriate lighting systems with high energy savings, without sacrificing the well-accepted properties of halogen lighting and allowing for high volumes and widespread applications. Energy savings will further be increased by applying intelligent lighting control systems. Standardisation will enable high volume applications. It will also enable cost reduction for the light sources as well as securing a leading position for the European lighting industry now and in the future.

By embedding intelligence in the electronic driver, lamp performance can be increased and the total system can be further miniaturised – a lower component count leads to reduced driver size and cost. Both HID and SSL technologies can use a common digital power driver platform, creating R&D synergies in the software as well as in the supply chain for the power electronics/microcontroller hardware.

However, the operating temperature of the lighting systems will require development of high temperature resistant electronics and controls. Major efforts will focus on optimisation of drivers and controls.

Use of a common platform and the same control interfacing building blocks will also ease interoperability for hybrid lighting systems consisting of both HID and SSL light sources – for example in the same shop. Given the high price of LEDs currently, many lighting applications will no doubt leverage hybrid systems for the foreseeable future, with HID lamps used for high light-output luminaries and SSL for highly controllable, miniaturised spot lights.

Large energy savings

Replacement of incandescent and halogen lamps by energy-efficient light sources will result in large energy savings. SEEL will provide alternative light sources with a high efficiency, thereby supporting the process of energy consumption reduction. With current annual sales of 1 billion halogen lamps with an average lifetime of 2,000 hours and 30 W power rating on average per lamp, 60 billion kWh is consumed each year. Modern light systems will save up to 45 billion kWh globally. Intelligent control of the new light solutions will improve this figure even more.

Adoption of highly efficient lighting in cars is directly driven by the reduction of pollution. Governments have defined legal requirements to cut CO₂ emission of cars to reduce pollution. Carmakers are still struggling with the last tens of grams of CO₂/km. The lighting in cars contributes approximately 5 g/km; more efficient lighting can reduce this to 2 to 2.5 g/km. This reduction is significant for the automotive industry to meet its CO₂ emission target.



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CATRENE (Σ! 4140), the EUREKA Cluster for Application and Technology Research in Europe on NanoElectronics, will bring about technological leadership for a competitive European information and communications technology industry.

CATRENE focuses on delivering nano-/microelectronic solutions that respond to the needs of society at large, improving the economic prosperity of Europe and reinforcing the ability of its industry to be at the forefront of the global competition.

