

WS 1: Understanding HVAC Operational Performance (SWEGON)

Monday, May 23, 10.30-12.00 (Meeting room: Bondestuen)

Workshop organiser

SWEGON AB
Cardiff University

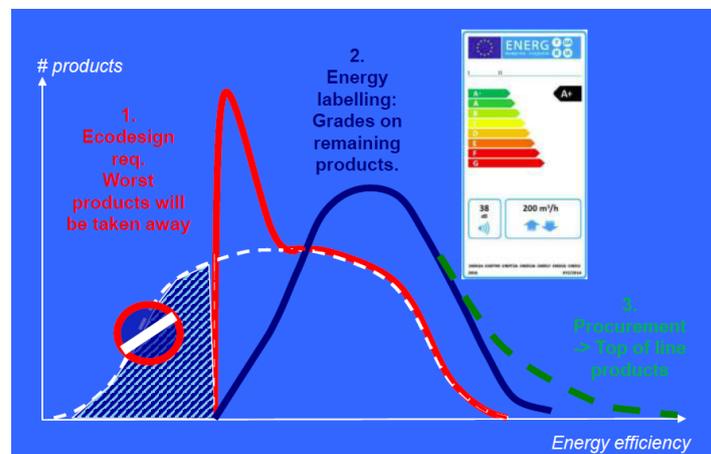
www.swegon.com, www.swegonairacademy.com
www.cardiff.ac.uk, www.k2nenergy.com, www.iservcmb.info

Presenters

Petra Vladykova Bednarova, Swegon AB and Swegon Air Academy
John Woollett, Swegon AB and CEJN
Ian Knight, Cardiff University and K2n Ltd

Introduction and background

The impending requirements for nearly Zero-Energy Buildings (nZEB) needs the efficient consumption of energy by services. This presents requirements for data to support understanding of how to achieve this in practice. This participatory workshop explored the potential for informative and practical guidelines for the operation of buildings and input for the building regulations. It has been discussed what information and data are needed, how they should be provided, and how they might be applied with regards to updating of a number of standards in this area. Data from operational performance of HVAC systems and components (results from the project iSERVcmb) needs to provide information about what can be achieved in the building's operation. In the workshop the focus was on operational data from HVAC systems/components, what can be found from the data at the operational level in contrast to legislative needs, and what opportunities exist to improve the operational performance of HVAC equipment/systems. The discussion topics were focused on: Standards and legislation (LOT 6, EPBD, EN/CEN); Operational performance - real data (IAQ, power and energy use); Operational level versus legislative needs; and Opportunities in the operational performance of HVAC systems/components.



Summary of the presentations

Since 2002, EU Directives (in particular the Energy Performance in Buildings Directive) have been gradually changing to try to reduce energy use to the point where all new buildings must be nZEB after December 2020 (while for public buildings the deadline is set for 31 December 2018). These have led to strict requirements on building properties, building services and improvements in existing buildings. In reality, many of these 'improvements' exist mainly on paper, not in practice. To achieve energy efficiency in practice we must use operational/monitored data as well as calculated/designed values. The presenters pointed out that there is a need for legislation based on operational data as a route to compliance, where operational data helps achieve the objectives by creating a framework to interpret and distinguish the actual impacts of differing products,

activities, services and techniques. Achieving energy efficiency as required by EPBD needs to be based on real data. In addition, it is necessary to propose a physically-based framework to allow comparisons to be made. Finally, the workshop explained what operational data is and how to use these data in HVAC operations. An example of implementation of operational data showed the interaction of physical assets and metered use.

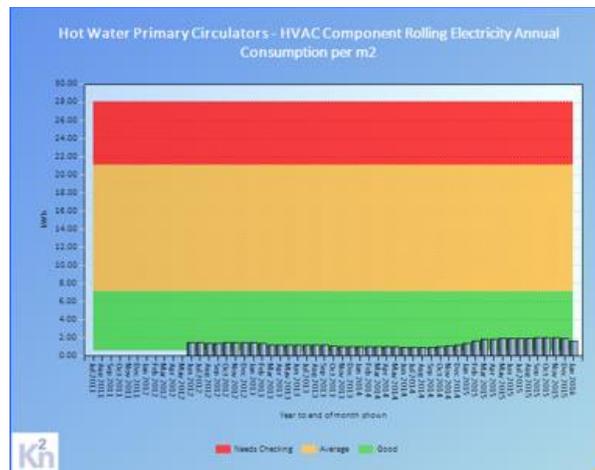


Figure 2: Implementation of operational data

Discussion and main results

The bar has been set high for the energy performance of both new and renovated buildings, so the conditions need to be right to achieve a healthy, accountable building stock across Europe. In fact, we face challenges regarding compliance and quality of the works. There is a lot operational data now collected and they need to be available and used to evaluate the energy performance of buildings in conjunction with the requirements/needs for healthy buildings and physical inspection. The workshop discussions covered the following issues:

Legislation:

- In Denmark, the commissioning procedure is used to control compliance and follow up after the building is occupied. Commissioning a building's HVAC system is not a must, but a customer care and business opportunity.
- Inspections and audits are performed to different levels in different countries, for example low-cost/low results in some Member States (MS), more costly and thorough in others (for example in Germany). There is often no practical value in inspections. In most MS, a certified "expert" performs inspections which showcase a positive impact from EPBD. Yet all very much depends on the quality level and the certified "expert".
- EU Ecodesign Regulation Lot 6 about air handling units provides some guidance in building regulations, and puts good demands on manufacturers and installers. Yet, in some countries not all required regulations are thought through. For example, in Portugal it is now mandatory to have an air handling unit with heat recovery but the potential for recovered energy is too small in this climate, leading to an increased overall energy use in overcoming the heat exchanger pressure drop.
- It is desirable to have energy-efficient, certified and high-quality products in Europe.
- Individual components have a performance grading in European regulations, but not the whole system in which they sit. This is a major problem, as often the overall system does not perform well.
- Energy performance compliance does not mean that the buildings are performing in real world as stated on a paper certificate.

The existing framework for use of data was also discussed:

- With today's easy accessibility of monitoring data, we need to use the collected operational data in a smart way and go back to the legislators to show them that the buildings are in compliance with the spirit of the regulations, and can provide the required performance.
- A problem was discussed in distinguishing energy data for HVAC, lighting against the actual number of occupants (versus design load calculations) in the building. Occupancy could be recorded by sensors.

The debate also involved compliance aspects:

- There is a clear need for a framework to use operational data to achieve compliance. And there is a need for benchmarking the building systems and components based on usage and activities.
- Actual energy consumption of a building can vary dramatically from designed values. It is necessary to understand how buildings are really performing (documented by actual operational data) and where and when the energy is being used in order to understand the saving. Each building is unique and needs its own data collection system.
- Additional revenue for manufacturers and installers could be generated, based on required building certification including follow-up and maintenance services.
- Extensive metering is already available, but the loop with data about occupants needs to be closed
- Using power demand benchmarks to help remove the time factor from assessments

The next step is to provide operational data based on benchmarks that MS legislators can refer to, which triggers additional questions:

- How to use the operational data in order to avoid inspections and instead prove energy performance based on building regulations?
- How will this impact the design and operation of new and existing buildings, and building services?
- How to find a reasonable way to assess the data in simple way and establish how to achieve compliance with building regulations?
- Can this provide a competitive advantage that manufacturers and installers can exploit?

Conclusion and future work directions in the field

The workshop was attended by total of 40 attendees (mainly from Europe) and it was a good mix of practitioners (engineers, designers), manufacturers (mainly HVAC and BEMS) and people from educational institutions (universities). The concept of the workshop was to discuss several points which the presenters have considered to be of importance, such as data at operational level versus legislative needs and the use of monitoring data in future legislation. It is clear that operationally low energy services are a key element for achieving lower energy use in buildings. Already we are seeing a move to building procurement with guaranteed operational performance in the contract. This potentially means choosing the best kit in the future for both new build and refurbished building stock.

Acknowledgement

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