

Global test procedures to support energy efficiency: obstacles and opportunities

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Energy Efficient Strategies

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Background

- Previous presentations have defined the concept of energy efficiency (output over input)
- We have also learned about the importance of test procedures and why global harmonisation is desirable
- Common efficiency metrics would support the development of better energy policy



Overview of this presentation

- Looks at IEC and ISO committees and examines issues which can work against the formation of global test procedures in the IEC and ISO
- Provides an overview of prospects for global harmonisation of test procedures at a product level
- Identifies opportunities for improvement in these processes



What does being global mean?

- **International standards must be developed with a global perspective in mind - this means the ability to adequately (and accurately) deal with regional and climatic issues**
- **This is particularly difficult and important for those products for climate control (heating cooling) or refrigeration and to some extent water heating or other weather/climate affected products.**

How can test procedures fail to be global in nature?



- Test procedures are seen as a low priority and appear to be of little interest to many organisations, even multi-nationals
- Even if multi-nationals have strong corporate objectives for global harmonisation of testing, this is rarely communicated adequately to relevant committee participants
- Standards committees are entirely responsible for the development of test procedure in a way that their members see as relevant - there is little vision or guidance of committees from a higher level

How can test procedures fail to be global in nature?



- There is currently little policy framework to guide committees in energy efficiency matters and few checks and balances to ensure that new international test procedures are global
- Membership of committees is as best random (whoever puts up their hand) but can be more sinister in terms of participating to protect a corporate position or slow the development of test procedures to frustrate government
- There can be commercial links between committee members which can unbalance decisions and support vested interests

How can test procedures fail to be global in nature?



- Committees can be dominated by individuals with strong views and forceful personalities
- Most committee members are there in a “voluntary” capacity and most undertake committee work as a second or third priority task (they still have to do their day job)
- Another problem is that many committee members hold low level positions in the organisations that nominate them and they are inclined to approach the issue of test procedures on the basis of their own (sometimes limited) experience

How can test procedures fail to be global in nature?



- The main clients/users of test procedures in terms of efficiency regulations is government, yet ironically governments rarely resource input into test procedures
- If governments do not communicate their needs and desires of test procedures, committees cannot be expected to develop test procedures that suit their needs
- The corollary is that governments cannot be expected to use test procedures that are unsuitable for regulatory purposes



Preliminary product assessment

- Provides an initial impression of major energy using products
- Major questions that have to be asked for each product are:
 - Is the test method global?
 - Is an efficiency metric likely to be possible?
 - What is the level of existing regulation - how much baggage or inertia would we have to overcome to achieve a global metric?
 - What are the prospects global metrics?



Electric motors

- **Test method: IEC and NEMA (IEEE) now aligned (direct measurement stray losses), but old IEC still widely used, JIS still around (no stray loss)**
- **Efficiency metric: Efficiency vs shaft power over a wide output range widely agreed (curve)**
- **Regulatory regimes: Wide range of different mandatory and voluntary programs in place, range of test methods (old IEC, JIS, new IEC with various options)**
- **Reasonable prospects, work under way to define agreed metrics**



Lighting

- **Test method:** Wide use of IEC, mostly OK, but complex side issues, CFLs, HID not covered yet
- **Efficiency metric:** Lumens output widely accepted. Issues regarding secondary requirements such as colour rendering and lighting quality (glare)
- **Regulatory regimes:** Mandatory and voluntary programs in place around the world mostly using similar metrics but with variations
- **Work on standardised metrics required**
- **Need to control other elements like quality and performance to complement, global initiatives**



Household refrigeration

- **Test method:** All existing methods have major drawbacks, these do not reflect use or climate effects (JIS very complex)
- **Efficiency metric:** Typically adjusted volume per kWh, but meaningless as test method does not give a sensible measure of energy related to use
- **Regulatory regimes:** Most regulated product type in the world for labelling and MEPS, many approaches deeply entrenched in regulations
- **Fairly much a disaster** without a global test method that can reflect use and climate



Household refrigeration

- Origin of test methods for refrigerators warrants closer examination (see LH EEDAL paper)
- Around 100m units produced per annum - widely traded
- Most regulated product - 60 countries with energy requirements, at least 10 major test variants
- All existing test methods have cannot give any indication of energy during normal use and in different climates - all test at a single elevated ambient, which is flawed (ex JIS)
- JIS does measure ambient temperature impact and processing load (door openings and warm food/liquid loads) but this is very complex and not suitable globally
- Field data shows there are major differences between laboratory measurements and normal household use - **elevated temperatures do not compensate for use**



Household refrigeration

- ISO15502 heavily oriented towards European product - major issues with frost free, test packs for energy
- Revision to the standard started in 2006 (agreed in 2002)
- ISO agreed to transfer to IEC TC59 in 2006 (TMB/SMB)
- Political wrangling has meant there has been no sub-committee under TC59 for nearly 3 years (WG only)
- Japan has been leading research work on the development of a global test method that takes into account the impact of ambient temperature and processing loads with input from Australia, NZ, Korea and USA
- While there has been progress in IEC, there is strong resistance to the new global concept from some individuals



Dishwashers

- Test method: IEC used widely around the world, except in North America - arguments about type and amount of soil vs adhered soil, soil drying (oven/air)
- Efficiency metric: Clean and dry dishes. Little agreement of minimum levels that may be acceptable for “clean”, water and detergent inputs
- Regulatory regimes: Only regulated in a limited number of developed countries, but approaches entrenched in regulations (DOE vs EU vs AU)
- Some prospects for global metrics if test method and acceptable performance requirements agreed



Air conditioners

- **Test method:** ISO used widely around the world, except for central and mini-splits in USA. However, concern about variable output systems and climate effects could create many approaches in the future
- **Efficiency metric:** Cooling or heating power output. How this varies by climate and output (inverters) not yet quantified (issue)
- **Regulatory regimes:** Widely regulated mostly using EER at T1, US different (SEER), Japan looking for seasonal efficiency, inverters now common
- **Good prospects** if key test points plus simulation can cover all climates and usage patterns



Air conditioners

- A global test method needs to be able to take into account a range of cooling or heating requirements
- Rated capacity at a single condition is not reflective of normal use for variable capacity units
- A seasonal rating approach is being developed in ISO and is generally supported
- However, this needs to provide a method of calculation for estimating seasonal performance under any climate zone and output requirement
- Picking one climate zone is not acceptable
- Defining standard test set points which are used as input into a simulation tool will be globally applicable



Hot water

- **Test method:** No international test methods of note, ISO looking at solar systems, but bogged down. Need to deal with climate, many fuel types (including solar), storage complex, diverse user profiles
- **Efficiency metric:** Hot water output plus user interaction + climate impacts (solar varies)
- **Regulatory regimes:** Widely regulated in many countries, usually a specific set of conditions and specific usage patterns which are not at all global
- **Poor prospects unless ISO can get physical testing plus a modelling approach to simulate climate and user impacts for all fuel types**



Clothes Dryers

- **Test method: IEC used in Europe and some other countries, some local procedures (US, AU)**
- **Efficiency metric: kg of dry clothes, some debate about “dry”, initial moisture content (washer spin performance) is biggest global variable**
- **Regulatory regimes: Regulated in some countries, usually at a specific initial moisture content that is locally relevant**
- **Good prospects - draft IEC method to test at 2 initial moisture contents which will allow interpolation to any desired initial moisture - no need to retest ever, some issues with washer-dryers, condensers**



Washing machines

- **Test method: Existing IEC very Euro-centric, barely applicable to top loading or impeller or cool washing, high end test - not relevant to developing countries**
- **Efficiency metric: kg clean clothes, but also spin, gentleness and rinsing are important, water and detergent inputs complicate the equation**
- **Regulatory regimes: Regulated in many countries. Massive differences in regulatory approaches**
- **IEC Edition 5 is a big step forward (2009), but there are still issues, consumer habits and practices and variations in detergents and water hardness/temp make defining a metric hard, big differences in regulation would suggest poor prospects**



Televisions

- **Test method:** Old IEC method not applicable to flat screens, but strong global effort to develop new procedure within IEC nearing completion
- **Efficiency metric:** screen size, but picture can affect energy - standardised clips, some debate about features and screen settings/brightness
- **Regulatory regimes:** Not regulated in many places at this stage - Top Runner in Japan and China has MEPS. Energy Star level. About to be regulated by AU, maybe EU and US soon
- **Good prospects** as not much existing regulation and good participation in new IEC method, perhaps not enough cooperation on metrics at this stage



Home entertainment (not TV)

- Test method: Existing IEC probably OK, set top boxes are becoming more complex - separate
- Efficiency metric: energy service is sometime a bit unclear, much energy used in non active modes, most power in active mode probably not essential
- Regulatory regimes: Regulated in a few countries, mostly non active mode limits as covered by standby and Energy Star
- Reasonable prospects on non-active mode requirements through standby regs, set top boxes should be OK, active mode for other HE unclear



External power supplies

- **Test method:** Agreed international method, but not yet published by IEC
- **Efficiency metric:** Efficiency no load plus 25%, 50%, 75% and 100% rated output widely agreed (curve is ideal), range of efficiency levels now defined (I to V, VI in development)
- **Regulatory regimes:** Mandatory and voluntary programs in place China, USA, Australia and soon EU Korea Japan, all using same metrics
- **Already achieved if others copy the approach**



Information Technology

- **Test method: Existing IEC measures energy consumption by mode (many modes)**
- **Efficiency metric: energy service is very unclear, large fixed energy requirement, incremental task energy small, most normal usage is very small**
- **Regulatory regimes: Mostly Energy Star, some country requirements, being considered in some countries**
- **Reasonable prospects for mode harmonisation, but energy management, especially in networks, is the major missing link for energy savings**



Space heating

- **Test method: Some IEC and ISO methods but not used much, mostly local or home grown**
- **Efficiency metric: Heating output. Energy in vs energy out, plus user+climate impact**
- **Regulatory regimes: Regulated in many countries, usually a specific set of conditions and specific usage patterns which are not at all global (local climate)**
- **Poor prospects, multiple fuels creates many issues for a comparative system of metrics, many different regulatory approaches, big differences in local technology complicates the issue**



Standby

- Standby defies the logic of the efficiency paradigm
- In simple terms, standby provides “functions” but the power levels necessary are typically very low
- Standby is more usefully characterised as “waste” and most standby functions are secondary
- Energy savings can be achieved through low power designs - technically close to zero can be achieved for many functions
- Power management is the biggest energy saving potential (auto step to lower modes)
- Network issues present large issues to be solved



Other issues to consider

- **International test procedures are incredibly slow to develop - this does not fit well with prudent and rapid strategies for mitigation of climate change**
- **Mandatory levels or efficiency standards do not belong in IEC/ISO standards - these are the concern of governments**
- **ISO/IEC should concentrate on test methods**

How can we plan for better test procedures?



- Ensure there is a capability of dealing with weather or temperature related impacts
- Determination of energy over the whole output range (curve or series of curves)
- Combination of physical measurements and simulation to cover a wide range of possible usage and operating conditions (climate)
- Quantifying the impact of user interaction and/or temperature/climate in a generic way so that any desired user profile or condition can be calculated without further testing (for discrete modes)

How can we plan for better test procedures?



- Governments and regulators should clearly define the types of efficiency metrics they want for each product type (coordinate?)
- Large corporations should clarify their policies on global approaches to testing
- We need to get the right people onto standards committees that understand the basis for a global approach - a balance of technical expertise together with a political vision



The way forward

- **Greater participation by government in national (in some cases) and international test procedures**
- **Strategic planning and development of policy frameworks for energy efficiency matters with international standards**
- **Active strategic coordination of energy related issues in test standards**
- **However, this needs to be based on a deep understanding of what is needed and what is possible**



The way forward

- While mandatory efficiency levels and timing will always remain a national or regional prerogative, agreement in approaches to define efficiency metrics and even defining families of efficiency levels will provide a strong driver for harmonised test procedures and (largely) compatible requirements set by government
- There may be a more formal role for government cooperation and coordination on energy efficiency regulations and test needs
- This in turn reduces costs of international trade and allows the flow of more efficient products



Conclusion

- Harmonised test procedures are the key to developing global efficiency metrics
- IEC and ISO are the bodies to develop global test procedures, but key stakeholders need to have a vision of a global test procedure, need better strategic oversight and committee guidance
- Global efficiency metrics are feasible for many products, but certainly not all
- Efficiency metrics do not belong in IEC/ISO - too slow to develop and maintain, too many diverse interests to reach consensus - but there could be a role for governments to improve coordination



Quote from Despair.com

Tradition:

Just because you've always
done it that way doesn't
mean it's not incredibly
stupid.....



The End

More information see:
www.energyrating.gov.au

- thank you