Report on the
11th European Lighting Conference - LUX Europa 2009
Istanbul, September 9-11, 2009

The Conference was attended by more than 300 experts in field of lighting applications. The main theme was: "Lighting and the Environment". Subjects covered during the conference were:

- Energy Efficiency
- Lighting Quality
- Adaptive Lighting
- Sustainable Lighting
- Lighting and Environment
- Standards of Lighting
- Measurements
- Lighting in Architecture
- Health and Lighting

In the session regarding “Energy Efficiency”, interesting papers on the new emerging lighting technologies and on the comparison between discharge lamps and new light-emitting devices were presented:

- “Energy efficient electric lighting”, by Wilfried Pohl of Bartenbach LichtLabor (Austria) (contact: wilfried.pohl@bartenbach.com): the author explained that the gap between conventional light sources and LEDs is decreasing, but at the moment it is still too large for “economical” lighting. However LEDs are beginning to be an alternative to GLS bulbs and tungsten halogen lamps having a low efficacy (<20 lm/W).

- The trend for the development of electric lighting consumption from 2005 to 2030 was presented (Fig.1), according to data of the “Guidebook on energy efficient electric lighting, IEA, Annex 45, 2009. From now until 2015, energy consumption reduction will be due mainly to phasing out of inefficient GLS bulbs and to increased shares of High Intensity Discharge lamps.

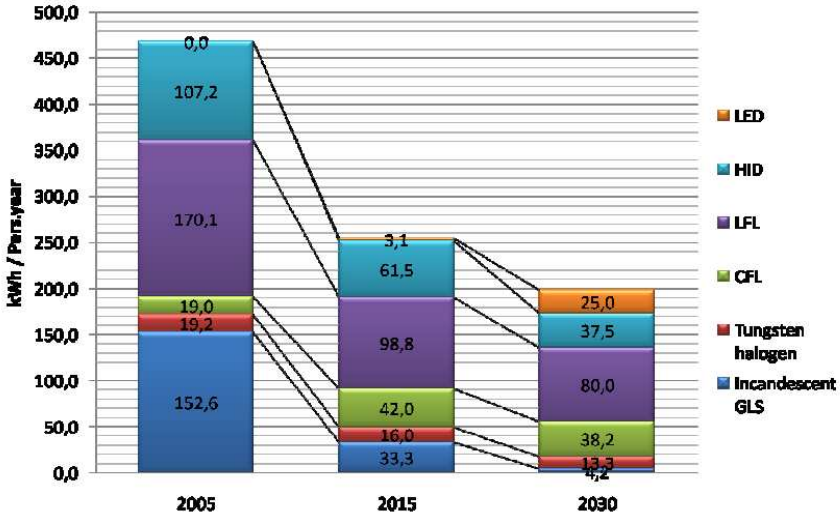

Fig.1: evolution of electric energy consumption and light sources

- (HID) and fluorescent bulbs (LinearFL and CompactFL) with improved luminous efficacy. The contribution of solid-state lighting to reduction in energy consumption will be limited in the next few years. By 2030 a reduction of the energy consumption may occur thanks to significant deployment of LEDs, and to increased light yield of HID and fluorescent lamps, in addition to the replacement of obsolete technology.

- "LED-street lighting: technological, energy, lighting aspects", Thomas Kuhn et al. (DE) (contact: kuhn@lichttechnik.tu-darmstadt.de). In this work a comparison of the performance and costs of conventional discharge lamps is provided (table 1). In addition comparative results of real tests on the roadway obtained with old technology high-pressure mercury lamps. New technology high-pressure sodium lamps and high-performance LEDs are discussed (table 2). In road lighting applications, the best in class LED luminaries can achieve good performance, even if costs are not yet competitive.

Name	Luminous flux [lm]	Power [W]	Luminous efficacy [lm/W]	Lifetime [h]	Colour rendering index [Ra]	Costs per lamp [€]	Costs per [1000 lm]
Sodium low pressure lamp	8100 13500 22500	55 90 135	147 155 167	18000 18000 18000	< 20	45,00 65,00 110,00	6,00 5,20 4,50
Sodium high pressure lamp	4000 6500 10000 17000 27000	50 70 100 150 250	80 93 100 113 108	12000 12000 18000 18000 18000	25	12,00 12,00 9,00 9,00 10,00	9,40 7,10 5,70 4,70 4,60
Fluorescent lamp	2500 4000	40 65	63 62	10000 10000	70	6,00 7,00	12,41 10,60
Compact fluorescent lamp	900 1800 2900	11 18 36	82 67 81	8000 bei KVG 8000 bei KVG 10000 bei EVG 8000 bei KVG 10000 bei EVG	70-82	5,00 7,00 7,50	20,83 19,20 15,60 11,30 9,40
Mercury high pressure	2000 3800 6200 14000	50 80 125 250	40 48 50 56	8000 8000 8000 10000	60	4,00 4,00 5,00 9,00	18,20 12,20 10,90 8,51
Halogen-metal discharge lamp	3400 5900 13000 19000	35 70 150 250	97 84 87 76	6000 10000 10000 20000	≥ 80	40,00 42,00 50,00 90,00	17,60 10,40 7,50 7,15

Table 1: comparison of performances and costs of discharge lamps

Nr.	Luminary	Lamp	Luminous flux [lm]	System Power [W]	System Efficacy [lm/W]
1	Original old luminaire "Koffer" from AEG for the test street	Original old high pressure mercury lamp (80W)	1290	93,0	13,9
2	Original old luminaire (cleaned)	New high pressure mercury lamp (125 W)	4040	145,7	27,7
3	Original old luminaire (cleaned)	New sodium high pressure lamp (68 W)	3520	84	41,9
4	New luminaire "SR50" electric ballast	New high pressure sodium lamp "HST" (70 W)	0 to 3520	0 to 79,3	69,6
5	LED luminaire (best in 2008)	LED	0 to 5700	0 to 121	48

Table 2: performances of luminaire configurations with different light sources

- "Effects of lighting performances from cooling for power LED" Ismail Kiyak et al. (TR) (contact: imkiyak@marmara.edu.tr): the authors studied the effects of the temperature on LEDs without heat sink, on LEDs with passive heat sink and on LEDs with active heat sink: the increase of temperature negatively affects both performances (light output) and lifetime of Power LEDs.

- "Organic Light Emitting devices – OLEDs for displays and general lighting", Roland Heinz (DE) (contact: roland.heinz@philips.com): organic semiconductors offer advantages with respect to conventional III-V semiconductors, in particular advantages related to higher flexibility in device design. Today small OLED displays are entering in the market, but larger OLED displays still cannot be produced at competitive prices. Major problems are the costly encapsulation of OLEDs, process reliability for the fabrication of large surfaces and pixel powering by high-current thin-film transistors. OLEDs can find interesting applications in the lighting field because they are capable of large lambertian radiation without additional optics or reflectors (necessary in LEDs). Characteristics of OLEDs under development for lighting are compared with those of high performance LEDs in Fig.2. Lifetime and luminous efficacy need further improvement to be competitive.

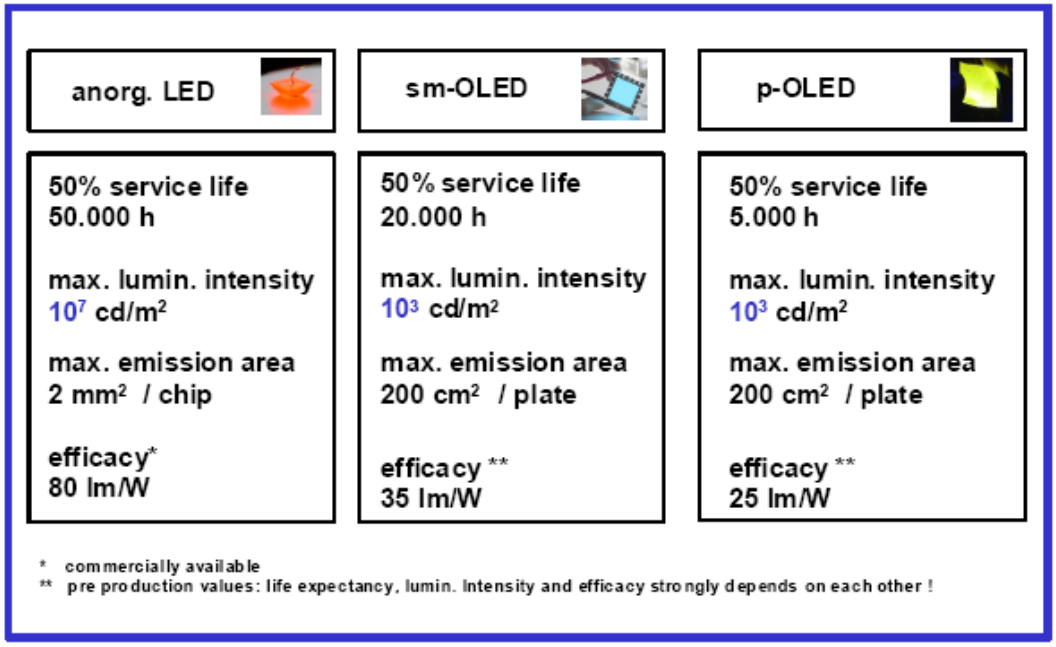

Fig.2: comparison of performances of "best in class" LEDs and small-molecules-OLED s and p-OLEDs

Concerning “energy efficiency”, many other interesting papers and posters were presented. Most of them were focused on the need of:

- efficient lighting concepts (high quality lamps and luminaries, bright surfaces)
- proper control systems (on/off occupancy sensors, daylight sensors)
- good maintenance of lighting systems
- intelligent architecture and façade construction (use of daylight).

In the sessions of “Sustainable Lighting” and “Lighting and Environment”, the importance of reducing the global impact of light sources on the environment was emphasized.

- Adaptive, energy-optimized techniques for the lighting of working areas, street lighting, industry and home applications (“Innovative and sustainable lighting” Heinrich Kaase et al. – DE - kaase@ee.tu-berlin.de)
- Development and optimization of more efficient Hg-free lamps that at the moment have a luminous efficacy too low with respect to mercury lamps (“Approach to environment-friendly mercury-free HID lamps” S. Franke et al. – DE - steffen.franke@inp-greifswad.de)
- Development and use of alternatives to hazardous materials in discharge lamps and reduction of mercury content in the efficient low pressure mercury lamps (“New environmental friendly getter alloy for discharge lamps” A. Corazza et al., “High accuracy mercury dispensers for linear, compact and circular fluorescent lamps” A. Corazza et al. – IT – alessio_corazza@saes-group.com).

In the session on “Lighting Quality” many papers addressed the issue of the impact of light on the environment and on people. Concerning this second aspect, several papers focused on the quality of the light in terms of colour rendering, colour temperature and emission spectra from light sources. Colour rendering index (CRI) of LEDs is not optimal, but it is improving:

- “Colour rendering of new white LED light sources” S. Brueckner et al. – DE - brueckner@lichttechnik.tu-darmstadt.de ,
- “On the LED colour rendering evaluation” N. Bo, P. Iacomussi et al. – It – p.iacomussi@inrim.it .

During the session on the topic “Adaptive Lighting”, authors presented strategies for intelligent lighting, in particular using automatic control systems.

- “Intelligent use of energetically optimized buildings with energy efficient, intelligent dimmable Electronic Control Gears and Bus-systems”, R. Weitzel – DE – (r.weitzel@osram.de)
- “Strategies for wireless lighting control systems” A. Rosemann, C. Suvagau – CA- (cristian.suvagau@bchydro.com)
- “Road lighting automation strategies” S. Onaygil – TR – (onaygil@itu.edu.tr)
- “Interactive lighting design using coded light” D. Sekulovski et al. – NL- (dragan.sekulovski@philips.com”).

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