Discussion of possible eco-design measures for walk in cold rooms

Meeting notes from Thursday 13 December 2012

Venue: Offices of PU Europe, Av. Edmond van Nieuwenhuyse 6, B-1160 Brussels
Metro station: Demey, Line 5. Website: www.pu-europe.eu.

Timing: 10 AM to 3 PM.

Attendees: Ugo Miretti (DG ENTR); Nicola Labanca (DG JRC); Jeremy Tait (Tait Consulting / CLASP Europe); Willem Coppens (Isocab); Davide Zannese (TC 44 / Epta Refrigeration); Sophie Delair (PAN and PRO Europe); Judith Evans (London South bank Uni); Mauro Freguglia (TC44 WG4 / INCOLD); Ari Kahrola (Porkka); Georgios Katsarakis (DG ENTR, construction); Shpresa Kotaji (Huntsman); Oliver Loebe (PU Europe); Per Henrik Pedersen (Danish Technological Institute / Danish & Norwegian representative); Daniel Quinet (DAGARD / PAN and PRO Europe); Siegfried Römer (Viessmann); Johan Schedin (EPAQ); Volker Siede (HKI); Stamatis Sivitos (ECOS); Klára Skačanová (Shecco).

Welcome – PU Europe

Oliver Loebel welcomed delegates on behalf of PU Europe, noting that there were still many issues to be resolved on this initiative but that it was encouraging to see so many now participating.

Introduction & current status – Commission DG ENTR

i. Ugo Miretti welcomed delegates on behalf of the Commission; all delegates introduced themselves.
ii. This meeting aims to at least identify key issues to be addressed, it will not resolve them all.
iii. Not all of the measures/regulations for the lot 1 products need necessarily proceed at the same pace; businesses may actually be better able to cope if there is some spread of timing, where several measures affect the products of any one company.
iv. The contractor's impact assessment study was completed in September 2012 and DG ENTR is now preparing its own internal impact assessment which will be completed in early 2013.
v. CLASP Europe has facilitated the input of Tait Consulting Ltd between December 2012 and February 2013 to collate additional input from stakeholders on walk in cold rooms (also regarding high-temperature industrial process chillers).
vi. The results of this analysis and additional research would ideally be available to the Commission by the middle of February 2013.

Key points from contractor's impact assessment study

i. The executive summary of the report was circulated to delegates prior to the meeting; key points were highlighted from this: the main focus for the policy measure is on smaller cold rooms (less than 100 m^3); the problems to be addressed are quality of installation,

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission

insulation not installed for optimum life cycle cost, reducing air ingress; the necessary test methodologies to regulate overall cold room performance do not yet exist and so interim measures addressing insulation are proposed; longer term measures to address quality of installation should be initiated.

ii. A discussion paper explaining some of the key issues to be resolved was circulated prior to the meeting and formed the basis of the agenda for the meeting.

iii. The topic of scope of products to be included generated discussion. A consensus appeared to be that inclusion within scope of cold rooms of which one or more walls were exposed to the outdoor environment could lead to complication of regulations due to overlap with building regulations. The commission would need to consider this further.

Progress on new harmonised test methodology for walk in cold rooms

i. CEN TC44 working group 4 has held its first meeting towards developing a new harmonised test methodology for walk in cold rooms in response to the Commission's mandate 495; Mauro Freguglia is the convener and summarised progress, answering questions.

ii. 27 participants had registered for the working group but only eight attended the first meeting on November 16, 2012. All delegates were encouraged to get in touch with their national standards body to access material from the working group and potentially participate.

iii. The harmonised standard currently being prepared will address calculation and test methods (when possible) of thermal performance of the insulated envelope only: thermal performance of panels, doors, construction elements such as corner joints etc, thermal bridges etc. It will not address any electricity consuming components.

iv. The concept is to provide cold room designers with calculation methods for the thermal performance of their design, including rules of thumb to estimate performance of factory made joints as compared to on site constructed joints etc. Also to provide indicative design judgements on, for example, ranking the relative performance of different types of insulated door. The role of automatic door closing devices could also be considered, as well as switches activated by the door to switch off evaporator fans and/or turn lights on and/or give audible warning that the door is not closed properly. The standard will avoid restricting the market on design approaches.

v. One technical challenge currently being considered is how to address cold rooms with insulated floor and those without an insulated floor. Noted that it would be necessary to derive a method to compare performance between these two types.

vi. Additional, separate standard(s) will have to address energy consumption of refrigeration equipment and electrical ancillaries. This/these have not yet been initiated or planned in detail but will fall under TC44 aiming to deliver by 2016. It was noted that additional detailed guidance from the commission would be necessary to ensure the emerging standards mesh properly and at the required time with regulatory requirements, perhaps in the form of a more detailed mandate.

vii. Next meeting of WG4 planned for 1 February 2013 in Milan - many more interested participants would be welcome to help steer progress.

viii. **PU Europe** noted new standards for panel performance should not be required as sufficient should already exist, avoiding excessive burden on suppliers.

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission

ix. **Porkka** and others noted the importance of ensuring that prefabricated cold rooms do not end up being penalised through the calculation process. Performance in-situ of prefabricated cold room joints will usually be superior to that achieved by joints in customised cold rooms. It is possible that some sort of bonus in the calculations may be appropriate for such rooms. Prefabricated rooms are already proportionately harder hit than customised rooms by health and safety and other regulations regarding associated ancillary equipment.

x. The need was noted to coordinate between TC44 and TC 128, TC113, TC89 and TC182, particularly regarding system performance. The CEN coordination group on eco-design measures should be involved in this process.

ACTION: Mr Freguglia to make available notes from the previous WG4 meeting, along with a summary of the intended scope of the envisaged harmonised standard.

ACTION: Commission to review necessity of additional mandate/guidance for harmonised standards on system performance metrics for walk in cold rooms.

System performance metrics

i. Regulation of U-value was acknowledged to be a pragmatic but not ideal interim metric, aiming to positively influence energy performance until a suitable overall performance metric is in place.

ii. **Dagard** noted that French standard NFP 75 401-1 (AFNOR Norme, October 2001, also known as DTU 45.1) sets maximum thermal transmission rates for insulated panels and floor in the form of maximum heat flux per square metre (maximum of 8 W/m^2 for rooms above 0°C; 6 W/m^2 for rooms below 0°C – see Appendix 1). This could be considered as an alternative performance metric (*but not necessarily same threshold*) for EU regulation instead of U-value although research would be needed to verify and develop this.

iii. It was noted that gearing up the industry for regulation of U-value would take some time and effort. To avoid excessive burden on the sector, this should not soon after be repeated for regulation of a thermal loss limit, followed after that by a total system performance metric.

iv. The overall objective of the harmonised standards is to enable the calculation of a *steady state* energy consumption of a cold room at the design stage for the purposes of comparing performance. It was noted that an indicative annual energy consumption figure was not representative as it is impossible to estimate the effects of door openings and storage product movements.

v. Noted that U-value is a more straightforward property of a panel to determine and label. Thermal flux changes with temperature differential, although it can be calculated for any given combination of panel and application.

vi. Potential need for rating according to the different climatic zones of Europe was briefly discussed but dismissed since the products under the potential regulation would most likely be only those constructed within other buildings.

vii. Consensus from discussion at the meeting appears to be that heat flux is a technically more satisfactory option but U-value should not be ruled out if heat flux would be too complex or take too long to develop.

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission

viii. Several delegates suggested that it may be appropriate to set different requirements for large and small cold rooms. This also allows scope to 'shelter' the smaller prefabricated market from stringent short-term panel-only requirements. This reinforced the need to consider whether separate requirements should be set for cold rooms with less than 100 m^3 internal volume and those with over 100 m^3.

ix. **EPAQ** re-asserted a suggestion they and a UK Institute of Refrigeration respondent made during consultation in March 2012 that the eco-design regulation should only apply to cold rooms of less than 100 m^3.

Note: **PU Europe** noted in an email to the commission prior to the meeting the existence of the Spanish national requirement under requirement IF-11[1] (loosely translated as for "cold rooms, controlled atmosphere rooms and refrigerated rooms"). The requirements for envelopes are: < 15 W/m^2 for a room with a refrigerated process (7 ºC < T < 20ºC); < 8 W/m^2 for cold room with T>= 0 ºC and T< 7 ºC; < 6 W/m2 for cold rooms where T< 0ºC (where T is the monthly average temperature of the room). **Dagard** kindly provided a translation of the most relevant part of NFP 75 401-1 after the meeting which lists similar requirements, see Appendix 1.

ACTION: commission to consider whether heat flow per square metre might provide a better interim performance metric instead of U-value.

Raising standards of installation

i. A harmonised standard on good practice for installation of walk in cold rooms was agreed as a useful and necessary first step towards raising the quality of installation work. This could be initiated via a mandate.

ii. Dagard and INCOLD both strongly endorsed the principle of pushing for better standards of installation. In France it is common to have inspections of customised cold rooms that are made according to DTU 45.1 (even using infrared survey); INCOLD inspect cold rooms after construction.

iii. **Dagard** volunteered to look into what key messages and topics are included in the French standard DTU 45.1 and report back to the group.

iv. Noted that an installation code/standard would be different for very large cold rooms compared to very small cold rooms and this must be taken into account in planning.

v. An industry challenge would be to establish a system for qualification and certification of suppliers/installers. The commission could in theory make it a requirement that only qualified personnel are able to carry out that job. This could be considered for the future.

vi. **EPAQ** reported on a cooperative initiative with IFPS on developing good practice codes for installation of panels (in many applications, not just cold rooms). Certification schemes and a training centre in Aachen are being developed. This may provide a useful precedent or basis from which to build a specific initiative for cold rooms. EPAQ agreed to provide further information on this initiative regarding certification labels for installers in due course.

[1] See BOLETÍN OFICIAL DEL ESTADO, Núm. 57, Martes 8 de marzo de 2011, Sec. I. Pág. 25955. INSTRUCCIÓN IF-11, CÁMARAS FRIGORÍFICAS, CÁMARAS DE ATMÓSFERA ARTIFICIAL Y LOCALES REFRIGERADOS PARA PROCESOS.

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission

Energy labelling for panels

A discussion of the merits of additional energy labelling associated with thermal performance of panels concluded that this would have limited benefit. There is no 'information failure' to be addressed: existing test methodologies establish U-value performance figures for panels that are perfectly adequate for designers/specifiers to use. End users rarely need to consider performance of panels alone. The possibility of requiring the U-value to be physically marked on each panel (and so visible post installation) was discussed but considered to offer limited benefit in practice.

Stringency of requirements; number of tiers; timing

i. The group agreed that stringency of thermal efficiency of panels should be set bearing in mind the risk of pushing prefabricated cold rooms and/or manufacturers of discontinuous panels out of the market at this interim stage: pure performance of these panel components may be inferior to that of continuously produced panels (which can more easily and economically be made thicker) but when at a later stage metrics for the thermal performance of the whole envelope are introduced, the overall performance of prefabricated rooms with discontinuous panels may prove better than that from customised construction. This is mostly due to superior fit and thermal performance of factory-made joints.

ii. There was consensus that a single tier of requirements for thermal performance of panels would be preferable and avoid the risk of backsliding under a less stringent first tier.

iii. **ECOS** requested clarification that the single tier would be at the level previously assigned to the second tier - the Commission and the wider group agreed that this was the principle to be followed.

iv. **Dagard** confirmed that their typical practice is for 60 mm thick insulation for medium temperature stores; 100 mm for low temperature. **Denmark** indicated 80 mm for medium temperature and 100 mm for low-temperature for small WICR. The view of suppliers is that losses are far greater from air ingress and door openings and so thicker insulation is more difficult to justify economically.

v. Comments were made that whilst 150 mm insulation may be more typical for good practice for low temperature cold rooms, that is generally in larger rooms / cold stores of over 200 m^3. This implies that previous impact assessment study judgements that Northern European widely used 'good practice' means 100mm for medium temperature and 150 mm for low temperature may not hold true for smaller cold rooms. *(Note: This supports the later suggestion for splitting the requirements into small and medium stores but the economics of insulation effectiveness, including the influence of typical door openings, could usefully be investigated).*

vi. **Viessman** suggested that stricter requirements could be set in place for continuously produced panels compared to discontinuous panels in order to shelter the prefabricated cold room market in the short-term.

vii. One higher requirement was noted under Swiss regulations reported as 150 mm required for cold stores/rooms at -18°C.

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission

[Note: Investigation after the meeting identified the requirements under EnFK Implementation guide EN-6 Cold rooms, January 2009[2]. This document (apparently mandatory under harmonised Canton energy regulations) imposes a mandatory maximum heat flux of 5 W/m^2 for rooms that are cooled to less than 8°C, with a concession that for rooms with less than 30 m^3 internal volume the heat flux requirement can be waived if the room has an average U-value of less than 0.15 W/m^{2}K; this corresponds with an insulation thickness of over 160 mm for lambda of 0.025].

viii. **Viessman** suggested that the "1st Tier" should actually be to address training and education standards.

CE Marking

i. The risk of potential confusion amongst suppliers regarding CE marking responsibilities was flagged by **EPAQ**. For example, to clarify whether marking should be based upon either a declaration of conformity (Ecodesign) or a declaration of performances (Regulation 305/2011, construction products) or both. Mr Katsarakis explained that there would only be one CE mark required; further details to explain this should be made available in due course.

[Note subsequent to meeting: Basic guidance on CE marking regarding eco-design requirements is already available on a DG ENTR website[3].]

Who takes eco-design responsibility?

i. The commission provided an indicative view on this: under eco-design regulations compliance is the responsibility of the body which places the product on the market. In the case of the cold room the 'product' does not exist until it can be put into service (i.e. the refrigeration system switched on) and so it is the installer who would take responsibility for a customised cold room. The manufacturer of a prefabricated cold room would take responsibility.

ii. It was noted that it is not particularly onerous for the installer to declare the U-value of the panels used in construction at this interim stage.

Subsequent to the meeting: Denmark/Norway suggested that the pressure equipment directive could possibly provide a useful precedent on who takes responsibility for eco-design conformity for customised WICR through the supply chain. CLASP/Tait Consulting will work with the Commission to develop this thinking in accordance with the Blue Guide[4] and relay findings to the group.

[2] See http://www.endk.ch/index.php?page=222

[3] http://ec.europa.eu/enterprise/policies/single-market-goods/cemarking/professionals/manufacturers/directives/index_en.htm?filter=4

[4] http://ec.europa.eu/enterprise/policies/single-market-goods/files/blue-guide/guidepublic_en.pdf

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission

Blowing agents

i. **Huntsman** provided some useful insight: it is blowing agents that are possibly most influential in defining the cost of panels. Pentane (HC) is cheap (but requires expensive explosion-proof processing equipment) and reached its upper limit of thermal performance. HFC more expensive but better thermal properties than HC, but used at lower concentration to control the price. The future alternative of HFO (low GWP) likely to be higher priced than HFC (to be confirmed).
ii. HFO production could go to other uses than panels in the early stages as it comes onto the market. Refrigerant manufacturers will switch plant from HFC to HFO production (unlikely to build new plant).
iii. HFO may be available from 2015 although this may be optimistic. Even once available for production, **EPAQ** and **PU Europe** pointed out that panel manufacturers will require at least 18 months for ageing tests and revision of standards, including application documents taking up to 2 years.
iv. There are limited thermal property improvements that could be made by adjusting blowing agent and production method but this is a complex process. HFC blown discontinuous panels could in theory perform slightly better thermally than hydrocarbon discontinuous panels, but economics of making the change are not viable.

ACTION: All delegates - In order to ensure time for other items, the discussion document items on requirements for doors/joints, reducing air infiltration and other issues on blowing agents were requested to be dealt with in correspondence after the meeting. Comments are invited.

Conclusions and next steps

i. CLASP (Tait Consulting) undertook to circulate minutes and follow-up investigation of some specific leads suggested during the meeting. This would be limited to around two days effort.
ii. The commission will consider the evidence provided and follow-up with further consultation if/as required.
iii. The commission thanked all delegates for their time and constructive input to the meeting.

Jeremy Tait,
Tait Consulting Limited, supporting the work of CLASP and the European Commission on eco-design regulations on professional refrigeration equipment (Lot 1),
e: jeremy@taitconsulting.co.uk,
t: +44 1235 884 896
m: +44 7814 242 469

Appendix 1: Indicative translation of extracts or main points (in relation with thermal aspects) of NFP 75 401-1 (version October 2001) provided for information only by Daniel QUINET, Dagard.

DTU 45-1 Construction Work: Thermal insulation of cold stores and constructions in controlled ambient

Additional note from Mr Quinet: Please note that those figures are for big cold stores, they are relative to the required performances of walls, ceilings, floors in their plain surface. They don't take in account the losses in corners, junctions, doors, etc. For small cold-rooms the principle of giving global performances is good but these figures have to be adapted: as the [room] dimensions are smaller, the loss from corners, doors, junctions could be as much as those from the plain surfaces.

1 Application field

This document explains the thermal insulation works for cold stores or constructions with controlled ambient used for transformation or storage of agro food products who need the control of the temperature , hygrometry and eventually who require specific hygiene rules.

It gives recommendations regarding the materials and construction products and also the rules for the installation.

Usual temperatures are:

- -40°C to 0°C for rooms named " negative"
- +1°C to + 12°C for rooms names " positive"
- + 13°C to + 40 °C for areas in controlled ambient

The works concerned are the thermal insulation of the envelop (floors, walls, ceilings) and also installation of isothermal doors. They may concern in addition the protection against external conditions (roof and cladding).

3 -1: Thermal insulation

Requirement

In case of non-existing specific documents in the contract the thermal insulation of the walls should be considered in order to limit the thermal transfer to 8 W/m^2 for positive temperature rooms and 6 W/m2 for negative temperature rooms, the surface in m2 is the surface of walls, ceilings and floor.

Note: usual thermal resistance are between 2 and 8 m^2K/W

Calculation

Thermal conductivity of materials are considered at an average temperature of + 10°C

For coldrooms (-40°C to + 12°C) if non specified in the contract the average external temperatures to be considered are :

- Floor:+ 12°C
- External walls:+ 25°C
- Ceilings under roof: + 30°C
- Roof: + 35°C

4 2 4 Thermal resistance of doors

For isothermal doors the thermal resistance of each doorleaf should be at minimum 70% of the thermal resistance of current walls. For doors separating two rooms at closed temperatures this value can be reduced to 50%.

Support to this meeting was provided by CLASP (http://www.clasponline.org) and the European Commission