Some Elements of a Harmonized Test Methodology

My Ton

APEC LED Workshop

Policies to Protect and Educate Consumers

Asia-Pacific Economic Cooperation

Australian Government

Department of Climate Change and Energy Efficiency

Presentation Overview

- *Short overview of objectives, key issues relating to methodology, round robin testing, and accreditation*

- Methodology Issues:
  - Challenges of applying existing test methodologies and characteristics to LEDs
  - Challenges of testing LEDs
- Round-robin testing
- Accreditation
- The way forward

Lighting testing: objectives

- *Testing is needed in order to perform general comparison of lighting products.*
- *Traditionally, measured lamps and luminaires characteristics include:*
  - Luminous flux
  - Life
  - CRI
  - CCT
  - Lumen depreciation
  - Distribution

- *Some key parameters for ascertaining energy efficiency of lighting products are total flux and luminous efficacy*

Challenges of testing leds

- *The arrival of LEDs presents the industry (and governments) with great opportunities, but also significant challenges for those responsible for setting lighting standards and measuring lighting performance.*

- *Challenges in applying traditional metrics to LEDs include:*

  - **Energy efficiency**: LEDs are directional as compared to conventional sources (GLS), which are omnidirectional.
  - **Rated life**: LEDs have the potential to last 10x longer or more as compared to conventional sources.
  - **Useful life**: LEDs have different failure modes.

Challenges of testing leds

- *The arrival of LEDs presents the industry (and governments) with great opportunities, but also significant challenges for those responsible for setting lighting standards and measuring lighting performance.*

- *New measurement challenges include:*
  - **Heat effects**: LEDs light output decrease with junction temperature
  - **Performance degradation**: LEDs package and driver electronics also need to be tested
  - **Color Preference**: CRI and even CCT are not adequate to describe LEDs light quality.
  - **Intensity distribution**: LEDs sources are directional, not point sources.
  - **Color shift**: LEDs can change color over time.

LEDs-specific testing Methodology

- *It has taken the lighting industry some time to understand how to develop a set of metrics to properly represent the nuances of this light source in architectural lighting applications. Efforts are still on-going*
- *A number of IES (North America) test methods have been developed*:
  - **LM-79-08**: "IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products,"
  - **LM-80-08**: "Approved Method for Measuring Lumen Maintenance of LED Light Sources,"
  - **TM-21**: "Lumen Depreciation Lifetime Estimation Method for LED Light Sources."
  - Others are under development by IES, ANSI, NIST, etc.

LEDs-specific testing Methodology

- *It has taken the lighting industry some time to understand how to develop a set of metrics to properly represent the nuances of this light source in architectural lighting applications. Efforts are on-going.*

- *The IEC recently published two Public Available Specification (PAS) performance requirement documents.*

  - **IEC/PAS 62717:** Performance requirements – LED modules for general lighting.
  - **IEC/PAS 62722:** Performance requirements – LED luminaires for general lighting.
  - Others are also under development. CIE is also developing a number of light-related standards.

Testing Methodology for lamps

- *For LEDs GLS replacement, other metrics are also needed, as well as test methodologies for them.*

- *For direct comparison of GLS performance:*
  - **Luminous intensity distribution**. Spatial distribution of the luminous flux graphically depicted in a luminous intensity distribution curve.
  - **Rated chromaticity coordinate**: The measured initial and maintained chromaticity coordinates of a LED module.

LED Test methods: Steps to harmonization

- *Test methods have different levels of accuracy and precision and costs. Developed and accepted methods should seek to balance the needs of:*
  - Manufacturers
  - Designers and consumers
  - Governments (benchmarking, compliance)

- *Since test procedures are the technical foundations of standards, their alignment is necessary in order to harmonize other elements, such as efficiency levels. This challenge is best approached as a regional, not national issue.*

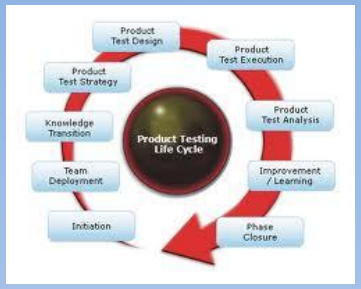
Remaining test methodology challenges

- *Challenges remain in how each published method addresses some outstanding issues:*

- *A complex example: luminous flux over time:*
  - **IEC**: A general method of projecting measurement data beyond limited test time is under consideration.
  - **IES**: Method for extrapolation based on LM-80 test data will be described in IES TM-21.

- *A simple example: sample size:*
  - 10, 20, or 30 test samples?

round robin: objectives

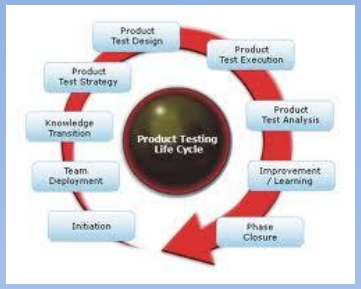


The main reason for performing a Round Robin test is to verify a test method or laboratory performance:

- **Verification of a new method**: If a method of analysis has been developed, a Round Robin test involving proven methods would verify whether the new method produces results that agree with the established method.

- **Inter-laboratory verification**: to determine the performance of individual laboratories for specific test and to monitor laboratories' continuing performance. In this specific case, all participants actually evaluating or testing the exact same test object.

Regional round robin needed for leds methods



- *Why round-robin tests are needed with LEDs:*
  - A number of LEDs test methods are newly developed.
  - Laboratories participating in Round Robin tests receive valuable information about the technical capability of their laboratories.
  - Results and conclusions can be used to diagnose and address deviating results if present.
  - The performance of a laboratory participating in the Round Robin test may be taken into account with confidence.
  - Laboratories have the chance to upgrade their performance by learning from other laboratories and refine their protocols.

Accreditation: Objectives

- *Accreditation defines a laboratory's scope in terms of p aspects of performance it is qualified to test against.*

- *Laboratories can be classified into broad types based on their level of accreditation:*
  - Unaccredited
  - National accreditation
  - Regional/International accreditation

Example of international Accreditation and requirements

- *Regional/International accreditation indicate testing facilities that are able to test products against national and international standards. It also means that the laboratory may have the ability to certify the quality of products for registration at an international level.*
- International accreditation will normally require that the national accreditation body awarding the accreditation has been accredited to the international standard, ISO/IEC 17011:2005.
- This indicates that the individual accreditation bodies can provide a comparable accreditation service and can recognise each other's accreditations.
- *ISO/IEC 17025 is a recognition of demonstrated testing competence.*

Mutual recognition agreements on Accreditation

- *ILAC (International Laboratory Accreditation Cooperation) is an organization that aims to develop a global network of accredited testing, calibration and inspection facilities that can be relied on to provide accurate data.*

- *These mutual recognition agreements should lead to the mutual acceptance of test results across the regions, and include:*

- European Co-operation for Accreditation (EA)
- Asia Pacific Laboratory Accreditation Cooperation (APLAC)
- Southern African Development Community Accreditation (SADCA)
- Inter-American Accreditation Cooperation (IAAC)

CONCLUSIONS AND RECOMMENDATIONS

Establishing reliable laboratory capacity from the ground up is very expensive and time consuming:

- Set up time and cost
- Time and cost needed to build up a test history and experience.
- Time and cost needed to obtain accreditation at the local, national, or international level.

CONCLUSIONS AND RECOMMENDATIONS

A number of considerations need to be taken into account when developing testing capacity, especially if these capacities do not previously exist:

- The anticipated frequency and volume of testing required (to support MEPS, labeling, or check testing)
- The level of testing required (national, regional, or international standards)

It is important to note that developing testing capacity for one type of lighting product, such as CFLs, may not help ease the shift to another type of lighting product such as LEDs.

Conclusions and recommendations

Considerations should be given to:

- The adoption of an existing internationally acceptable testing protocol for measuring the performance criteria for energy efficient lighting
- Regional or cross-border harmonization or agreements for mutual acceptance of results.
- Provide input to the international process of developing a systematic approach to international testing.
- Ways to coordinate and share data and experience regionally or internationally

Conclusions and recommendations

- *Considerations should be given to:*

  - A regional network of laboratories can reduce non-compliance & increase consumer confidence.
  - Sharing of capacities is easier with accredited laboratories.
  - Accredited laboratories also facilitate the mutual recognition of test results.
  - A regional network of laboratories reduces non-compliance & increases consumer confidence.

THANK YOU

PAPER FROM:

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