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Increasing need for reliable performance data of HVAC products

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Energy efficiency has a key role in the EU policy. Ecodesign regulations, EPBD requirements and Energy Efficiency Directive present strong requirements to reduce energy consumption of buildings and GHG emissions. HVAC systems play a major role in improved energy efficiency. Good performance of systems is based on good and reliable products. The main focus of this issue is on energy efficiency of air conditioning and heating products, particularly how certified performance data can support high performance buildings.

Nowadays many forces are acting to shape the building industry and HVAC, but there is only one common key performance indicator: energy efficiency. Components, products, HVAC systems, and buildings need to be characterized with increasing quantity of performance data. All actors in the value chain from building designer, building contractor, manufacturer of building material, building components and building equipment, to building operator and building owner are looking at a common direction: better performing buildings. The energy saving quest for the designer and the engineer is about the need to find, manage and analyse a huge quantity of performance data to deliver better project performance within the given short timeframe.

The building industry and product suppliers like HVAC manufacturers need to operate in a very rapidly changing environment. Strong and fast material and product innovation including new product and new hydrid product innovation are flooding the market. Product complexity is going up, but a new product and a new concept need to be properly defined and characterized technically. The amount of technical data needed to describe material or product performance according to a new set of rules or conditions is increasing manifold. The number of technical conditions and rules to describe the thermal performance of a building or project is also increasing significantly. We cannot ignore that this tremendous challenge is happening in a new era. An era of optimum efficiency is required to succeed in this period of economic recession, minimum financing flexibility, reduced safety margin and only long to very long term gains as the reward, but with immediate commitment to succeed. We have to do a lot more and better with less for sure, to travel the path of efficiency. A large choice of design, materials, components and equipment being part of the ultimate solution, the quantity of alternative product and performance data to design is increased tenfold by this wide and rich market offering.

Products with performance that can be compared must only be considered in order to reach a decent data integrity pool to work from. Comprehensive and detailed performance data must be based on the same test conditions on paper and in practice. The same tolerance is required for each performance parameter being considered or computed. A third party data performance process with accreditation is sought for continuous update. Data and associated data formats must be readily available simultaneously for a wide range of suppliers and competitors. Voluntary third party certification should be investigated considering its strong built in potential for the benefit of the consultant.

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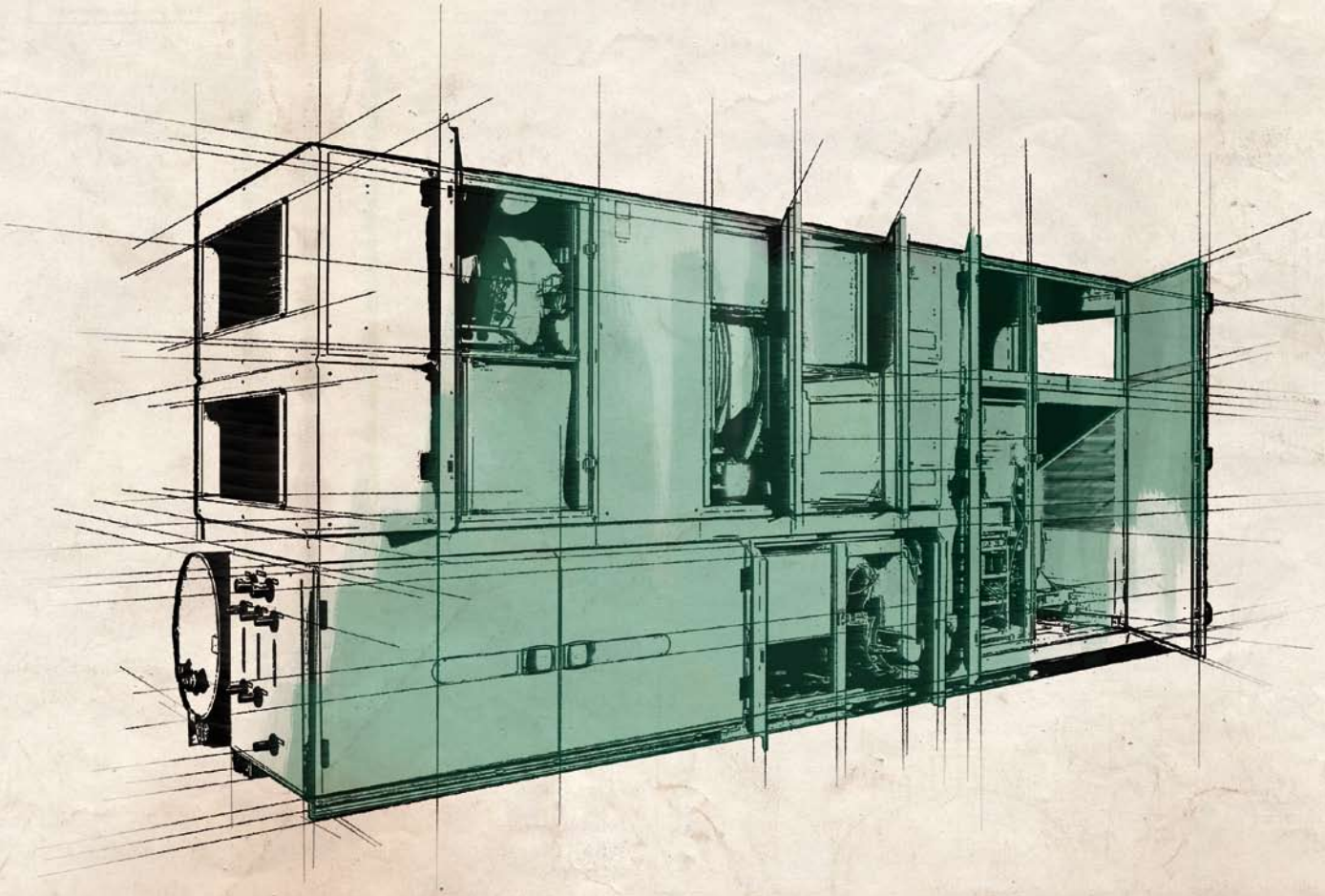

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Energy Labelling
- State of play and conceptions for future

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It is no novelty that the EU is aiming for a 20% cut in Europe's annual primary energy consumption by 2020, but how we get there, seems to be a regularly reappearing novelty. Ecodesign and energy labelling have been key instruments in boosting the energy efficiency of appliances. While ecodesign cuts the least efficient appliances off the market, energy labels help consumers choosing products which save energy and thus money. They also provide incentives for the industry to develop and invest in energy efficient product design. However, the energy labelling landscape is changing. First, the introduction of new labels will guide, apart from consumers, also professionals such as system designers and installers. This is in particular the case with the new energy labels on air-conditioners, heaters, and water heaters. Second, many consumer products will reach the maximum energy efficiency classes during the coming years. Therefore, the future review of the Energy Labelling Directive will have to face the challenge of addressing these issues. This article sheds light on some of the key issues related to the future of energy label building on the first inputs available from stakeholders.

Background in Brief

The European Community scheme on energy labelling of 1979 presented in Council Directive 79/530/EEC was the first approach on presenting energy efficiency to consumers on a European level. It gave Member States discretion to require labelling of some household appliances sold within their jurisdiction providing a common EU label format was used. This early label was of an information-only type, which presented technical details including energy consumption under standard test conditions, but not information about the appliance's relative energy performance or efficiency compared to similar models. Being text only, it was therefore quite different to modern labels and not very successful. In practice, this label was only briefly applied in few Member States (Denmark and Italy) for one appliance (household ovens) and hence had a negligible impact.

Following this first approach, Council Directive 92/75/EC was the first 'modern' piece of legislation in the EU to establish a common energy consumption labelling scheme. The directive was supplemented by further, implementing Commission Directives [**1**] on household washing machines, washer-dryers, lamps, cold appliances, electric ovens and air-conditioners during the period 1995-2002.

Household appliances offered for sale, hire, or hire-purchase had to be accompanied by a fiche and a label providing information relating to their consumption of energy and of other essential resources. The supplier had to establish technical documentation sufficient to enable the accuracy of the information contained in the label and the fiche to be assessed (including the description of the product, results of design calculations and where necessary, test reports).

The first labels were provided in eleven different languages with the Belgian label in two languages (see **Figure 1** for English language version). Suppliers provided a free label to retailers and include the fiche in the packaging of the product, and retailers attached the label to the appliance.

In 2005, Directive 2005/32/EC on ecodesign for energy-using products was introduced. It utilised a life-cycle approach, allowing the setting of minimum performance requirements on energy-using products. A result was the phasing out of the most environmentally-harmful products from the market, with a *de facto* removal of appliances from the lower energy labelling classes.

The Energy Labelling Directive 92/75/EC was finally replaced by the recast Directive 2010/30/EU. Its main features were the introduction of A+, A++, and A+++ classes on top of the A-G scale, an almost language free label used across the whole internal market, and distance and internet sales added into the scope. **Figure 2** presents an example of such a new label.

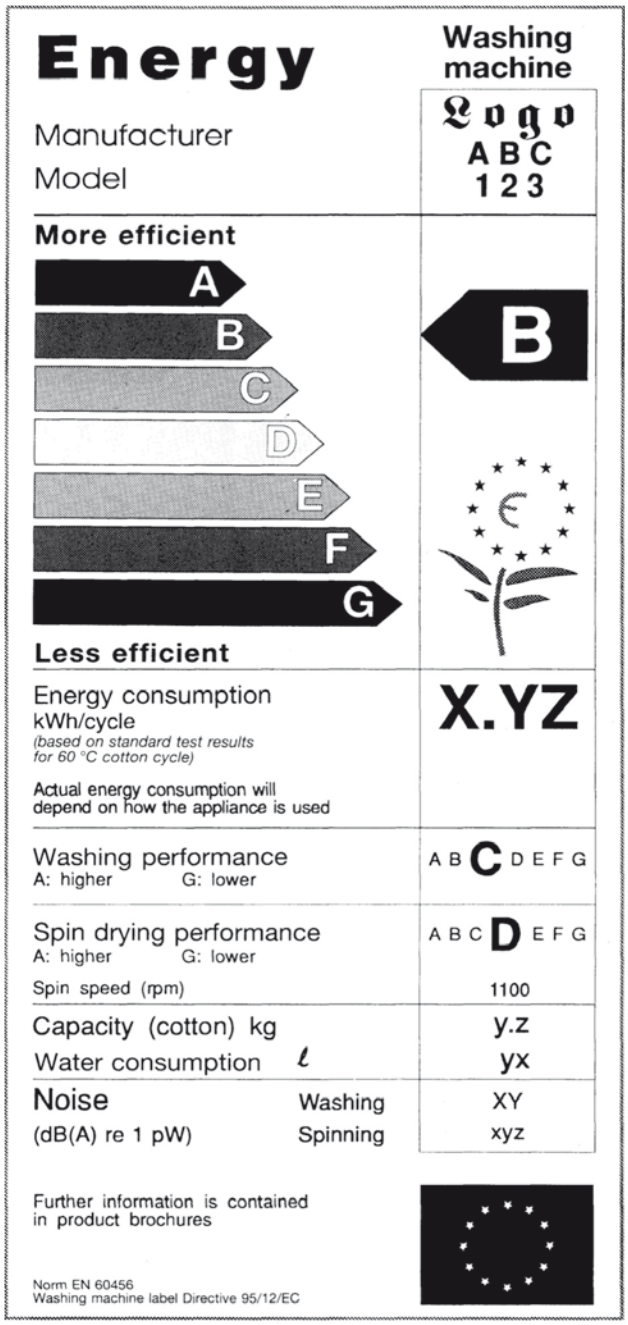

Figure 1.
First mandatory EU energy label in black and white.

Figure 2. Modern EU energy label for a fridge in colour and with additional information.

To date, seven energy labelling regulations [**2**] are in place and six new regulations [**3**] are planned to be adopted in 2013, including the regulations on heaters and water heaters.

Impact of the Energy Label

Since its introduction, the energy label has been a story of success. It is well known (80% of citizens recognise the label), and has helped create offspring labels for buildings, cars, and tyres. European consumers trust the energy label and usually take it into account when they buy electrical household appliances with the undeniable effect of transforming the market towards more energy efficient products [**4**].

Much of the credit must be attributed to its design, which also helped in exporting the idea of the label to numerous countries abroad (see **Figures 3-6**). Today, over 70 countries have an energy label, allowing some 500 million people to make an energy efficient choice in buying products [**5**]. It has achieved this by being:

- Easy to understand: comparative information is presented without the need for technical knowledge, and it touches the heart of consumers: money (85% of consumers pay attention to cost while only 15% pay attention to environmental aspects)[2];
- Language neutral, which is a prerequisite for an EU label with over 20 language zones within the internal market. Pictograms, however, limit the complexity of the message that can be passed and today's/tomorrow's products will be more and more complex.

Result of the Success of the Label and Ecodesign

The success of the European Union's energy efficiency legislation created a fundamental issue hard to resolve. Energy labelling and ecodesign measures have removed products with low energy efficiency from the market. More and more products end up in the highest class with empty lower classes, and rapidly diminishing possibility to differentiate anymore between the efficiency of products.

This problem was first addressed in 2010 with the introduction of A+/++/+++ classes. However, the introduction of 'plus-classes' better than A was only seen as an intermediate step, because a further drive towards better products will lead to the same problem again. Furthermore, research [**2**, **6**] has shown that consumers are liable to misinterpret the difference between the new classes (i.e. A+++ to A class) more than the difference between the old classes (i.e. A class to D class), which leaves adding further 'plus-classes' as an inferior option. Other important aspects are:

- Many classes in the label are empty, which gives misleading information to consumers on the relative energy efficiency;
- It will be practically impossible to populate seven classes in the future, because there will be not enough difference in terms of energy efficiency between the worst and best appliance given the impact of tolerances and/or insignificant difference in consumer savings between models;
- Any attempt to 're-launch' an A-G scale replacing the current A+++ scale will require the downgrading of existing appliances, which will receive industry opposition when faced with a situation without return to investment (e.g. A appliances to be downgraded to e.g. class D);
- Due to increasing complexity of products and aspects labelled, more complex information is entering into the label making it more difficult for consumers to understand. Several labels will also include information for new target groups such as installers. However, a positive aspect is that some of this new information triggers useful questions from consumers to installers;
- Thus far only products have been labelled but the situation is changing. The current system does not allow for the labelling of important products and systems such as most modes of transport (aircraft…), services (holidays…), systems (other than buildings), or energy producers (nuclear, renewables…). The question is if we should be aiming towards savings through labelling within these new areas or are there other more suitable tools for this objective.

Starting a Discussion on the Future Energy Label Review

The Energy Labelling Directive is foreseen for 2014 with a review study launched early 2013. The study will be open for participation to all stakeholders and interested parties of the society. The first contributions to the future of the energy labelling have already been launched by stakeholders. Consumers, environmental organisations, academia, Member States and the EU institutions are well aware of the key issue with the current label, each of them from their own view point. These views are still to be expressed and shared in a systematic review process.

To avoid a conflicting and stalling discussion between stakeholders, green NGOs (EEB and ECOS) and household appliance manufacturers (CECED) have initiated an informal discussion platform in view of the 2014 re-

view. They have identified a set of shared general principles to take into account when exploring future options for revising the energy label.

Following these principles, the label should be based on a reasonable number of indicators, usually three or four, with the main focus on energy. Balance between energy, other resources, and performance shall be ensured, especially when they are correlated.

All the necessary information should be displayed within the same label in order to allow the consumer easy access to comparison between models. The energy information should be available both in absolute value and relative value. The level of prominence of display should be determined on a product-by-product basis to ensure best consumer understanding. The absolute value informs about the actual impact of the product, while the relative value informs about the efficiency of the product in its category.

As previously, the calculation methodologies behind the parameters should be clear, credible, and sufficiently close to real life use of the products, provided that uncertainty and complexity remain acceptable. When energy use is substantially influenced by regional variations in the EU (e.g. for heat pumps and air-conditioners), the label should help consumers evaluate the performance for their geographical situation.

Future layouts should follow current examples and be as uniform as possible across product groups; visual simplicity should be a priority. The main parameter(s) should be displayed in a way that allows clear differen-

Figure 3. Example of two Chinese energy labels following the European class system.

Figure 4. Example of an energy label from Singapore using a slightly different approach.

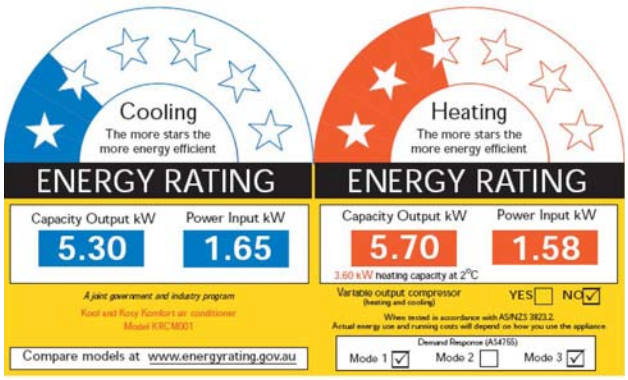

Figure 5.
Example of an energy label from Australia.

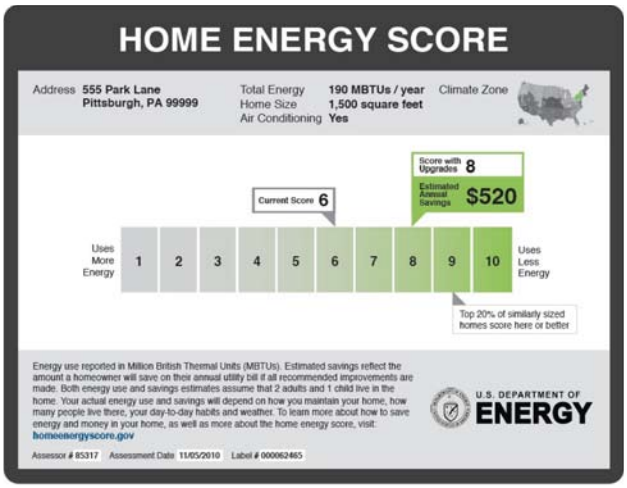

Figure 6. Example of an US energy label with estimated savings in US Dollars.

tiation and comparability between products, and encourages innovating towards the top. However, the scale and reference should be designed in a way that ensures that consumers are not encouraged to buy products with high absolute impact even if they are efficient in their category. Furthermore, continuous or class scales should be used in a way that minimises the need for complicated reclassifications or scale modifications such as experienced in the moment. Colour codes are a fundamental component of the layout. They should be used in a simple and understandable way that helps identifying the top performing products on the market.

Following these principles would allow very different label designs ranging from keeping the existing structure, using further classes and removing unused, old ones up to using a continuous scale with a numerical value without fixed classes including any mixture in-between (i.e. using classes with numerical values), which is in-line with ECOS, EEB, and CECED intention to investigate as many different designs as possible. In addition, the information provided on the paper label displayed in shops should be systematically complemented by more refined information available through internet and smart phone tools.

The overall expectations for the new label are to transform the market with a drive towards best appliances while being transparent to the consumer and conducive for innovation.

Insights from Research

Research provides useful information on the impact and acceptance of the energy labelling policies, and should therefore be seen as a valuable resource in the review process.

In contradiction to some proposals, research has shown that the colour coding should be consistent, but is much less important than the numerical or alphabetical value presented (such as A class) [**7**]. Furthermore, the coding with a specific value should be clear and follow concepts familiar to consumers (i.e. the difference between an A and a D is much faster for consumers to process than A+++ to A) [**2**].

Another important insight is that the main criterion for a label should be the actual money saved by the consumer, or a value in a direct and easy-to-understand relation to it [**2**, **5**]. For most consumers, saving money is the number one reason for choosing energy efficient products, and the energy label is seen as valuable information to achieve this task.

Conclusion

Overall, it is vital to base the review process on research findings to ensure a successful energy label, which is accepted by all stakeholders while achieving its goals towards greater energy efficiency. Consumers are at the centre of these considerations. Only an energy label which can easily be understood by consumers, gives reliable and accurate information, and offers preferably information on direct financial benefits to consumers will be able to increase the energy efficiency of products.

While this article aimed at shedding light on some of the key issues and the energy labelling issue to be addressed in the coming years, it reads from the nature and level of challenges that that success in tackling the challenges ahead can only be ensured with broad and transparent cooperation involving the relevant actors, industry, consumer and environmental organisations, academia, Member States and the European institutions alike.

References

[1] 95/12/EC household washing machines and 95/13/EC household electric tumble dryers, 96/60/EC household combined washer-dryers, 98/11/EC household lamps, 1999/9/EC household dishwashers, 2003/66/EC household electric refrigerators, freezers and their combinations, 2002/40/EC household electric ovens, 2002/31/EC household air-conditioners.

[2] List of adopted regulations: http://ec.europa.eu/energy/efficiency/labelling/labelling_en.htm

[3] Ecodesign Working Plan 2012-2014: http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/product-groups/index_en.htm

[4] AEA (2012). Consumer research on EU product label options. Final report for the European Commission.

[5] Amann, JT (2007). The effectiveness of energy labelling. ACEE Conference presentation

[6] Heinzle, SL, and Wüstenhagen, R (2012). Dynamic adjustment of eco-labeling schemes and consumer choice – the revision of the EU energy label as a missed opportunity? Bus Strat Env, 21(60-70).

[7] Heinzle, S (2012). Consumer response to energy labels - insights from choice experiments. Doctoral dissertation at Uni St. Gallen.

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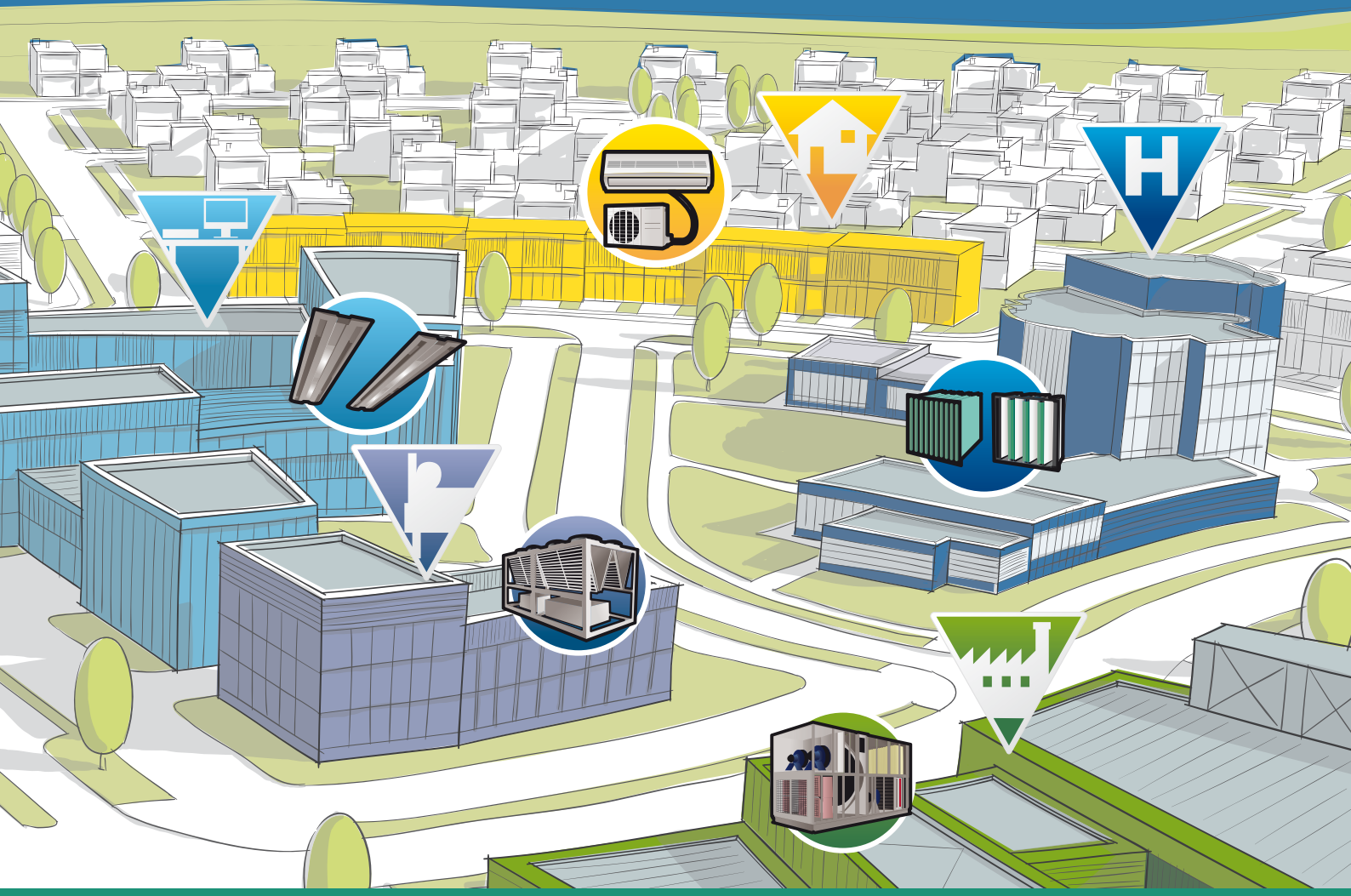

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Voluntary labelling and certification of HVAC products

For some years now the European commission has pushed for energy efficient products to be sold on the European market. Currently three types of initiatives are pushing in this direction:

1) The Ecodesign Directive (2005/32/EC and recast 2009/125/EC) on Energy Related Products (ErP) which aims to set minimum energy efficiency requirements for products sold in the European market.
2) The Energy Labelling Directive (92/75/EEC and recast 2010/30/EU) which aims to set uniform labels for products of the same type.
3) The Ecolabel Directive which aims to reward the most energy efficient products. The two first directives are closely linked as they cover identical product groups. The last one is a voluntary scheme and concern a few number of products within the HVAC sector.

In addition to these legal regulations the industry has developed several schemes for product labelling many of these include the energy and environmental aspect of products.

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This article will first provide an overview of current voluntary energy labels that are established by voluntary certification schemes which proceeded and/or complete the EU labels are presented. Finally interactions between private voluntary labels and mandatory EU labels are assessed.

Voluntary energy labels

The European commission is not the solely body to develop energy labels. In the HVAC&R industry some organisations have created voluntary labels in order to promote energy efficient products. This is the case of Eurovent Certification which has put in place several labels in the past few years.

Chillers and hydronic heat-pumps

Already in 2004 Eurovent certification defined energy efficiency classes for chillers and hydronic heat-pumps base on Energy Efficiency Ratio (EER) and Coefficient

Table 1. Definition of Eurovent Energy classes for Chillers and Heat pumps.

Cooling Mode					
Air-cooled LCP/A/../../N/..AC	**Air-cooled ducted** LCP/A/../../D/..AC	**Air-cooled, Floor** LCP/A/../../N/..CHF	**Water-cooled** LCP/W/../../N/..AC	**Water-cooled** LCP/W/../../N/..CHF	**EER Class**
≥ 3.1	≥ 2.7	≥ 3.8	≥ 5.05	≥ 5.1	A
2.9≤EER<3.1	2.5≤EER<2.7	3.65≤EER<3.8	4.65≤EER<5.05	4.9≤EER<5.1	B
2.7≤EER<2.9	2.3≤EER<2.5	3.5≤EER<3.65	4.25≤EER<4.65	4.7≤EER<4.9	C
2.5≤EER<2.7	2.1≤EER<2.3	3.35≤EER<3.5	3.85≤EER<4.25	4.5≤EER<4.7	D
2.3≤EER<2.5	1.9≤EER<2.1	3.2≤EER<3.35	3.45≤EER<3.85	4.3≤EER<4.5	E
2.1≤EER<2.3	1.7≤EER<1.9	3.05≤EER<3.2	3.05≤EER<3.45	4.1≤EER<4.3	F
< 2.1	< 1.7	< 3.05	< 3.05	< 4.1	G
Heating Mode					
Air-cooled LCP/A/R/../N/.. AC	**Air-cooled ducted** LCP/A/R/../D/.. AC	**Air-cooled, Floor** LCP/A/R/../N/.. CHF	**Water-cooled** LCP/A/R/../N/.. AC	**Water-cooled** LCP/A/R/../N/..CHF	**COP Class**
≥ 3.2	≥ 3.0	≥ 4.05	≥ 4.45	≥ 4.5	A
3.0≤COP<3.2	2.8≤COP<3.0	3.9≤COP<4.05	4.15≤COP<4.45	4.25≤COP<4.5	B
2.8≤COP<3.0	2.6≤COP<2.8	3.75≤COP<3.9	3.85≤COP<4.15	4≤COP<4.25	C
2.6≤COP<2.8	2.4≤COP<2.6	3.6≤COP<3.75	3.55≤COP<3.85	3.75≤COP<4	D
2.4≤COP<2.6	2.2≤COP<2.4	3.45≤COP<3.6	3.25≤COP<3.55	3.5≤COP<3.75	E
2.2≤COP<2.4	2.0≤COP<2.2	3.3≤COP<3.45	2.95≤COP<3.25	3.25≤COP<3.5	F
< 2.2	< 2.0	< 3.3	< 2.95	< 3.25	G

Table 2. Eurovent Certification Energy Classes for Heat Exchangers (Air cooled condensers units and dry coolers).

Class	Energy consumption	Condensers, Dry coolers $R_{Condensers,\ Dry\ coolers} = \frac{Capacity\ SC\ wet}{Fan\ power\ cons}$	Dx Air Coolers $R_{DXaircoolers} = \frac{Capacity\ SC2\ wet}{Fan\ power\ cons} \times \sqrt{\frac{fin\ spacing}{4.5}}$
A++	Remarkably low	R≥ 240	R≥ 45
A+	Extremely low	160 ≤ R< 240	35 ≤ R< 45
A	Very low	110 ≤ R< 160	27 ≤ R< 35
B	Low	70 ≤ R< 110	21 ≤ R< 27
C	Medium	45 ≤ R< 70	16 ≤ R< 21
D	High	30 ≤ R< 45	12 ≤ R< 16
E	Very high	R< 30	R< 12

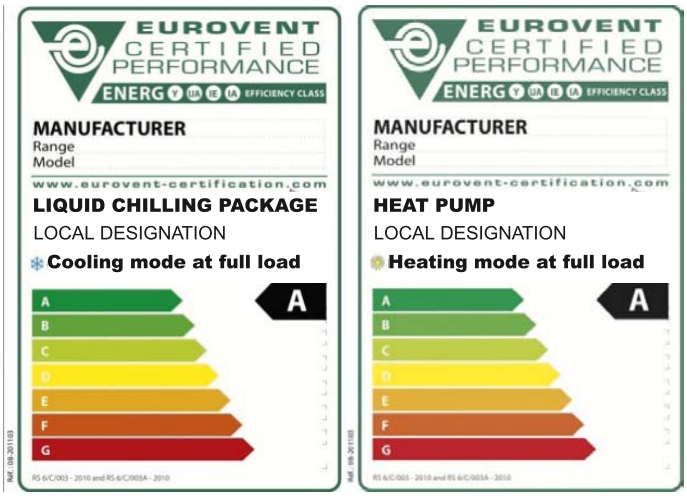


Figure 1. Eurovent Certification Chillers and hydronic heat-pumps labels. [www.eurovent-certification.com]

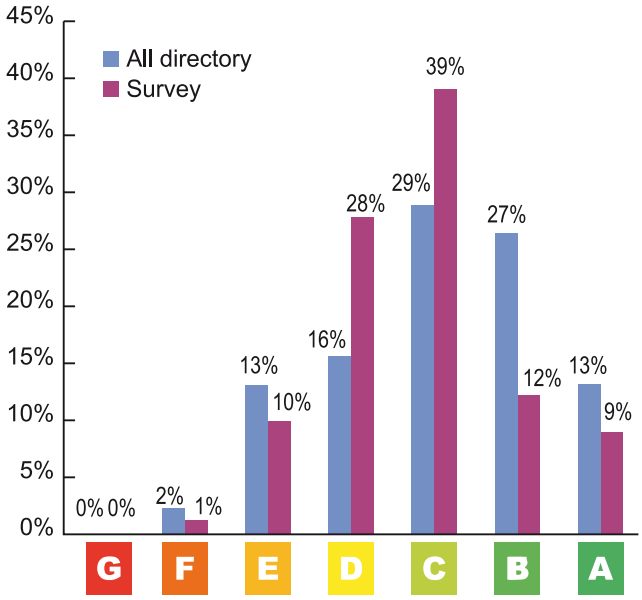


Figure 2. Distribution of Eurovent certified Rooftops units in 2010 according to the energy classes.

of Performance (COP) at standard conditions (see corresponding label and table of the definition of the energy classes).[**1**] This system covers both air-source and water-source units.

Air cooled condensers units and dry coolers

Energy classes for Air cooled condensers units and Dry coolers were defined in 2005. The one for Dx air coolers arose in 2011. The energy efficiency is based on the energy ratio R which is equal to the nominal capacity in kW divided by the total power input of the fan motors in kW at standard rating conditions.

Rooftop units

Energy efficiency classes for Rooftop units were defined in 2010 within the corresponding Eurovent Certification programme. The definition of the classes is based on the levels of the first EU energy label for air conditioners of the packaged type. These levels were found to be consistent with the values found on the market (see distribution of Rooftop units in **Figure 2**).

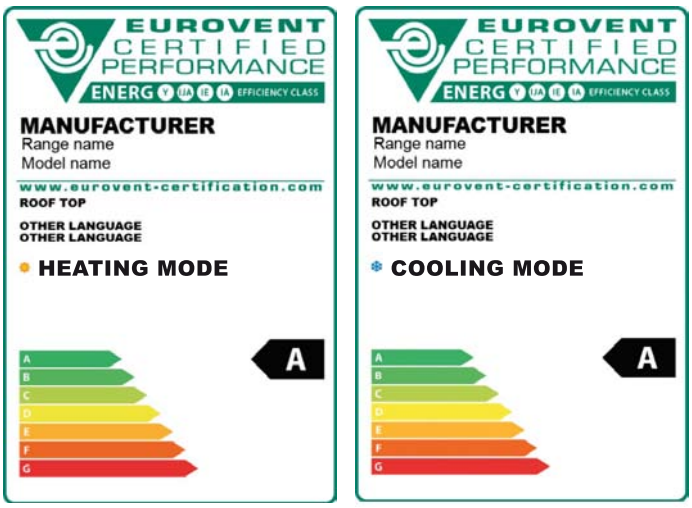


Figure 3. Eurovent Certification Rooftops Labels.

[**1**] Eurovent Certification Company, http://www.eurovent-certification.com/

Air handling units

The Eurovent energy efficiency label for Air handling units was created in 2010. This rating system allow to assess with only one letter the balanced effects of the air velocity in the fan section, the heat recovery efficiency and pressure drop, and finally the fan efficiency. The classification is done for three types of products: products designed for outdoor temperature lower than 9°C (for which the heat-recovery system takes a preeminent role), products designed for outdoor temperature higher or equal to +9°C, and single extracts units.

Fan Coil units

Energy efficiency classes for fan coil units are available since January 2011 (**Figure 5**). This scheme covers ducted and non ducted units, two pipes and four pipes. The energy classes are based on "FCEER" and "FCCOP" (Fan Coil Energy Efficiency Ratio and Fan Coil Coefficient of Performance) for cooling and heating mode. This characteristic corresponds to a weighted average efficiency of the unit at the low, medium and high speeds (see formula below).

$$FCEER = \frac{5\% \cdot Pc_{high} + 30\% \cdot Pc_{med} + 65\% \cdot Pc_{low}}{5\% \cdot Pe(c)_{high} + 30\% \cdot Pe(c)_{med} + 65\% \cdot Pe(c)_{low}}$$

$$FCCOP = \frac{5\% \cdot Ph_{high} + 25\% \cdot Ph_{med} + 70\% \cdot Ph_{low}}{5\% \cdot Pe(h)_{high} + 25\% \cdot Pe(h)_{med} + 70\% \cdot Pe(h)_{low}}$$

The scale is very ambitious as currently a small part of the market can reach A class (see distribution in **Figure 6**). However, in view of the up-coming of EC fan motors units in the near future, the A class might be reached more often.

Air filters

Energy efficiency classes for air filter intended for ventilation were recently defined in the Eurovent Document 4/11 [**2**] (downloadable free of charge on www.eurovent-association.eu).

This method defines an annual energy consumption of an air filter in kWh/year based on the average pressure drop of the filter and standard airflow conditions.

The energy classes are defined for each filter efficiency class from G4 up to F9 (**Table 3**).

[**2**] Eurovent Document 4/11 "ENERGY EFFICIENCY CLASSIFICATION OF AIR FILTERS FOR GENERAL VENTILATION PURPOSES", www.eurovent-association.com

Figure 4. Eurovent Certification Air Handling Unit Label.

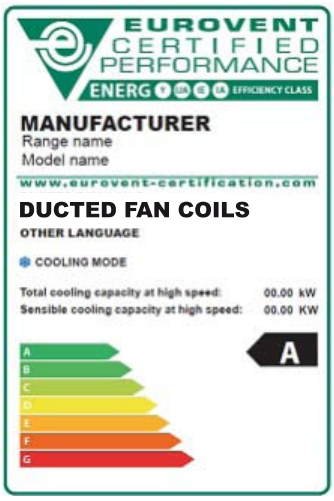


Figure 5. Eurovent Certification Fan Coil Units.

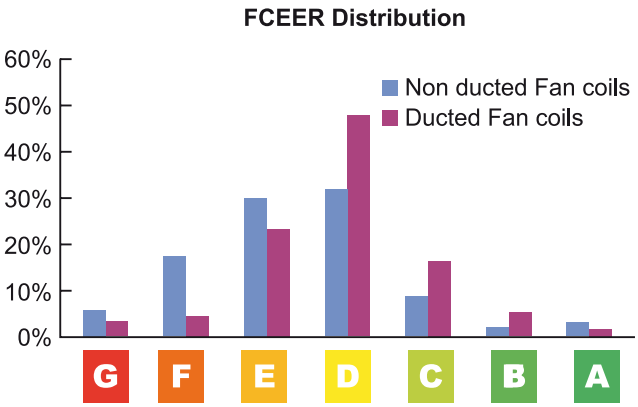


Figure 6. Distribution of Eurovent certified Fan Coil units in 2011 according to the energy classes.

It is important to note that a filter has to be chosen by designers firstly from the filter efficiency point of view according to the use. CEN standard EN 13779:2007 provides guidelines for good practice to this respect.

It is only when the filter efficiency class is defined that one can compare two filters which each other on an energy efficiency basis.

Interaction between EU labels and voluntary labels

EU labels accelerate the standardization process

The EU commission is able to send mandates to CEN in order to create or modify existing standards allowing supporting published directives. This was the case notably regarding the directives on air conditioners and heat-pumps which will be based on seasonal efficiency. The corresponding CEN standard EN 14825 has to take into account the method proposed by the directives and to include it. The new version of this standard has been published in 2012.

Table 3. Definition of Eurovent Energy classes for air filters.

Filter class	G4	M5	M6	F7	F8	F9
MTE	—	—	—	MTE ≥ 35%	MTE ≥ 55%	MTE ≥ 70%
	M_G = 350 g ASHRAE	M_M = 250 g ASHRAE		M_F = 100 g ASHRAE		
A	0 – 600 kWh	0 – 650 kWh	0 – 800 kWh	0 – 1200 kWh	0 – 1600 kWh	0 – 2000 kWh
B	> 600 kWh – 700 kWh	> 650 kWh – 780 kWh	> 800 kWh – 950 kWh	> 1200 kWh – 1450 kWh	> 1600 kWh – 1950 kWh	> 2000 kWh – 2500 kWh
C	> 700 kWh – 800 kWh	> 780 kWh – 910 kWh	> 950 kWh – 1100 kWh	> 1450 kWh – 1700 kWh	> 1950 kWh – 2300 kWh	> 2500 kWh – 3000 kWh
D	> 800 kWh – 900 kWh	> 910 kWh – 1040 kWh	> 1100 kWh – 1250 kWh	> 1700 kWh – 1950 kWh	> 2300 kWh – 2650 kWh	> 3000 kWh – 3500 kWh
E	> 900 kWh – 1000 kWh	> 1040 kWh – 1170 kWh	> 1250 kWh – 1400 kWh	> 1950 kWh – 2200 kWh	> 2650 kWh – 3000 kWh	> 3500 kWh – 4000 kWh
F	> 1000 kWh – 1100 kWh	> 1170 kWh – 1300 kWh	> 1400 kWh – 1550 kWh	> 2200 kWh – 2450 kWh	> 3000 kWh – 3350 kWh	> 4000 kWh – 4500 kWh
G	> 1100 kWh	> 1300 kWh	> 1550 kWh	> 2450 kWh	> 3350 kWh	> 4500 kWh

Voluntary labels prepare the work for EU regulation

In some cases voluntary labels precede the EU labels. In such cases it is obvious that the work of the commission is facilitated as an already existing scheme is in place and used by the industry. For example, some references to the Eurovent labels are present in the studies to set-up a European label for Fan Coils, Rooftops and Chillers. [**3**] However for these product groups, it is likely that no EU label will be defined. In this case voluntary labels are complementary to EU ecodesign directives.

Voluntary labels provide market data on energy efficiency

Voluntary energy labels like Eurovent Certification energy labels allow providing to EU commission useful data on energy efficiency. These data are crucial in order to prepare the most adequate regulation in terms of energy efficiency levels to be reached.

Case where EU labels and voluntary labels have different requirements

This case can be illustrated by the air conditioners up to 12 kW (AC1 programme within Eurovent Certification). As said before these products are in the scope of a labelling directive since 2002. This directive refers to a standard allowing 15% tolerance on energy efficiency. The corresponding Eurovent Certification programme considers a tolerance of 8% for exactly the same product. This means that some non certified products declared as class A can only be rated B within the corresponding Eurovent Certification programme due to the stricter tolerance for this programme. This situation is not easy to manage for a certification scheme as some manufacturers are tempted to leave the certification programme in order to gain one energy class.

Voluntary labels complete the market surveillance activity

Member states have the responsibility of the market surveillance regarding the Labelling directive. This market surveillance consists of checking the declaration of the performance of the products (correct labelling display on site) but also perform product testing. According to a study carried in 2009 by the Fraunhofer institute [**4**] it can be estimated that between 0 and 10 tests are performed per year on air conditioners up to 12 kW. At the same time, a voluntary third party certification scheme like Eurovent Certification performs more than 120 tests per year since 2000 on this type of products.

Given this role sharing out, market surveillance activities from member states should focus on non-certified products in order to complete the testing activity of voluntary certification bodies.

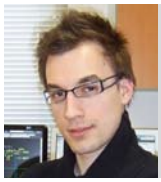
Conclusion

Energy efficiency labelling is a boiling subject. The impact it has on customer behaviour makes it a powerful marketing tool but also more and more a powerful regulation tool. Both public and private sector can be at its initiative. We have seen that the two approaches were complementary if well coordinated. EU labels provide an impetus to standardization work at the European level whereas voluntary certification labelling schemes can accelerate the work of creation of EU labels if they are created before and allow for a given pool a products to have accurate market surveillance as soon as the EU label is put in place. Finally regarding market surveillance activity there is a clear possibility to have coordination between the two approaches in order to benefit from their complementarities.

[**3**] "Ecodesign Preparatory Study ENTR Lot 6 Air Conditioning and Ventilation Systems" Task 1 Lot 6, http://www.ecohvac.eu/documents.htm

[**4**] Survey of Compliance Directive 92/75/EEC (Energy Labeling), Fraunhofer Institute (2009)

Thermal and acoustic comfort requirements in European standards and national regulations



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Summary

This paper presents some results from the Work Package 5 in the HealthVent project supported by the European Commission. One of the objectives of the project has been to review and critically evaluate the requirements on thermal and acoustic comfort requirements in national building codes and European standards. The data in national legislation and codes were collected in spring 2011 from 16 European countries with questionnaires, which were sent to project partners and trusted experts on ventilation.

The requirements on indoor temperature, air velocity, humidity, and noise levels were all found very inconsistent. Indoor air temperature in summer range from 25 to 28°C and 15 to 21°C in winter. Maximum air velocities vary from 0.15 to 0.30 m/s and in many regulations the limits do not depend on the air temperature. Limit values for air humidity are almost consistently 30% r.h.in winter and 70% r.h.in summer. Noise requirements follow the pattern of other observed requirements and vary in a wide range. Moreover, they are further complicated because they are given in three different units, which cannot be compared.

A common European regulation based on existing European Standards would help to establish uniform requirements for thermal en acoustic environment in Europe, which would also benefit industry by i.a. reducing the construction cost of HVAC systems.

Introduction

This article is the second and last from the series of articles about indoor environmental requirements in European Standards and national regulations. While the first article published in January 2012 issue of the REHVA Journal focuses on requirements for ventilation rates and indoor pollutant levels, this issue focuses on requirements for temperature, draft, humidity, and noise.

Like the previous article from the January 2012 issue of the REHVA Journal, this one also presents some of the results from the work performed in the HealthVent project [**1**], supported by the European Commission. The objective of the HealthVent project is to develop health-based ventilation guidelines for the EU. Members of the project group are experts from different disciplines from 9 European countries. One of the objectives of the project was to review and critically evaluate the existing requirements on ventilation and IAQ defined in building codes and European standards. The project's focus was set on ventilation rates, pollutants, noise, temperature and relative air movement in dwellings, offices, schools and kindergartens.

Results

Information on national regulations and practice in European countries were collected with a special questionnaire that was sent to project partners and trusted experts on ventilation in several European countries. The questionnaire comprised of 10 questions and subquestions. Respondents were asked to provide values of ventilation rates, indoor temperature and relative air velocity limits, noise levels, etc., which can be found in the national regulations. In case if no such values existed in the regulations, they were asked to provide values which are most widely used in practice (from standards, guidelines, etc.). In the responses they had to mark if the provided value is mandatory or voluntary to use. Questionnaires were returned by respondents from 16 countries (**Table 1**) in spring 2011.

In order to distinguish whether the data presented in the following diagrams is mandatory or not to use, the following applies: values in charts and tables, which are given in normal letters, are published in regulations and are therefore mandatory to be used. Values which are underlined and given in italic letters are only suggestions

[**1**] HealthVent project website: www.healthvent.eu

Table 1. Country abbreviations used in charts.

BG	Bulgaria	GR	Greece	PL	Poland
CZ	Czech Republic	HU	Hungary	PT	Portugal
		IT	Italy	RO	Romania
DE	Germany	LT	Lithuania	SI	Slovenia
FI	Finland	NL	Netherlands	UK	United Kingdom
FR	France	NO	Norway		

in regulations, or published in guidelines and standards, which are voluntary to use.

Thermal and comfort requirements

The results for indoor temperature limits and relative air velocity limits in summer and winter show that values are very inconsistent among European countries (**Figure 1**).

Temperature limits for summer vary from 28 to 25°C and in winter from 15 to 21°C. It is important to note that an optimum indoor air temperature is important factor for learning performance of children [1] and performance of employees in offices [2]. Summer limit of 28°C seems to be too high from that point of view since considerably reduces performance. It is interesting to see that Finland, which is a country with coldest climate among included countries, has the highest limit of the winter minimum temperature. On the other hand, Finland has also the lowest summer design temperature, thus making it the country with the set temperature limits which are the closest match of the optimum values. One can notice that the minimum air temperature limit is prescribed more countries than maximum air temperature limit. The recommended values in EN15251:2007 are 20°C and 26°C for winter and summer, respectively. A comparison with the values from the national regulations shows that seven countries have at least one temperature limit set under out of the recommended range by the EN standard. Winter minimum temperatures are more problematic since there are 6 out of 16 countries that have minimum temperature requirement below 20°C.

Maximum air velocities were also found to be inconsistent among countries. They vary from 0.15 to 0.30 m/s. Majority of regulations only prescribe maximum air velocity but not also the temperature of air at that velocity, which has a big influence on the perceived comfort of the person that is exposed to the draft. Limits of air velocities are not prescribed as often as temperature limits since requirements exist in only 6 out of 16 countries.

Limits values of air humidity follow the pattern of temperatures and air velocities and but are slightly more consistent (**Table 2**). They are expressed as relative humidity (%) or absolute humidity (g/kg). Lower limits are constantly at 30% while higher limits are 70% in all cases except one, where it is 75%. Humidity level is given in terms of absolute humidity to limit the highest amount of water in the air and is in both cases the same, i.e. 12 g of water per one kg of air.

Noise requirements

Limit noise levels as defined in European regulations and standards are very inconsistent, which coincides with findings on temperature, air velocity and humidity limits. Inconsistency is present also in the use of units since countries use maximum level (L_{AFmax}), equivalent level (L_{eq}), and noise rating curves (*NR*). Due to the dif-

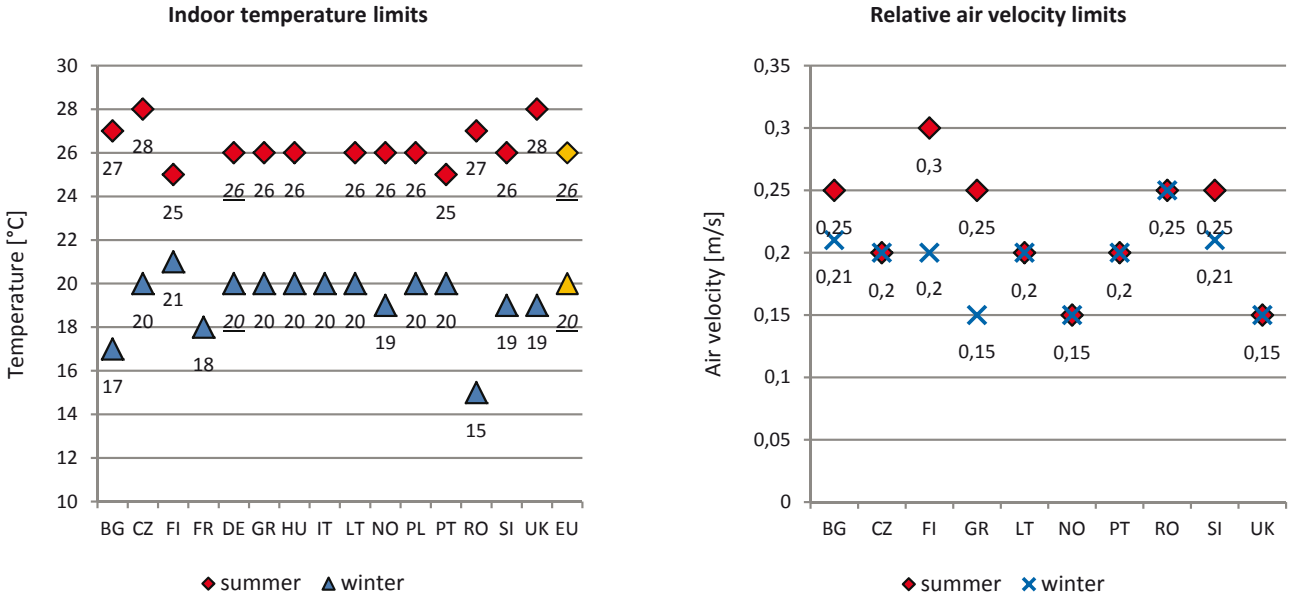

Figure 1. Comparison of requirements for indoor temperature (left) and relative air velocity (right). Markers in yellow colour designate the recommended values from EN 15251:2007 (category II).

Table 2. Limit values of air humidity.

Country	Limit value for humidity of indoor air
Czech Republic	30 -70% RH
Finland	no humidification above 45% RH
Germany	*max 12 g/kg*
Greece	winter max: 40% RH summer max: 45% RH
Hungary	30 - 70%
Italy	*45-55%*
Lithuania	max. 75% RH
Norway	only recommendations to prevent dampness and mold growth
Romania	for 20 - 27°C RH = 30 - 70% upper max 12 g/kg
Slovakia	30 - 70% RH
Slovenia	30 - 70% RH

ferent definitions used in the definitions of the three units, they are not directly comparable.

Minimum given equivalent level for bedrooms in dwellings is 28 dB(A) eq and minimum given instantaneous level is 25 dB(A). Maximum levels are 35 dB(A) eq and 40 dB(A). Lower limit values for classrooms and playrooms are in comparable range and also higher than in bedrooms. Range for equivalent levels (min – max) is 28 to 40 dB(A) eq, and for instantaneous levels 30 to 45 dB(A). Values in offices are (min – max) for equivalent levels 33 to 45 dB(A) eq and for instantaneous levels 35 to 50 dB(A). Differences min – max are big in both cases, equivalent and instantaneous. It seems that in average, equivalent levels are usually 5 dB lower than instantaneous levels.

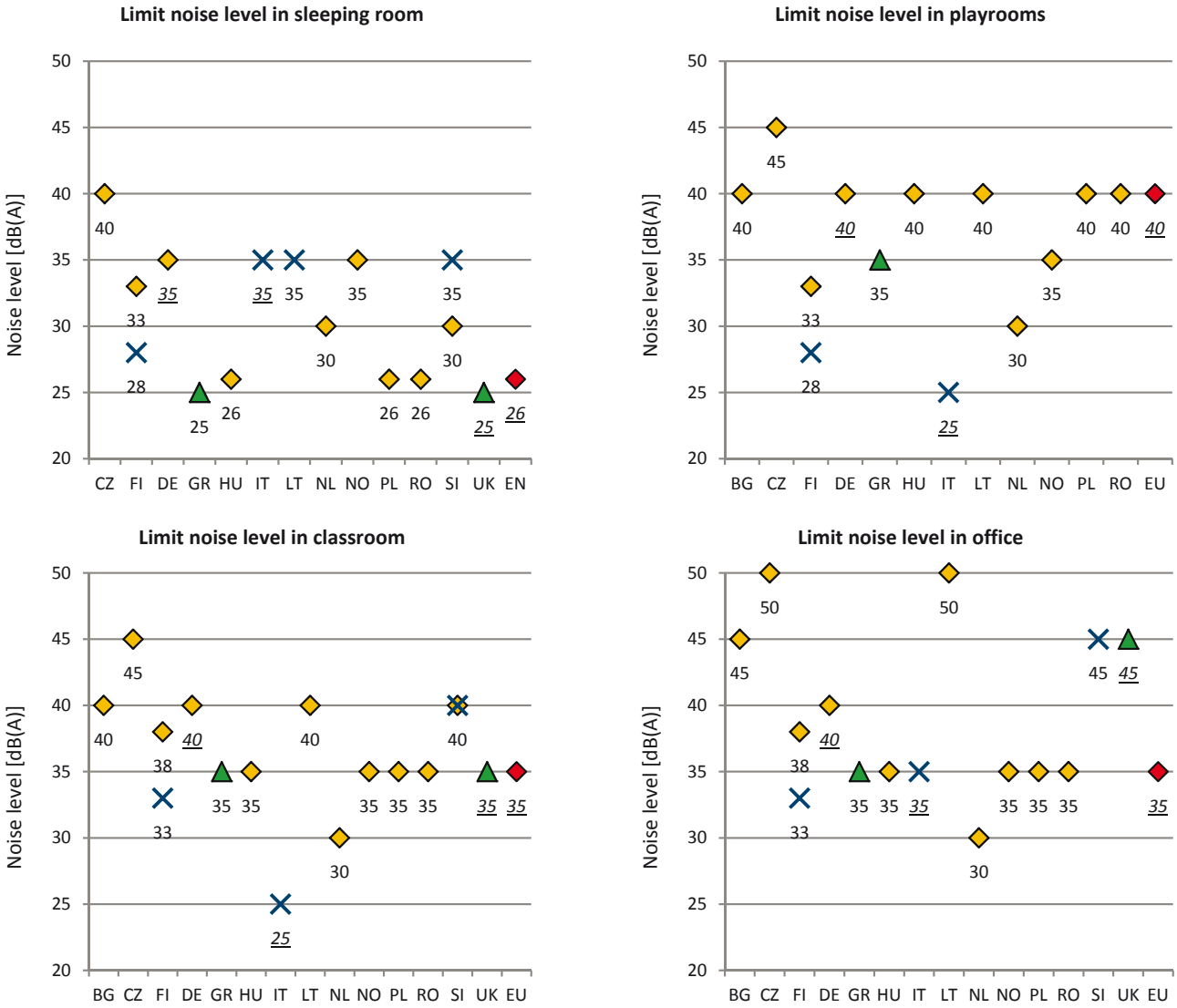

Figure 2. Comparison of requirements for limit noise levels. Markers in red colour designate the recommended values from EN 15251:2007. ◇ LAFmax ✕ Leq △ NR

In comparison to the values, which are recommended by the EN 15251, many of directly comparable limit values (given as instantaneous sound power levels) are too high. In the sleeping room, where EN value is 26 dB(A) the highest limit is 40 dB(A). Recommended level in classroom of 35 dB(A) is exceeded only by one country, while the recommended limit in classrooms in exceeded six time and for maximum 10 dB(A). The recommended limit for offices of 35 dB(A) is exceeded five times. The comparison of values in regulations and European Standard clearly shows that in general the noise limits are set to high. In the case of too high ventilation noise building occupants, especially in family houses or apartments, tend to reduce the fan speed or even turn off the ventilation, which results in poor indoor air quality.

Conclusion

The data was collected from 16 countries from all parts of Europe, thus giving a good coverage of regions with different building practice and climate. Questionnaires were returned by respondents in spring 2011, i.e. about two years ago. Since regulations are periodically a subject of modifications some of the presented data may now already be obsolete. Although the respondents are experts on ventilation, a certain measure of uncertainty exists regarding the accuracy of the collected data. Due to limited resources, all data could not be verified. Due to these limitations the nature of data presented in this article is informative and should not be used in practice.

Despite some limitations in the reliability of collected data it is clear that the values found in regulations are inconsistent and missing in regulations of some countries. We can conclude that common European regulatory values are needed for thermal and acoustic environment. European Standards, if properly applied, should already ensure no problems with thermal and acoustic environment (good practice). They already cover a significant part of the elements which should be respected during design of ventilation systems. National regulations, on the other hand, do not regulate all the elements of thermal and acoustic environment. Moreover, the values are inconsistent and vary in a wide range. A common European regulation based on existing European Standards would help to establish uniform requirements for thermal en acoustic environment in Europe, which would also benefit industry by i.a. reducing the construction cost of HVAC systems.

Acknowledgements

The HealthVent project is partially sponsored by the Executive Agency for Health and Consumers (EAHC) through the grant agreement n° 2009 12 08. REHVA thanks the project partners and other national experts for submitting the data on national regulations.

References

[1] Wargocki P., Wyon D. P. (2007). Ventilation and Health in Nonindustrial Indoor Environments. Report from a European Multidisciplinary Scientific Consensus Meeting. Indoor Air, vol. 12, no. 2, pp. 113-128.

[2] Lan L., Wargocki P., Lian Z. (2012). Optimat thermal environment improves performance of office work. REHVA European HVAC Journal, vol. 49, no. 1, pp. 12-17.

[3] EN 15251:2007. Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics. European Committee for Standardization (CEN).

Hybrid heat pumps

– saving energy and reducing carbon emissions

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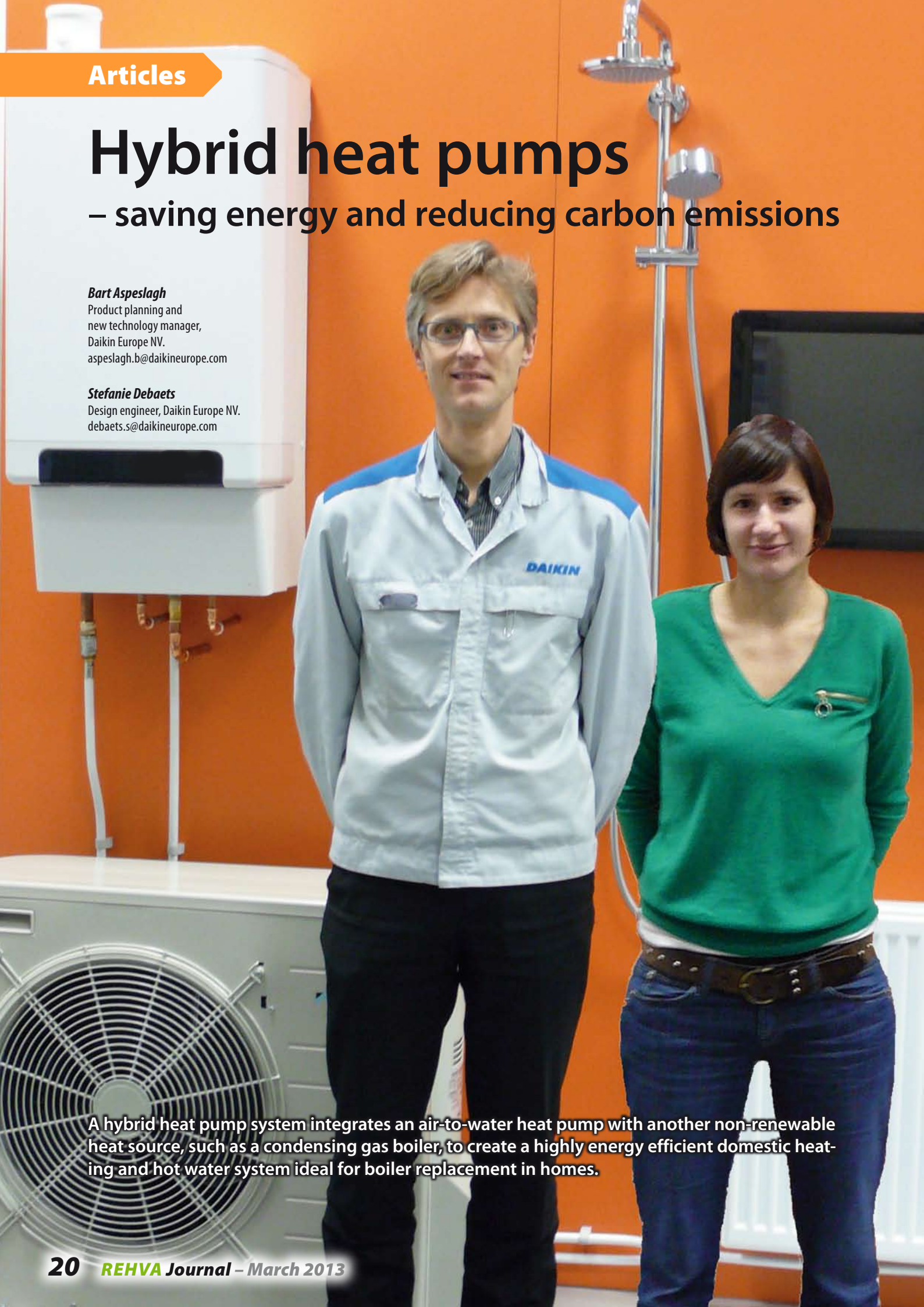


A hybrid heat pump system integrates an air-to-water heat pump with another non-renewable heat source, such as a condensing gas boiler, to create a highly energy efficient domestic heating and hot water system ideal for boiler replacement in homes.

Background

About 40% of all energy consumed in the EU is in the home, of which space heating and hot water production account for 70% of the primary energy use in dwellings. With the majority of the 122 million homes in the EU being heated by combustion of fossil fuels, a heat generating system that could improve domestic energy efficiency significantly has the potential to deliver dramatic reductions in primary energy consumption and CO_2e emissions throughout the EU.

At the same time, a heat generator needs to be affordable for the vast majority of the EU's population, particularly in the face of the continued debt crisis, expected to last for another five years, and the reduction, or even complete cutting, of financial incentive schemes for renewable energy installations.

Additionally, any heat generation needs to be flexible enough to be installed easily in the wide range of house types across the EU, many of which use radiators with water flow temperatures of up to 80°C.

The Daikin Hybrid heat pump

Daikin's Hybrid heat pump meets all of these pre-conditions and has no major limitations because it combines two proven and well-established technologies: a heat pump that uses air as renewable energy source and a condensing gas boiler. A hybrid system can produce water flow temperatures from 25°C up to 80°C, making it suitable for any type of heat emitter, including underfloor heating and radiators.

Thanks to its excellent environmental performance, its suitability for a wide range of house types and its fairly low installation and equipment costs, the hybrid heat pump has the potential to help meet the EU's ambitious environmental 20-20-20 targets of achieving a 20% cut in greenhouse gas emissions compared with 1990 levels; a 20% increase in the share of renewables in the energy mix; and a 20% reduction in energy consumption by 2020 (*EU Directive for Renewable Energy, Directive 2009/28/EC*).

How the Daikin hybrid system operates

The intelligent hybrid heat pump from Daikin measures the outdoor temperature, automatically adjusting the flow temperature to the emitters and calculating the efficiency of the heat pump. The system continuously evaluates whether or not the efficiency of the heat-pump is higher than that of the condensing gas boiler. Based upon this evaluation, the energy source is selected, ensuring the most efficient heat source is being used at any one time. As shown in **Figure 1**, the height of the heating season in Western Europe corresponds to an outdoor temperature of approximately 4°C.

Daikin has developed a unique and patented algorithm which reduces energy consumed by the boiler because water is pre-heated by the more efficient heat pump. This intelligent interaction between the two systems is the difference between a true hybrid system and a bivalent system. This hybrid operation mode increases energy efficiency by approximately 10%, compared with a condensing gas boiler, at outdoor temperatures from –2°C to 3°C.

There are three operating conditions (see **Figure 1**):

- **Heat pump only:** For about 60% of the year, when outdoor temperatures are "mild", the heat pump will supply energy for space heating. The primary energy based efficiency in this mode is about 1.5.
- **Hybrid operation:** For about 20% of the year, when outdoor temperatures are between –2°C and 3°C, the heat pump and condensing gas boiler work together to provide energy for space heating. The system efficiency is about 1.0 in this mode.
- **Boiler only:** When outdoor temperatures are below –2°C (for about 20% of the year) the condensing gas boiler provides the energy for space heating.

Across the year, the overall weighted primary energy efficiency is between 1.2 and 1.5, which is 30 to 60% higher compared with the best gas condensing boiler on the market –currently considered as the best available technology for replacing traditional heating systems in refurbishment projects.

The above scenario is valid for a typical house in Western Europe equipped with radiators and water flow temperatures of 60–70°C. Obviously, efficiency will increase if water flow to the emitters is at lower temperatures. This means that, as insulation of building envelopes becomes ever-more effective, lower water flow temperatures will be sufficient to heat homes, making hybrid heat pumps even more suitable.

Domestic hot water production

Domestic hot water is produced by the condensing gas boiler. However, it is possible to pre-heat the hot water using the heat-pump (see **Figure 2**). In such cases,

a storage tank is required. The system can also be used in combination with solar thermal panels for hot water production.

The condensing gas boiler in Daikin's hybrid system has a unique 'dual pass heat exchanger' which allows direct heating of hot water through gas combustion. As a consequence, flue gas is condensed not only through space heating but also through hot water production. This increases efficiency in hot water production up to 20%, compared with a conventional condensing gas boiler.

Energy efficiency

The hybrid system delivers high levels of energy efficiency in space heating because it uses the most efficient air-to-water inverter driven heat pump on the market (COP of 5.04, at water temperature 35°C, delta-T of 5K and outdoor temperature of 7°C), combined with Daikin's patented Hybrid operation mode.

In domestic hot water production, high efficiency is achieved through the unique dual pass heat exchanger which enables condensation of the flue gases. Ultimately, this efficiency can be enhanced further by heat pump pre-heating and use of solar thermal panels.

Environmental performance

Daikin's Hybrid system achieves excellent environmental performance because of its highly efficient operation.

Primary energy efficiency is between 1.2 and 1.5, compared with real-life performance of approximately 0.9 for a gas condensing boiler. However, the CO_2e emission-savings are highly dependent on the country where the hybrid system is being used, relating directly to the country's energy mix used for electricity production. For example, a house in London consuming 18 000 kWh for space heating annually would produce CO_2e emissions savings of 1.5 tonnes/year.

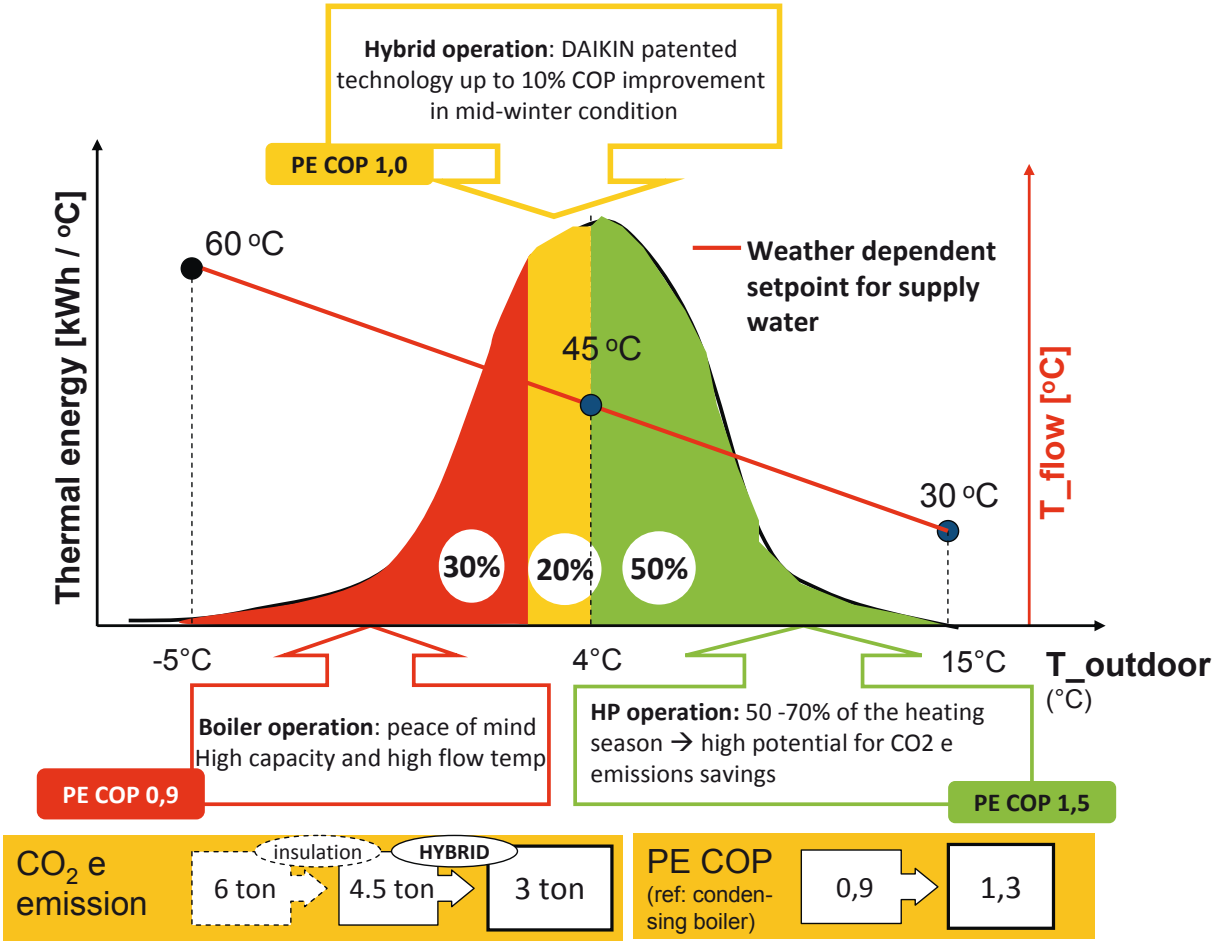


Figure 1. Distribution of space heating energy in London climate depending on outdoor temperature. Supply water temperature to heating system is controlled by outdoor temperature. PE-COP = Primary energy efficiency. Typical value for cold season is 0.9, for warm season 1.5 and for mild weather with hybrid operation 1.5.

The total CO_2e emissions in the EU from space heating are estimated at 750 Mtonnes/year, based upon an average space heating energy demand of 20 000 kWh/yr. If conventional heat generators were replaced with hybrid heat pump systems, the savings would be an estimated 200 Mtonnes of CO_2e annually. This technology has the potential to produce 25% of the CO_2e emission savings targets in the EU Energy Directive, being 250 times more effective when compared with implementing renewable energy sources in all new build homes.

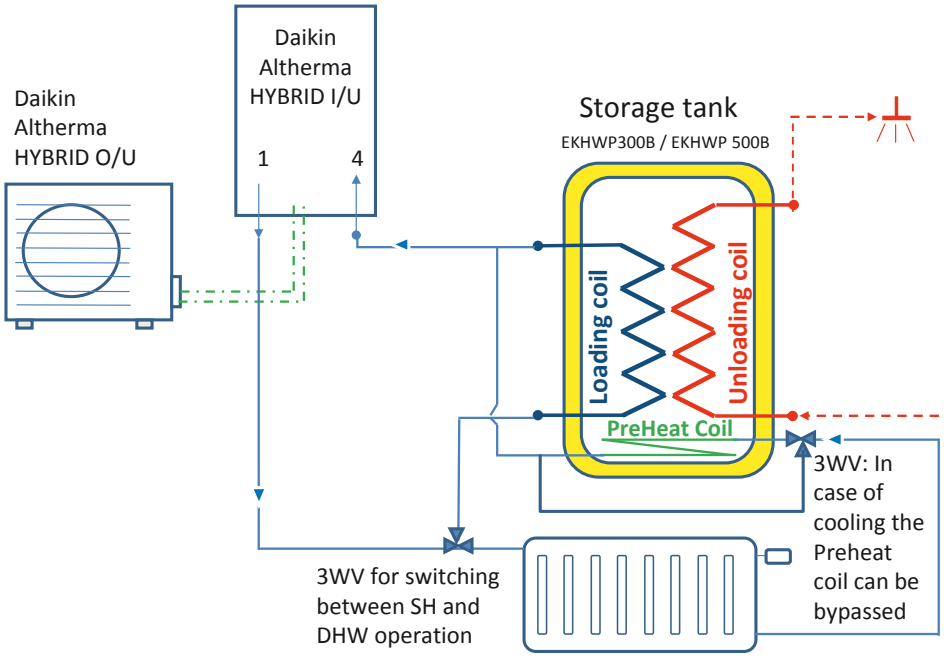


Figure 2. Domestic hot water can be preheated with heat pump in hybrid Altehrma system. **1**= SH supply water, **4** = SH return water, SH: Space Heating, DHW= Domestic Hot Water. Loading coil = coil for heating up the tank with an external heat source, Unloading coil = coil for tapping water, Preheat Coil= small coil for preheating.

The hybrid heat pump is not only a pragmatic solution because it combines the best of two proven technologies in an intelligent way, it is also the most affordable renewable energy source available.

About 70 to 80% of the energy supplied for space heating by the hybrid heat pump is produced through using air as a renewable energy source.

The price of renewable energy produced by the hybrid heat pump is about 1.7 €c/kWh RE. This based upon 15 000 kWh of space heating being produced by the heat pump per year. The power input of the heat pump is about 4 000 kWh/year and the renewable energy produced by the Hybrid is 11 000 kWh/year. This calculation also takes into account an operation span of the hybrid heat pump of 12 years (lifetime expectancy is 15 years) and a price premium of the hybrid heat-pump over a gas condensing boiler of 2 250 €.

In comparison, the cost of renewable energy produced by solar PV is nine times higher, at 16 €c/kWh, based upon 1 kWpeak PV costs of 3 500 € with a yield of 1 100 kWh. For solar thermal systems, the cost of renewable energy is 12.5 €c/kWh, or seven times higher than the hybrid system. This is based on four panels costing 2 500 €, with a yield of 1 000 kWh/year (in a typical German climate).

The hybrid heat pump is not only the best performing renewable energy source in terms of running costs, it also has the lowest capital cost. The cost of a hybrid heat pump is between 1 500 and 3 000 € more than a gas condensing boiler, while cost of a solar PV installation varies between 10 000 € and 20 000 € and the cost of a solar thermal system is between 2 000 € and 5 000 €.

The Hybrid heat pump system's major components

The Daikin hybrid heat pump system consists of three main components (**Figure 3**):

The outdoor unit transmits the renewable energy extracted from the air to the indoor unit (hydrobox). The compact and whisper-quiet outdoor unit contains the inverter driven compressor, which has a modulation ratio from approximately 20 to 100%. In partial load conditions, the outdoor heat exchanger is over-sized which increases the efficiency by up to 30%. The outdoor unit can be placed in a garden, mounted on a wall or on the roof, up to 20 m from the hydrobox.

The hydrobox is mounted on the wall behind the condensing boiler. As well as the controls for the system, it contains the water-side elements of the system, such as the expansion vessel and pump, and also the heat ex-

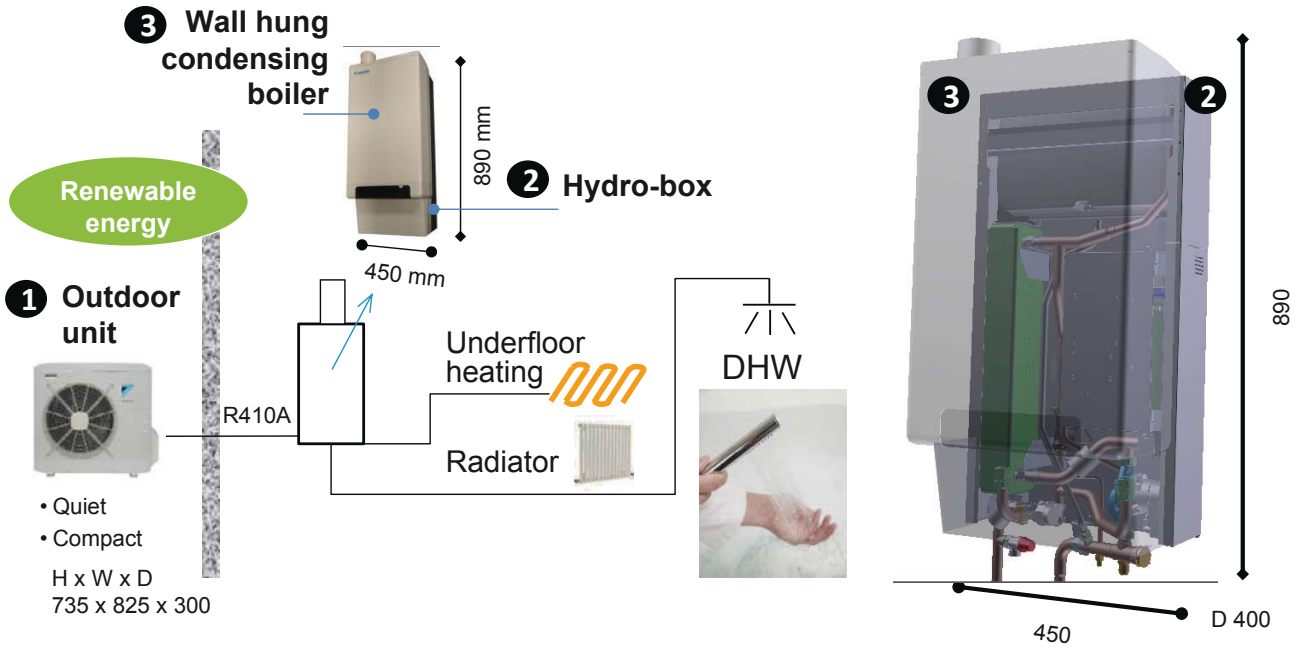


Figure 3. Major components and dimensions of hybrid heat pump system.

changer, which converts the renewable energy extracted from the air into hot water.

The condensing gas boiler is mounted in front of the hydrobox. The combined dimensions of the boiler and the hydrobox are about the same as a conventional wall-hung boiler, making the system ideal for the replacement boiler market.

Figure 4. The HYBRID heat-pump system was tested in this 110 year old, terraced UK house during winter 2011-12. A family of three lived in the building with heated floor area of 140 m^2. The house was heated with hot water radiator system with design supply temperature of water 70°C in design outdoor temperature of –6°C.

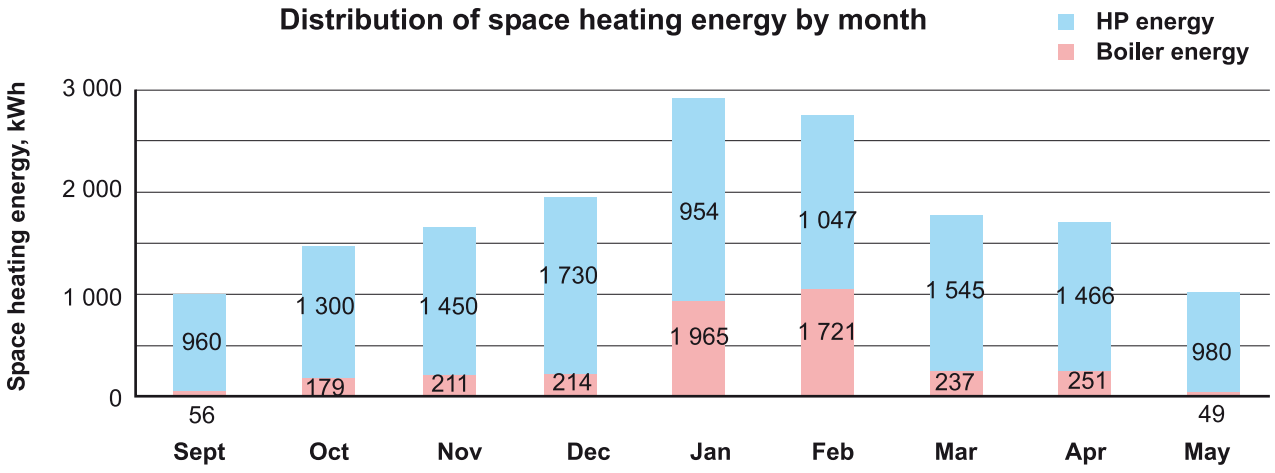
Field testing

The Daikin hybrid heat pump has been field tested in various climates and house types (size, age, and energy rating) with a range of different heat emitters. Seasonal efficiencies measured during the winter of 2011-12 varied between 1.25 and 1.6.

An example of this field testing in a UK home is shown in **Figure 4**. This house can be considered a 'worst case' scenario: it is 110 years old, with high flow temperatures to the radiators. The house has a floor area of 140 m^2 and a heating capacity of 9 kW at a design temperature of –6°C.

The annual energy demand is approximately 18 500 kWh, of which 16 300 kWh is used for space heating and 2 100 kWh for hot water production. Results from the trial of the hybrid system show that of the 16 300 kWh used for space heating, 13 060 kWh was produced by the heat pump (see details in **Figure 5**).

This example demonstrates clearly that, even in older properties with radiators, the heat pump in a hybrid system will supply most of the energy for space heating,



with the boiler acting as a 'supporting' heat source. In fact, the hybrid system is suitable for any house type: small or large, young or old, with underfloor heating or radiators.

The measured seasonal efficiency in the house, based on the primary energy source, is 1.26 for space heating and 1.2 for the total energy supply (space heating and hot water production combined). This is 37% higher than a state-of-the art gas condensing boiler, based on an efficiency of 0.9 for space heating operation (seasonally based) and 0.7 for domestic hot water.

The hybrid heat pump's efficiency is also 28% higher than a system comprising a condensing gas boiler with solar thermal panels for hot water production, which is generally considered 'best available technology'. Assuming 50% of the hot water is produced by the solar thermal panels (solar pump energy not being taken into account), the seasonal efficiency of such a system would be 0.94.

Smart grid ready

Besides the excellent comfort and top efficiency of a hybrid heat-pump system, we'd like to add that the system is the perfect tool for electricity grid management. Depending on the load of the grid, the system can switch between boiler and heat pump operation. At the moment, switching between the heat pump and boiler in the Daikin Hybrid heat pump is carried out via a voltage free contact, but in the future it is envisaged that a smarter solution can be embedded, for example based smart meters that are linked to the grid.

The hybrid heat pump – the heat source of the future

The hybrid heat pump can be considered as the heat source of the future: environmentally-friendly, able to cope with the complexities of energy mix and supply, while remaining easy to operate and ensuring comfort for end-users.

Regardless of energy prices, changing outdoor temperatures and the varying load of the heat pump, the hybrid system determines the most efficient and effective energy source to use, all while maintaining consistently high comfort levels.

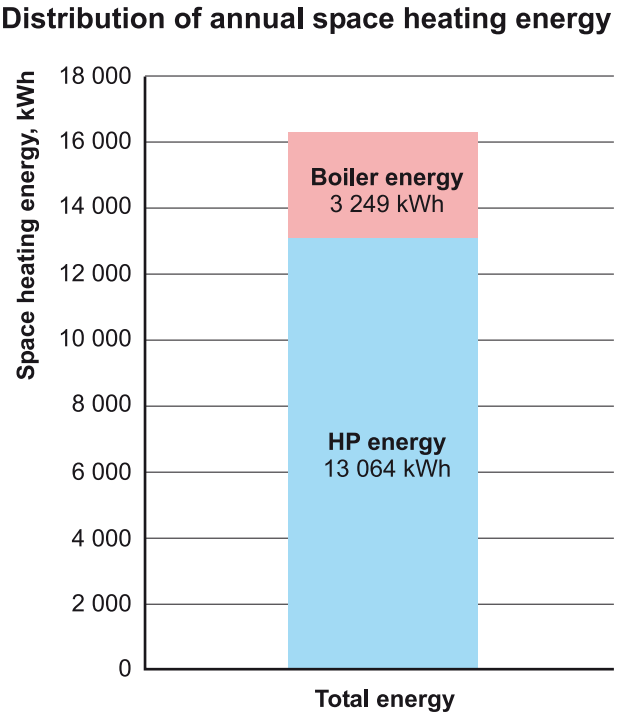


Figure 5. Monthly and annual distribution of the space heating energy between heat pump and boiler in the house of Figure C4 during winter 2011-12.

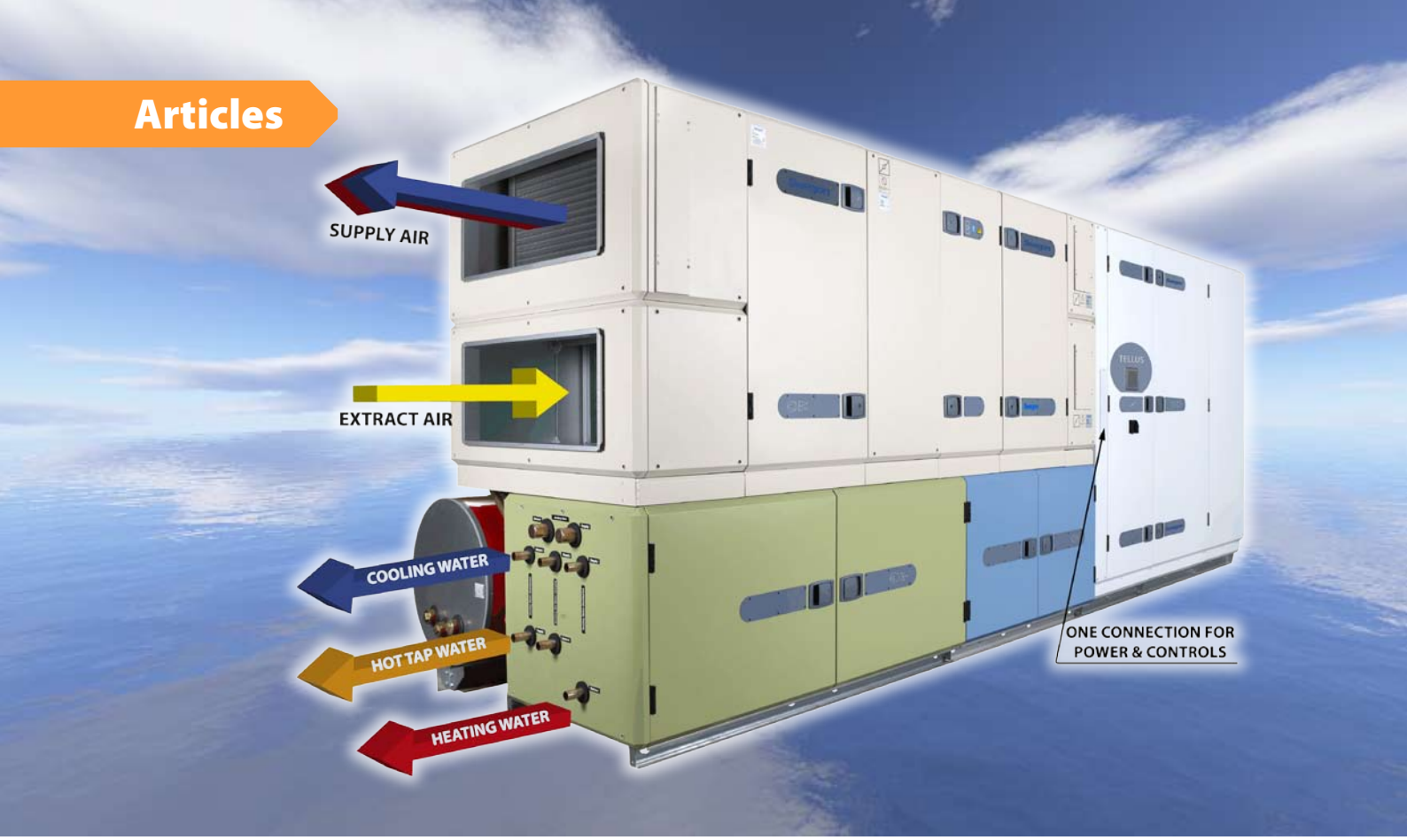


Figure 1. TELLUS Climate system from Swegon is a complete, modular system product for the production of ventilation, heating, cooling and hot tap water. Its four modular blocks are: Air Handling Module (light brown), Hydronic module (greenish), Chiller&Heat Pump Module (blue) and Energy Exchange Module (white).

Holistic approach creating the best comfort using the least energy

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Swegon TELLUS – The next step for multifunctional HVAC units

For the past seven years Swegon has focused on system development and system products, realising that many improvements in comfort and energy saving can only be achieved by a holistic approach.

TELLUS is a complete HVAC and energy plant producing acclimatized air, waterborne cooling, heating and hot tap water all at the same time or independently of each other. Due to the integrated, modular design energy efficiency is increased and acclimatisation costs are dramatically reduced.

The production sites, R&D centres and laboratories of Swegon comprise production of heating, cooling and ventilation, flow control and indoor climate products. Four of these sites where actively involved in the design of TELLUS.

The first units were displayed in the spring of 2012, at the international HVAC fairs Nordbygg in Stockholm and Mostra Convegno in Milano.

The target for the development was to make a boxed product with a minimum of external interfaces that could satisfy the total indoor climate needs of commercial

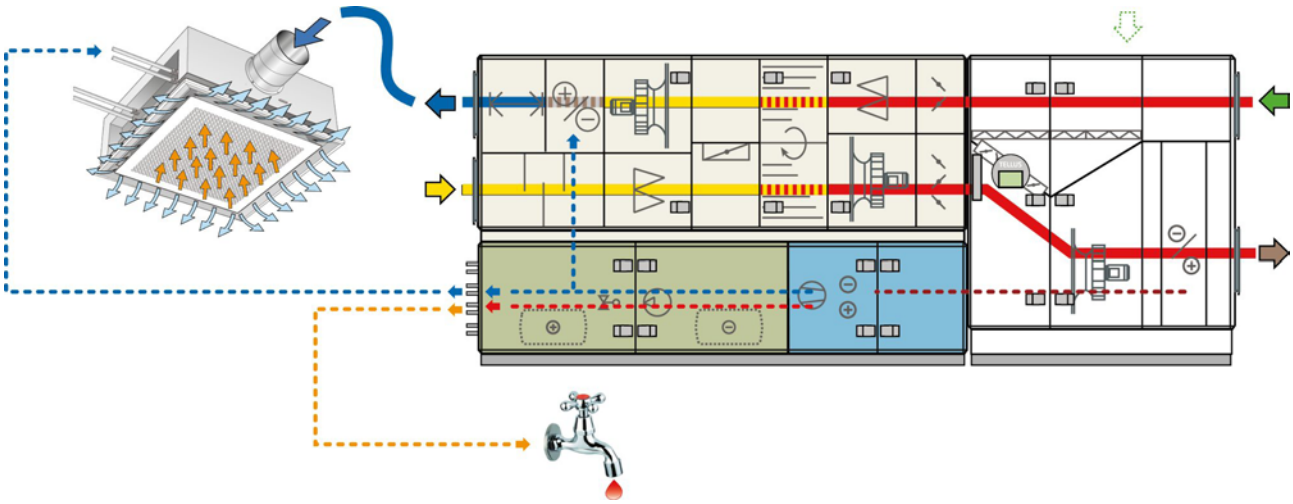

Figure 2. Example for cooling and hot tap water need, daytime. Air Handling Module (light brown), Hydronic module (greenish), Chiller&Heat Pump Module (blue) and Energy Exchange Module (white).

buildings between 600 m² and 4 000 m², in European climate conditions.

Highest priority is always to obtain the desired comfort with the least amount of purchased energy. An integrated system enables demand control of temperatures and flows for all energy transfer in the building.

- **Firstly**, running conditions for compressors and fans are improved when over-/under temperatures and high airflows are avoided.
- **Secondly**, energy losses resulting from high pressures across regulating devices such as dampers and valves are minimised when production matches demands.
- **Thirdly**, it is possible to provide efficient energy recovery and redistribution of the energies supplied and retrieved from the building. Thermal energy of extracted air is fully recovered and utilised to meet simultaneous heating and cooling demands.

Operation Swegon TELLUS

TELLUS is a complete, modular system product for the supply of ventilation, heating, cooling and hot tap water. All these energies can be produced simultaneously or independently from each other, according to the actual demand.

TELLUS suits buildings between 600–4 000 m² due to its cooling capacity between 25–82 kW, heating capacity between 12–60 kW and air volumes between 1 000–16 000 m³/h. TELLUS can be used in regions with outdoor temperatures between +45°C and –20°C and can be placed indoors or outdoors.

Besides conditioned supply air, TELLUS provides cooling water for comfort modules, chilled beams or fan coils and heating water for comfort modules, radiators or under-floor heating.

Swegon TELLUS consists of 4 modules that can be combined in different sizes to suit the energy need of different projects (see **Figure 1**).

General principle

The outdoor air passes through ducts, or in outdoor version, directly through the Energy Exchange Module (green arrow and read line in **Figure 2**). Subsequently, the air passes through the Air Handling Module where it is filtered, preheated or cooled by the hygroscopic rotor. It then passes through a change-over coil for desired supply air temperature.

The Hydronic Module distributes warm and cold brine from the Chiller & Heat pump Module to the warm and cold internal 500 litre tanks, to the change-over coil and the heat exchangers between TELLUS and the secondary circuit for the building (waterborne cooling, heating and hot tap water). Hot tap water is optional and one or multiple hot tap water tanks can be installed in cascade. The brine flows through the coil in the Energy Exchange Module, where it absorbs or emits heat. Warm and cold brine are produced by the Chiller

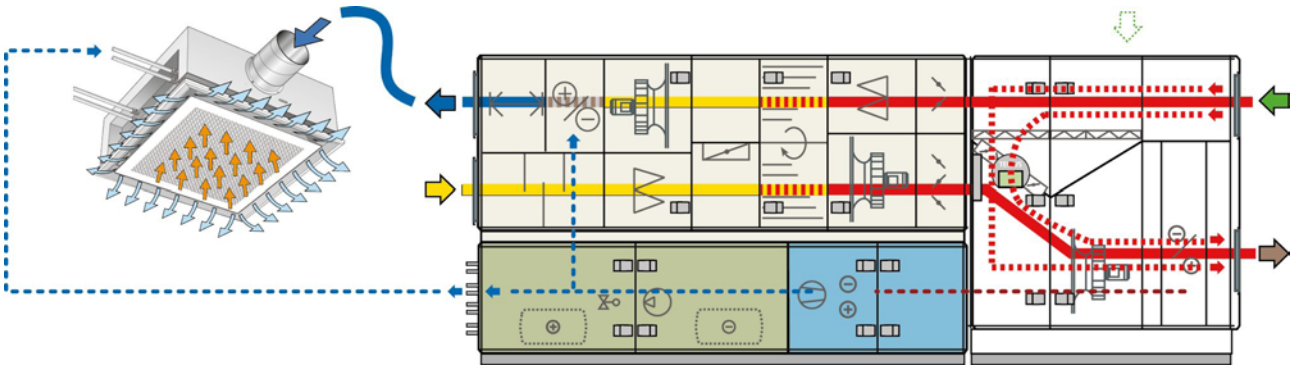

Figure 3. Example for boosted cooling need in summer, daytime. Air Handling Module (light brown), Hydronic module (greenish), Chiller&Heat Pump Module (blue) and Energy Exchange Module (white).

& Heat Pump Module with two tandem vapor injection Copeland compressors.

The Chiller & Heat Pump Module, that uses R410 as a refrigerant, can be considered as a "water-water unit" when stand-alone, together with the Energy Exchange Module as an "air-water unit" and together with the Hydronic Module as a multifunctional unit.

Operation mode for peak cooling periods

The coil in the Energy Exchange Module receives the extract air passing through the Air Handling Module; but due to the fact that air volumes normally are demand controlled and limited to the actual need of air changes in the building, the amount of air passing over the coil is not sufficient to heat and cool the entire building. For this reason the Energy Exchange Module is fitted with a circulation damper that allows up to three times as much air volume over the coil than the maximum extract air from the building (**Figure 3**).This function is patent pending and allows to get rid of the excess heat in summer and sufficiently retrieve energy from the air at winter time.

Operation for simultaneous cooling and heating

Swegon TELLUS can supply heating and cooling independently or, like in the example in **Figure 4**, both at the same time. During spring and autumn there are periods when many buildings have a simultaneous heating and cooling need. In this case the cold water for climate beams is available at the same time as the heating for e.g. radiators and hot tap water. The pri-

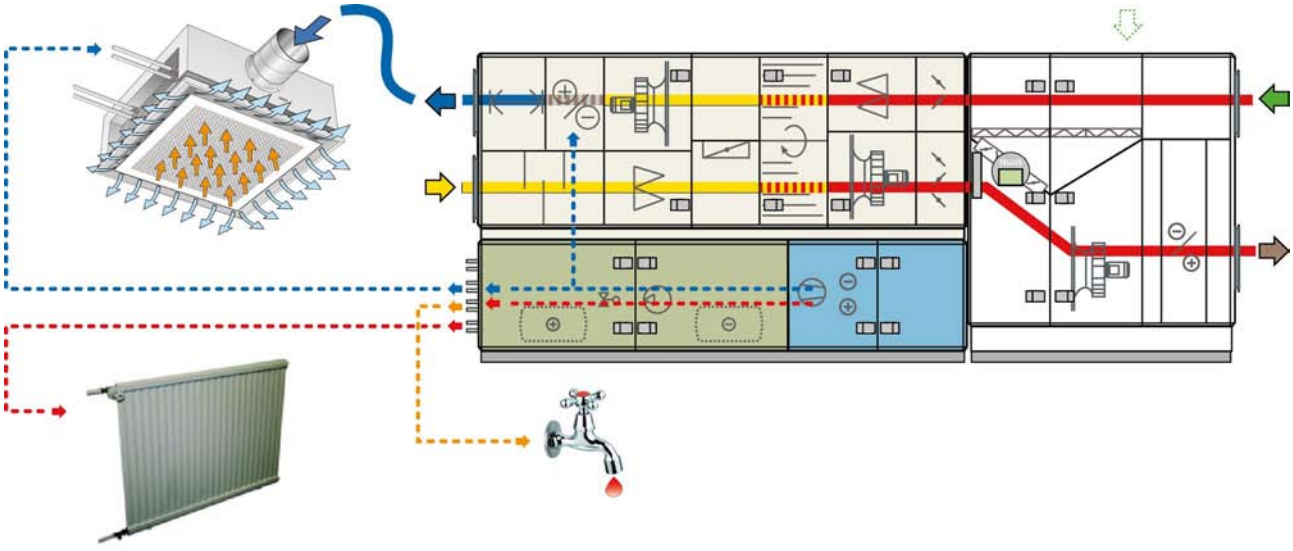

Figure 4. Example for cooling, heating and hot tap water at the same time, daytime. Air Handling Module (light brown), Hydronic module (greenish), Chiller&Heat Pump Module (blue) and Energy Exchange Module (white).

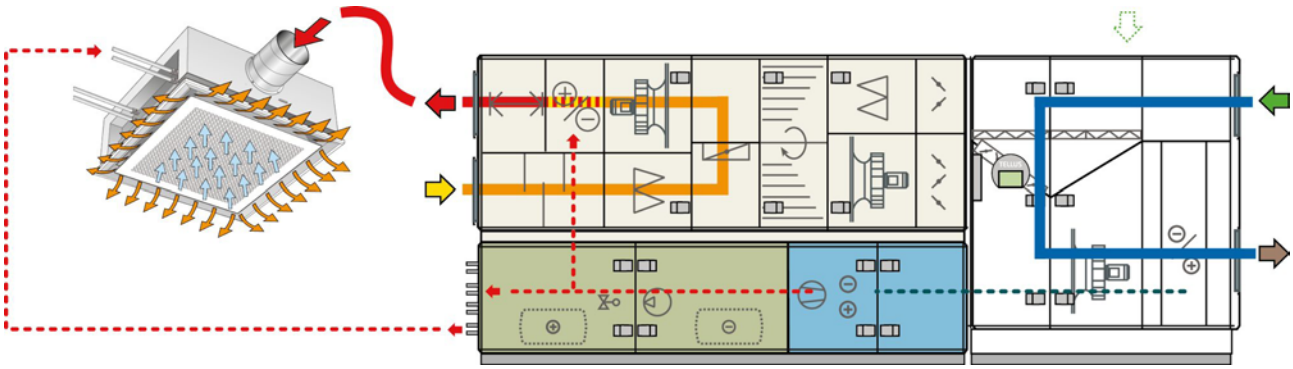

Figure 5. Example for heating with climate beams, night time. Air Handling Module (light brown), Hydronic module (greenish), Chiller&Heat Pump Module (blue) and Energy Exchange Module (white).

mary energy need is produced as efficiently as possible and the secondary is facilitated by the emerging excess energy.

Night time operation

Fresh air is not required to keep unoccupied buildings warm, e. g. during weekends and nights. The heating needed will be facilitated by circulating a sufficient amount of outdoor air over the coil in the Energy Exchange module. If radiators or under-floor heating are used, warm water will be supplied by the exchanger in the Hydronic module. However, if climate beams are used, an accessory internal circulation damper can be included (see **Figure 5**). This allows heating at night without pressure loss of the rotor or the supply filter. Even if the supply fan will need some electric energy, this is a fraction of the energy saved by the increased COP of the compressor. Heating with climate beams will normally allow an up to 10K lower water temperature than with radiators, which increases the COP by up to 30%.

Energy saving with Swegon TELLUS

There are many ways Swegon TELLUS saves energy. Some methods are traditional and some are innovative. All have in common that they strive for minimising the purchased external energy as much as possible without neglecting the comfort of the indoor climate.

The traditional methods, which are used by the high quality HVAC products from Swegon that are parts of TELLUS, includes the **Hygroscopic rotary heat exchanger** that provides 80–85% heating and cooling energy recovery and dehumidifies the supply air. This saves an additional 6–24% cooling energy, depending on the outdoor climate. Furthermore, **Speed controlled fans and pumps** allowing demand controlled ventilation, will save between 25–40% of annual fan energy. Finally, **A-class chiller** components with large operating range, due to vapour injection technology allow outdoor temperatures between –20°C and +45°C.

An intelligent control system can reduce energy consumption using traditional methods such as **summer night cooling, night set-back or scheduled running times**. However, a system approach can provide additional energy saving features.

SMART Link valve optimisation ensures that the chiller/heat pump module delivers **brine temperatures** that match the real needs of the building. The cooling production will now always be as warm as possible and the heating production as cold as possible. This increases COP and EER and lowers pressure drops across valves in the brine circuit.

Also the distributed cooling and heating water to e.g. beams or comfort modules can be demand controlled (*All Year Comfort- functionality*) which saves up to 10% of energy annually by **optimised temperatures** and more open valves. This function also ensures supply water temperature to chilled beams above condensation point by a humidity sensor in the extract air.

The available cooling energy of the outdoor air can be used directly through the supply air and indirectly by cooling brine in the integrated 500 litre cooling tank (**free cooling**). Cold water can be transferred to different parts of the building efficiently. This limits the running time of the compressors and reduces fan power.

Due to the circulation possibilities between extract and supply air and outdoor and exhaust air, the amount of **fresh air supplied to the building** is independent of the total amount of air used for heating and cooling

production. This will save both fan power due to lower pressure drops and heating and cooling energy due to smaller ventilation losses.

Innovative ways to improve energy efficiency with Swegon TELLUS

Free heating during cooling season and free cooling during heating season

Heat pump technology always results in that both heating and cooling is available simultaneously. The excess heating energy that is released while cooling, either to be removed from the system or can be used to heat special parts of the building or the hot tap water tank, without additional costs. The integrated heat and cold tanks can be pre-loaded with the free available energy in order to create a better starting point. Thus, the primary need of either heating or cooling must to be purchased while the secondary is free. This increases the total efficiency of the unit immensely, especially since 30% to 40% of all the annual hours in Europe have outdoor temperatures between +5°C and +15°C which approximately is the temperature range where a building has a simultaneous heating and cooling needs. Hot tap water is needed throughout the year and there might be areas, such as server rooms, that require constant cooling. These factors improve the energy saving calculation.

Extract air and temperature recovery

In TELLUS the extract air, if available, is used in the heating and cooling production. Only if that air volume is insufficient the extra fan in the Energy Exchange Module has to be used, feeding more air through the outdoor air bypass damper. This fan will run significantly less than that of a free-standing heat pump, increasing the EER and COP of the unit. This combination of a small and a big fan in series is patent pending. On top of that, the extract air often has a more feasible temperature than the outdoor air for heating and cooling production. So even remaining extract air energy, after the hygroscopic rotor, will be recovered here (the last 15–20%), making TELLUS more efficient.

Intelligent defrost system

When defrosting is needed the unit continues to deliver heat. This is made possible with another patent pending functionality that allows the rotor to temporarily lower its efficiency so that warmer extract air can be used to defrost the coil in the Energy Exchange Module. In the meanwhile the extra energy to the supply air heating coil will be supplied by the internal warm tank that has been pre-charged. This means that defrosting can be realised swiftly and without affecting the produced comfort.

Central Controls for optimisation

Central controls can be reached locally or through Internet, by a bus cable from the BMS-System or by the integrated touch screen and create the optimum interactivity between all TELLUS modules, always supplying the needed energies as efficiently as possible to the building. Self-supervision, energy monitoring, set-point adjustments and full overview are possible e.g. by the integrated web-server.

Figure 6. Internal controls can be used by build-in touch screen or remotely.

Over all energy efficiency of TELLUS on annual basis is high. Annual system level efficiency of TELLUS is >4.5 when calculated as ratio of all energy needs of building supplied by TELLUS system and the amount of purchased energy used by TELLUS. These data are also verified by the laboratory readings and test installations in a Swedish office building during year 2012.

Conclusion

In conclusion, TELLUS supplies the total heating and cooling energy of a mid-size commercial building as efficiently as possible. The excess energy that the main process releases covers secondary energy needs of the building. The presented integrated, border crossing technologies save energy, space and installation time; removing demarcation lines typical for installations with many suppliers involved. This creates security and avoids system losses. Swegon TELLUS simplifies the design process, the installation and the maintenance of a HVAC system by reducing it to one integrated energy distribution unit.

The general approach of using known technology and combining it in an innovative way also triggered the work on the M-value, together with CIT Management (Chalmers University, Gothenburg) that attempts to create a common denominator in the evaluation of different HVAC systems available on the market.

Eurovent chiller certification key stones and future challenges

In 1995 Eurovent launched the first European chiller certification program with the announced goals to provide a common playing field to manufacturer, promote energy efficiency and educate end user. The continuous effort of the industry and independent laboratories helped over the years to shape a strong well recognize program and to lead the way for upcoming legislation.

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Energy Labeling since 2005

Eurovent chiller program introduced the first energy label for chiller based on energy efficiency restricted until that moment to household appliances in the regulation. The classification scheme follows the A to G approach used in the European Energy Labeling regulations for household appliances while the class's thresholds were defined and revised by the participants to promote energy efficient products, phase out non- efficient products and incentivize development.

Development of a European Seasonal Energy Efficiency Ratio

The seasonal efficiency ratio presents another effort from Eurovent and the chiller certification program participant's to provide simple and representative selection criteria to help the purchaser choose more efficient products. Efficiency at standard conditions and energy labeling are great tools to select efficient products but they only reflect the efficiency of the product under standard conditions at full load which is practically insignificant over the real operating conditions of the product. The European Seasonal Energy Efficiency Ratio (ESEER) is a weighed formula enabling to take into account the variation of EER (Energy Efficiency Ratio) with the load rate and the variation of air or water inlet condenser temperature as follows

$$ESEER = A \times EER_A + B \times EER_B + C \times EER_C + D \times EER_D$$

Where

Conditions	Load Ratio %	Weighing coefficient	Air temperature at condenser inlet (air cooled chillers)	Water temperature at condenser inlet (water cooled chillers)
A	100	0.03	35	30
B	75	0.33	30	26
C	50	0.41	25	22
D	25	0.23	20	18

Although the ESEER methodology is inspired by ARI IPLV[1], the conditions and the weighing coefficient were determined after a study for European climate and European buildings.

As shown in **Figure 1** the discrepancy between Energy Efficiency ratio at nominal condition and the ESEER, and the fact those units with the similar EER have different values of ESEER summarize the added value of this approach. The ESEER should be the primary criteria to select a unit with better performances at operating temperature conditions and part load.

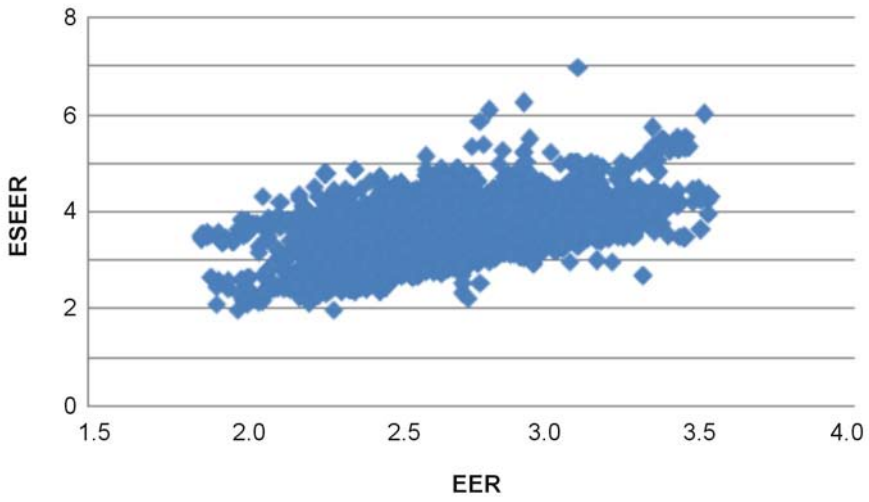

Figure 1. ESEER vs. EER Eurovent 2012 certified data for air cooled chillers

The ESEER is largely embraced by the market and become recognized as a major selection criterion. The ESEER certification also constituted experience that helped during the study for Ecodesign[2] regulation Lot 6 especially for determination of minimum energy efficiency requirement and possible threshold for labeling.

Energy use of pumps and fans impact on chiller performances

A revision of EN14511 was ratified on the 19th of July 2011 and published beginning of 2012. The new version of EN 14511-2011 advocates that the efficiency of the pump whether it is an integral part of the unit or not is a function of its hydraulic power instead of the default value.

Historically chiller performances were certified as "gross" values measured when the pump is not running for units with integral pumps. This choice was made as the previous methodology (using a default value) was unrealistic and penalizing especially large units.

As this method is more realistic, the chillers program participants decided to fully apply this new version starting from the 2012 certification campaign. The new performances declared based on this new version of the standard were published on the ECC website by March 2012.

As shown in **Figure 2** a significant difference between thermal performances (Cooling/Heating capacities, EER/COP and ESEER) published according to EN 14511:3-2011 and those certified during the previous campaigns (calculated according to EN 14511:3-2007 with exception of heat exchanger pressure drop & water pump efficiency) can be observed.

Eurovent also advocates for the adoption of the same mythology for Fan's as minimum efficiency are already defined in the regulation 327 for lot 11. This approach will guarantee harmonization between the different EupLots[3] and to have a better transcription of the real performance of the unit.

Ecodesign

Under Ecodesign Directive chillers are affected by 3 studies which are Lot 1 Boilers and combiboilers, ENTR Lot 1 Refrigerating and freezing equipment and ENTR[4] Lot 6 Air-conditioning and ventilation systems. The Eurovent product group for chillers heavily participated in the work done for these lots through position papers, meeting with the consultants in charge of the preparatory study and participation in the stakeholders meeting. Eurovent help bringing accurate data and information about the state of the art of chiller industries and the forecasted technological developments in this field. The work done by Eurovent certification on the development of a seasonal energy efficiency ratio in cooling and later on in heating (ESCOP[5] project) helped pinpoint the dif-

1 ARI IPLV" : Integrated Part Load Value by AHRI [reference : AHRI Standard 550/590 (I-P), see http://www.ahrinet.org/App_Content/ahri/files/standards%20pdfs/AHRI%20standards%20pdfs/AHRI%20Standard%20550-590%20%28I-P%29-2011.pdf]

2 Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast).

3 "Eup Lots": Lots for "Energy using Products directive", previous name of "Energy related Products directive" [reference : http://ec.europa.eu/energy/efficiency/studies/ecodesign_en.htm] where scope has been splitted per families of products, grouped in so called Lots.

4 Directorate-General for Enterprise and Industry at the European Commission.

5 "ESCOP": European Seasonal Coefficient of Performance.

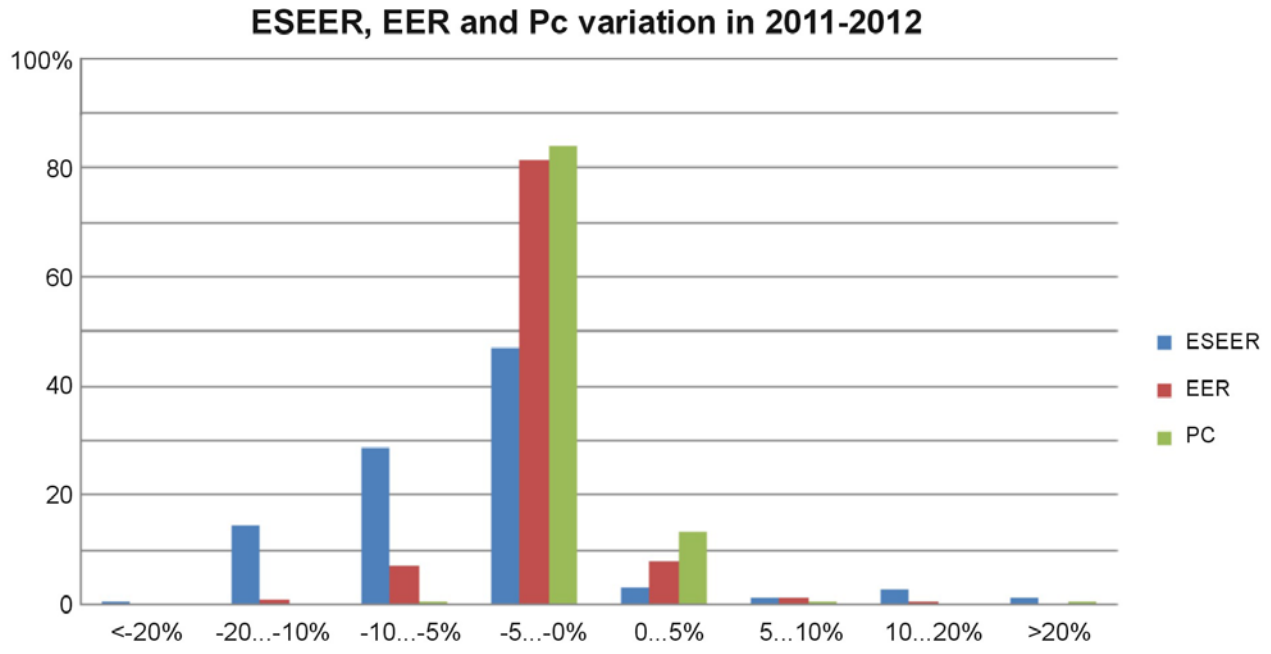

Figure 2. Distribution of the difference between 2012 net data and 2011 gross data in percentage (in horizontal axis). ESEER = European Seasonal Energy Efficiency Ration, EER =Energy Efficiency Ratio, Pc = Cooling.

ferent challenges for the instituting such factors. The certification committee for chiller also started working by creating a technical committee in order to tackle the different issue for starting the certification of performances required by the regulation that will emerge from the lots sited above.

Data publication

Making the certified data easy available for consumer and consultant was always a priority for Eurovent. Our interactive web site, created since the launching of the company helps bring reliable data. In addition to the certified data a dedicated description page for each certification program containing the outlet of the program, definitions and rating conditions is made accessible and constantly updated to help visitors understand the value and the consistency of the certified data.

In 2009 Eurovent launched a widget called Certiflash designed as a service bringing added value to the community of consultants, design engineers, specifiers, architects, buyers, contractors, developers looking for quick and real-time access to HVAC products data and to get individual certificate for HVAC products.

Available on the three popular web browsers and on iPhone, Blackberry and Android mobile phones, Certiflash is the guarantee to have a permanent access to certified data and to generate individual certificate that can be used to complete applications for local incentive scheme or to obtain a building energy performance rating.

Eurovent is also part of a project called CLE@[**6**] that aims to feed on a regular basis numerous building thermal/energy simulation software. By doing so, Eurovent certified products and associated performance data are imbedded and directly used in building calculation engines which is very helpful to consultant at the stage of product selection. This project comes as a response for the implementation of EPBD directive in different EU countries (RT 2012 in France) that requires the declaration of an important amount of performances.

The article was originally written by Ahmed Fatteh, Project Engineer at Eurovent Certification

6 "CLE@": Association managing databases (issued from Promodul and Edibatec associations): [ref: http://www.promodul.fr/sites/default/files/Juin_2012-Lettre%20Information%20CLEA.pdf]

Influence of the dry cooler capacity on the efficiency of chillers

- increased energy efficiency through certification

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Energy efficiency is currently one of the most important subjects in the HVAC&R industry. When using a certified chiller with a separately installed condenser or recooler, it is very advisable also to use a certified product in order to reach the maximum energy efficiency.

Eurovent Certification Company (ECC) started the Certification Programme for Liquid Chilling Packages (Chillers) in 1996. The programme applies to standard chillers used for air conditioning and refrigeration. In 2006 the ESEER -European Seasonal Energy Efficiency Ratio - was implemented. By the publication of the certified data on the ECC website www.eurovent-certification.com the average chiller efficiency is comparable.

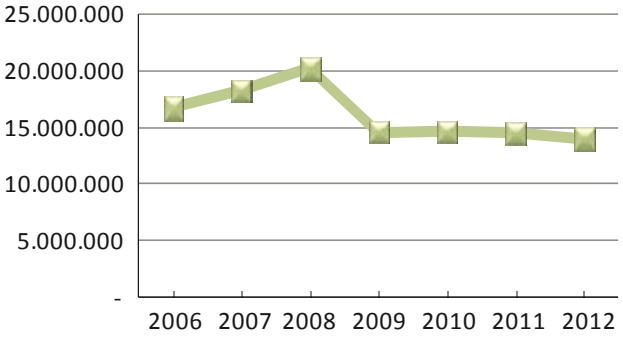

Figure 1. Chillers' sales evolution in cooling capacity, EU.

Chiller Construction Types

Water cooled chillers are built with plate and tube bundle heat exchangers as condensers. Hereby the heat is being dissipated into the ambient air by a recooler in the secondary cycle. If the heat is being dissipated directly into the ambient air by a condenser, the system is called air cooled chiller. These are classified as either compact chiller for outdoor use with integrated air cooled condenser or chiller split system with an air cooled condenser for outdoor installation. Today, in most cases compact air cooled chillers are used.

Chiller Market

Most chillers are certified by Eurovent Certification Company. Currently 33 chiller manufacturers participate in the Certification Programme. The chillers' sales evolution in the EU in the past seven years is shown in **Figure 1**.

The EU sales proportion according to construction type and size is shown in **Figure 2** and **Figure 3** [1].

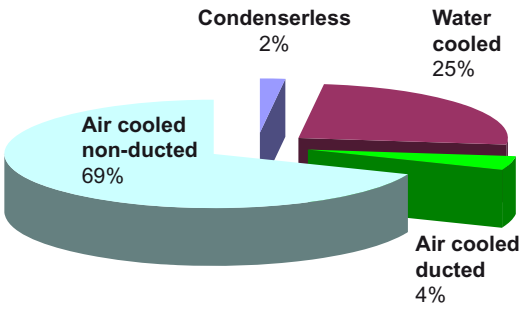

Figure 2. Chillers' sales by construction type (shares in cooling capacity, kW), EU 2011.

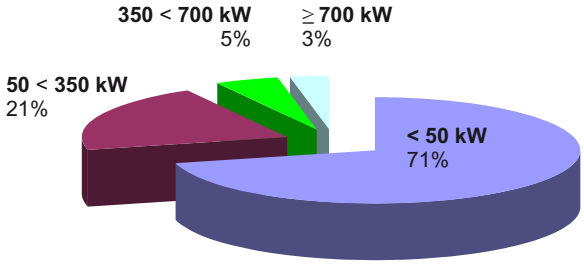

Figure 3. Chillers' sales by cooling capacity (shares in number), EU 2011.

In the following the energy consumption of the complete system water cooled chiller plus dry cooler is considered. Thereby the influence of the dry cooler's capacity on the energy efficiency of the complete system is shown.

On the initiative of the Eurovent certified heat exchanger manufacturers the performance of nine heat exchangers manufactured by seven European companies not participation in the Eurovent Certification Programme was tested in an independent test facility between 2004 and 2008. A comparison of the performance data tested with the values published in the manufacturers' product literature resulted in a capacity reduction up to 37% [**2**].

Calculation Model

A Eurovent certified water cooled chiller of Eurovent energy efficiency class B used for air conditioning (cooling only) is considered. The cooling capacity of 1 000 kW at full load and ambient temperature 35°Cis provided by two screw compressors using refrigerant R134a. The evaporator is cooling down water from 12°Cto 7°C. In the simplified model it is assumed that the temperature difference between condensing temperature and ambient temperature is fixed 12 K. The condenser is heating up the secondary fluid which is recooled by a dry cooler. In the dry cooler the secondary fluid is cooled down by 5 K to a temperature which is 5 K above the ambient temperature. The pump power of the secondary fluid is not considered. The study is comparing the efficiency of the chiller plus certified dry cooler with the chiller plus a non-certified dry cooler having a capacity gap of 25%. At full load the non-certified dry cooler is causing a 2.5 K higher condensing temperature of the chiller. At 75%, 50% and 25% part load operation the AC fans' speed of the non-certified dry cooler is raised to achieve the same condensing temperature as when using the certified dry cooler. By the calculation of the ESEER value of the complete system the energy efficiency is compared.

Results

The dry cooler fan power consumption is within the range of 10% and 20% of the total system's power consumption at the different load conditions (**Figure 4**).

Figure 5 shows the EER of the total system with the two different dry coolers. The ESEER value of the system using a dry cooler with capacity gap is 4.6% lower due to the higher power consumption of the chiller at full load and the higher power consumption of the fans of the dry cooler at part load operation.

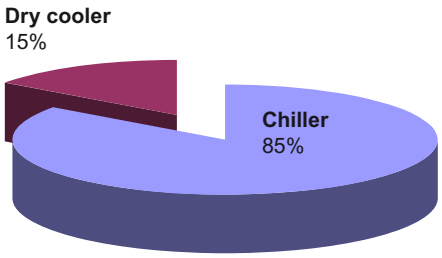

Figure 4. Power consumption of the total system chiller plus dry cooler (kW).

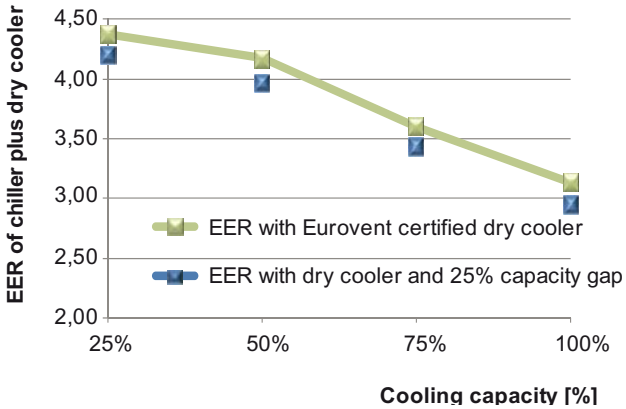

Figure 5. EER of system chiller plus dry cooler at different load.

For the City of Milan the annual energy saving of the chiller system using a dry cooler obtaining the designed capacity is around 20 000 kWh at calculated 3 542 operating hours. At energy costs of 0.15 €/kWh the saving in energy costs will be around 3 000 € per year. Assuming that a non certified dry cooler may be 10% cheaper the payback time is less than 1.7 years and every year annual savings in operating costs will be achieved. Additionally capacity gains or benefits when for example operating with free cooling are possible. For chillers with longer operating hours or chillers designed for process cooling the payback time will be even shorter.

Conclusions

The paper showed how important it is to use certified components and systems. Correct performance data for heat exchangers are absolutely essential, because they influence the energy efficiency of the entire system. In the study a water cooled chiller recooled by a dry cooler with a capacity gap of 25% was causing 4.6% higher energy costs.

References

[1] Eurovent Market Intelligence: Chillers' Sales Data. E-mail January 2013.
[2] Eurocent Certification Company: Flyer July 2009.

Energy – Water Nexus

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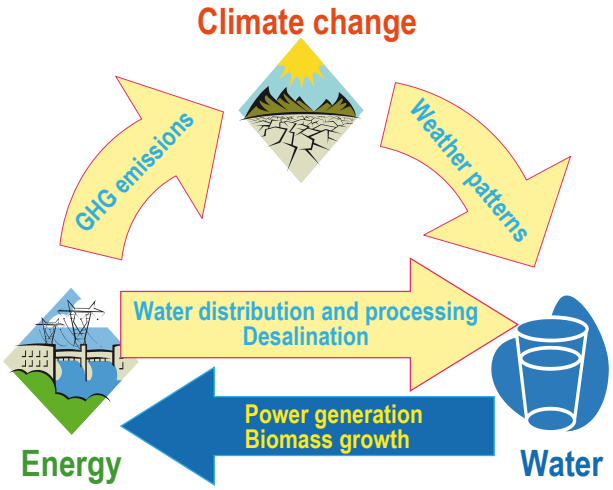
Energy and water are strongly interlinked. The energy-water "nexus" is more evident due to climate change increasing droughts, floods and different rainfalls. The interactions between water and energy is one of mutual dependency: the exploration of energy sources, biomass production and power generation need water; on the other hand, water distribution and processing needs energy.

15% of the global water withdrawals are used for the energy sector although the effective water consumption is smaller, as part of the withdrawal is led back to nature. Both withdrawals and consumption are projected to grow in the future, notably the consumption because of more biofuels.

Many energy sources, their extraction and fuel processing need water. These requirements depend on the fuel but also on the extraction site and technology. The power generation technologies differ significantly in their water needs. In general, the combined cycle gas turbine technologies need less water. Carbon capture and sequestration may remarkably increase the water use. Also, nuclear plants require more water than coal plants of the same capacity because they operate at reduced steam conditions. The renewable energy technologies differ: wind and photovoltaic technology barely consume water while water is important in concentrating solar systems. Hydropower is a story itself: run-of-river plants hardly lose water but evaporation from circulation plants with water storages may be significant.



Strong direct and indirect links between energy and water.

When it comes to energy end-use, water is not only consumed in kitchens and bathrooms but is also a medium of heat transfer. Luckily, saving both energy and water often leads to mutually useful measures. Pumping is at the heart of the nexus. Eco-design requirements and energy labels address also water consumption of washing machines and dish washers. Saving devices such as water saving toilets, shower heads, thermostatic water taps are appliances that save both energy and water.

European fresh water use in the past two decades has been slightly declining mainly because of efficient industrial use. However, the high water demand for irrigation in Southern Europe has not decreased although the irrigation technologies have much improved. The energy needs of the water sector have been growing as more water treatment and irrigation is needed, also because of desalination.

Worldwide more than one billion people in developing countries do not have a safe access to clean water and proper sanitation. Water collection is often a major workload for women who need to fetch the daily water sometimes kilometres away. New technologies to construct wells and operate these for instance by solar pumps, have improved the living conditions in many countries.

The water – energy nexus has recently gained more political visibility. In the future, water scarcity may increase the vulnerability of the energy sector. We need intelligent, sustainable energy to meet the global water requirements. A key answer to these challenges is efficiency at every step - notably in pumping, automation and metering but also in appliances. All these issues are most familiar to the readers of REHVA Journal. Your expertise is invited to meet the nexus!

Environmental Health in Low Energy Buildings – IAQ 2013
October 15 - 18, 2013, Vancouver, British Columbia, Canada

IAQ 2013 will review the state of knowledge of the balance of environmental health and energy efficiency in buildings and help define future education, policy and research directions. With an increasing emphasis on energy conservation, there is a tendency to ignore the purpose of the use of much of that energy, the maintenance of good indoor environmental quality. The roles of building, HVAC and passive system design and operation for achieving good environmental health in low energy buildings are the core themes of this conference.

The conference program will include internationally acclaimed keynote speakers, original peer reviewed conference papers and extended abstract presentations.

Abstracts are invited in the following subject areas:

- Environmental Health in Low Energy Buildings
- Moisture and Health
- Sources and Chemistry
- IEQ Factor Interactions
- Residential Buildings
- Commercial and Institutional Buildings
- Air Cleaning and Filtration
- Microorganisms and Infection
- Tools (models, measurements and more)

REHVA Seminar during ISH

REHVA will organise a Seminar during ISH on Thursday 14 March 2013. The topic will be school ventilation. More information at the website **www.rehva.eu**.

Design Criteria and Software Development for Finned Tube Evaporator Using R744

Friterm R&D Department has evaluated CO_2 evaporators and gas coolers used both in subcritical and transcritical refrigeration systems under the title of environmentally friendly technologies, which took place in the scope of The Scientific and Technological Research Council of Turkey (TUBITAK) Funding Program. As part of this evaluation, not only a laboratory has been constructed but also new software has been developed for finned-tube R744 (CO_2) heat exchangers. The software data have been compared to the test results so as to confirm compatibility between these two methods. The information in the following parts is aimed to address the data collected from this evaluation.

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CO_2 evaporators

Finned-tube evaporators can be employed both in subcritical and transcritical refrigeration systems. The key designing data are classified into three fundamental groups.

1. *Air side design data*
2. *CO_2 side design data*
3. *Heat exchanger design data*

Air Side Design Data

1. **Atmospheric pressure** - the atmospheric pressure must be known so that the physical properties of air relative to the pressure can be defined. The term of "altitude" is preferred instead of "atmospheric pressure".
2. **Air flow** - the amount of air flow should be known to meet required capacity.
3. **Inlet temperature** - the inlet temperature of the ambient in where the cooler run should be known.
4. **Relative humidity** - the relative humidity of the ambient in where the cooler run should also be known. Additionally, wet bulb temperature can substitute for relative humidity.

CO_2 Side Design Data

1. **Refrigerant flow** - If the refrigerant flow is known, it becomes easier to calculate the outlet conditions of the given evaporator. The superheat can be calculated according to refrigerant flow. If unknown, the following properties along with dryness fraction should be given.
2. **Evaporation temperature** – the temperature difference between ambient temperature and evaporation temperature should be determined.
3. **Dryness fraction** - the dryness fraction of the refrigerant entering the evaporator in transcritical R744 cycle must be known in order to define the inlet conditions of the refrigerant. This value is dependent on the gas cooler's operation pressure and outlet temperature. In Subcritical R744 cycle, the condensation temperature and subcooling degree should be known.

Figure 1. CO_2 evaporator testing.

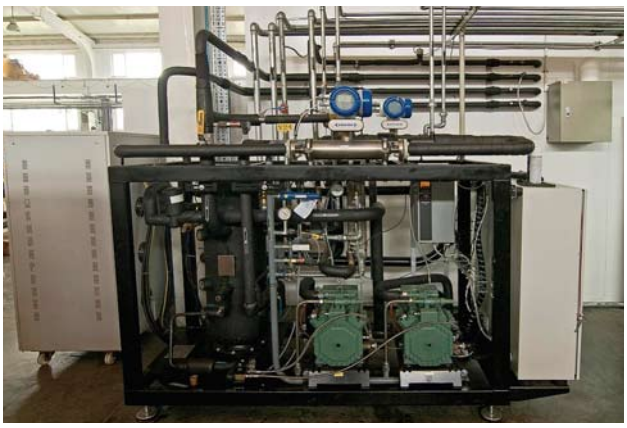

Figure 2. CO_2 refrigerant preparation unit.

4. **Superheat** - the dryness fraction should be known to define evaporator outlet conditions.
5. **Subcooling** - it is the difference between condensation temperature and the temperature before expansion valve described in subcritical R744 refrigeration cycle.

Heat Exchanger Design Data

The finned-tube heat exchanger's design data are given as follows:

> The distance between tube and rows, coil geometry, fin length, tube and row number, pass or circuit number, fin spacing, fin material and thickness, collector diameter (if known), distributor diameter and finally tube material and thickness.

In light of the data given above, the CO_2 evaporators were designed and after that they were tested in the "Calorimeter Room".

In order to test CO_2 evaporators, the given conditions are shown in **Table 1**.

The results collected from the tests have been analyzed in detail by means of FRTCOILS and are shown in **Table 2**.

Test results were in comply with the calculation of software. In other terms, the software calculations have been supported by the test results. Consequently, a new software has been built which enables the designing of finned-tube CO_2 evaporators and gas coolers.

Conclusion

So far it has been seen that a system choice which is in line with the designing conditions is crucial. The needed software evaluation has been carried out for the evaporators and gas coolers - the most important components of the system. In this brief paper, only the studies carried out for the evaporators are considered. The software efforts have been supported by the test results of the prototypes. It is concluded that test results are in comply with the calculations of the software. In conclusion, FRTCOILS has been developed for the finned-tube CO_2 heat exchangers.

Table 1. Evaporator test conditions

Test	Tested Products	CO_2 Evaporation Temperature (°C)	CO_2 Mass Flow (kg/h)	Inlet air Temperature (°C)	Air Relative Humidity (%)
1	Prototype 1	1,58	193,11	12,02	45,17
2	Prototype 2	1,25	164,068	10	48,79
3		-7,08	122,829	-0,01	50,20
4	Prototype 3	-12,39	76,492	-0,01	41,50
5	Prototype 4	-2,74	110,705	15,03	27,70

Table 2. CO_2 Evaporator testing results.

Test	Tested Products	Results Capacity (kW)
1	Prototype 1	11,503
2	Prototype 2	9,667
3		7,684
4	Prototype 3	4,665
5	Prototype 4	6,989

Identifying Energy Using Components in Exhaust Ventilation Systems

Exhaust ventilation systems, whether simple or complex, share common system components, each of which has its own energy loss. Understanding the energy losses of exhaust ventilation system components is key to designing, evaluating and operating the system for optimum performance without excessive energy. This article identifies the energy components in a typical exhaust ventilation system (Figure 1), allowing a clear accounting for the total system energy requirements.

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System components common to exhaust ventilation systems are:

- Hood(s) for air entry into the system
- Ducting to transport the air from the hood to its final release point
- Duct fittings such as elbows, branch entries, contractions, expansions or mechanical devices (such as dampers) used in routing the ducting from the hood to its final release point.
- Air Pollution Control (APC) equipment, ranging from simple static filters to more sophisticated air cleaning or conditioning equipment trains
- The fan used for moving the air through the hood to its final release point.

So let's take a look at the energy requirements corresponding to each of the above system components (**Figure 2**).

System Component: Hood

By definition, a hood is a shaped entry through which air enters the exhaust system. There are two (2) corresponding energy components which occur as air enters the exhaust system through a hood.

Acceleration energy

This is the energy required to accelerate the air from its natural state through the hood and into the duct to achieve the design velocity for transport through the system (**Figure 3**). It can be envisioned as the inertia component of an air system similar to the wk^2 component of a mechanical drive system. In both cases, either the air or the drive component is considered to be at rest and when started, both have to be accelerated to the full design speed of the system. In an air system, this is referred to as *acceleration* energy.

Figure 1. Typical hood system.

Figure 2. System design components.

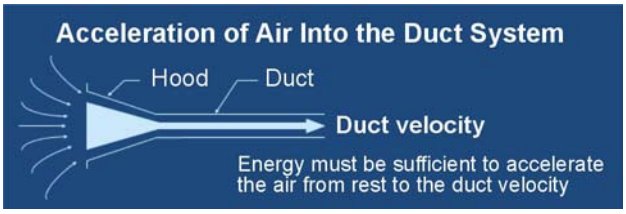

Figure 3. Acceleration energy.

For an exhaust system this may mean accelerating the air from rest to a duct velocity of anywhere from 10,16 to 22,86 m/s. And since the start point is when the air is at rest, this energy component is normally counted as one (1) duct velocity pressure. It is measured in Pascals and represents the energy conversion from static to velocity pressure.

Noting that a 10,16 m/s duct velocity corresponds to a duct velocity pressure of 62,27 Pa and a 22,86 m/s duct velocity corresponds to a duct velocity pressure of 313,84 Pa, it can be seen that the energy required to accelerate the air into the exhaust system can be substantial. And, if this energy requirement is unaccounted for or miscalculated, the system performance will be deficient by the same amount.

Hood entry loss, h_e

This is the energy component specific to the hood shape and design. It is the energy necessary to overcome losses due to turbulence or the air changing shape as it enters the exhaust system through the hood (**Figure 4**).

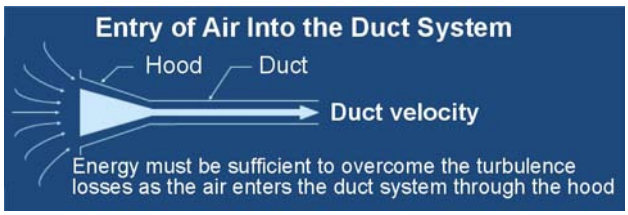

Figure 4. Hood entry loss.

This energy component is normally represented by a hood entry loss factor and is calculated as a factor x the duct velocity pressure.

For instance, if a particular hood design has a hood entry loss factor of 0.25, then the hood entry loss would be calculated as 0.25 x the duct velocity pressure at the duct design velocity.

Example: Take a hood having a hood entry loss factor of 0.25 which moves air into a duct system having a design velocity of 20,32 m/s. Since a 20,32 m/s duct velocity is equivalent to a duct velocity pressure of 249,08 Pa, then the hood entry loss would be calculated as 0.25 x VP_{duct}, or (0.25)(249,08 Pa), which would result in a hood entry loss of 62,27 Pa. Then when we combine the hood entry loss with the acceleration energy (1 duct vp), the cumulative energy required to move the air from rest through the hood to the duct velocity is the hood entry loss, 62,27 Pa + the acceleraton energy, 1.0 duct vp, or 311,35 Pa hood static pressure.

Hood entry loss factors used to calculate the hood loss are derived empirically and are noted in a number of publications [**1**].

Hood flow coefficient, C_e

This is the ratio of the actual flow of air from rest into a hood to the theoretical flow that would result if the energy conversion from static pressure to velocity pressure were 100% efficient. Since hoods always have some inefficiency, the hood C_e will always be < 1.0.

Mathematically, the hood flow coefficient is defined as the square root of the ratio of the duct velocity pressure to the hood static pressure, or

$$C_e = \sqrt{\frac{VP_{duct}}{SP_{hood}}}$$

(ACGIH® Formula 3.11) [**2**].

This means that if the hood static pressure is either known by design or by field measurement, then the hood C_e can be calculated in order to determine the hood flow efficiency. And conversely, if there is a target hood C_e at the system design stage, then it can be used to determine the hood entry loss necessary to achieve the targeted hood C_e.

It follows then that in a system having multiple hoods, if the C_e is determined for each hood, then the overall system efficiency of the movement of air from rest into the system via the hoods can also be determined.

Summary

In summary, the energy components associated with the system hood(s) are combined from the acceleration energy of the air from rest to the duct design velocity and the losses resulting from the air movement due to turbulence and the changing of shape as the air enters the hood. These are normally calculated as factors of the duct design velocity pressure and are collectively referred to as the *hood static pressure (SP_h)* in Pascals. And, when using the hood coefficient of flow, C_e, one can make a determination of the efficiency of airflow from rest into the system.

System component: Ducting

Energy losses through ducting are pretty well understood throughout industry and are defined as *the energy required to overcome resistance to flow as the air moves through the duct*. Being a frictional energy representing resistance to flow, duct losses are normally noted as duct

static pressure and are calculated as a factor, or friction coefficient of the duct velocity pressure in Pascals x the total duct section length in meters.

There are a wide number of resources commonly available to determine duct energy loss, including simple duct slide rule type hand calculators, duct friction charts and calculation formulas, all having varying degrees of sophistication, accuracy and allowances for changes in duct materials and roughness [**3**].

Figure 5. Ducting.

Using the Darcy-Weisbach equation for duct pressure loss with a) the Darcy-Weisbach friction coefficient (f) from the Moody Diagram or Colebrook Equation as 0.0186 representing an average duct having an absolute roughness coefficient (ε) of 0.15 x 10^{-3} meter, a diameter of 0.254 meters and a resulting relative roughness of 0.0006, b) a given duct length (L) in meters, c) a given duct diameter (d_h) in meters, d) a standard airstream density (ρ) of 1.2 kg/m³, and e) a given duct velocity (v) in m/s, then the energy loss through a duct segment can be calculated as follows [**3a**].

$$\text{Duct segment pressure loss} = f\,(L / d_h)\,(\rho \cdot v^2 / 2)$$

or, when simplified for standard air conditions

$$\text{Duct segment pressure loss} = f\,(L / d_h)\,(vp_{duct})$$

Example. 56,63 m³/min is flowing through 30,48 m of 0.254 m diameter duct at 18,63 m/s duct velocity and 208,73 Pa duct velocity pressure.

Using the duct friction loss formula noted above with f = 0.0186, L = 30,48 m, d_h = 0.254 m, ρ = 1.2 kg/m³, and v = 18.63 m/s, the duct segment pressure loss calculates as 464,8 Pa. Using a typical Duct Calculator for the same calculation and converting from in wg to Pa, the duct friction loss is shown as 498.16 Pa static pressure. Alternatively, work by Loeffler [**4**] based on the velocity pressure method in lieu of the equivalent foot method used for the Moody Diagram resulted in values to calculate the duct friction loss coefficient, F'_d, per foot of duct per the duct vp, using I-P units (v = fpm, Q = cfm) as follows:

$$F'_d = \frac{aV^b}{Q^c}$$

(ACGIH® Formula 3.15 and Table 3-6, I-P units) [**3b**].

For these examples, the deviation between the Darcy-Weisbach method using the Moody Diagram for the friction coefficient and the Loeffler method is about 4 %, and the deviation between the Darcy-Weisbach method using the Moody Diagram for the friction coefficient and a typical duct calculator is about 7.2 %. However, since most duct calculators are based on standard sheet metal duct construction and a standard duct roughness, the deviation can be much different when other duct materials are utilized in the system design.

Due to the deviations which result from differing methodologies, materials of construction and airstream characteristics, it is recommended that the system designer utilize a common method for each complete system.

System component: Fittings

Energy losses through duct fittings are normally considered dynamic losses since they occur mainly due to the turbulence and the changing of shape of the air as it moves through the fitting. More specifically, it is **the energy required to compensate for turbulence and distortion as the air changes direction and shape while moving through the duct fitting**.

Example. Elbow: A 5 piece elbow with a 2.0 centerline radius has an elbow loss factor of 0.19. If the duct design velocity is 20,32 m/s (duct vp =249,08 Pa), then elbow energy loss would be 0.19 x 249,08 Pa = 47,33 Pa static pressure. **[5]**

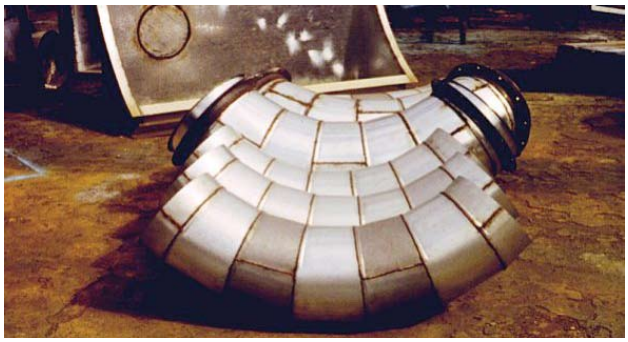

Figure 6. Elbows.

Example. Branch Entry (**Figure 7**): Air enters a main duct through a branch entry. The main duct design velocity is 20,32 m/s (duct vp = 249,08 Pa) and the branch entery angle is 30 degrees with a loss factor of 0.18. Then the branch entry energy loss would be 0.18 x 249,08 Pa = 44,83 Pa static pressure. **[6]**

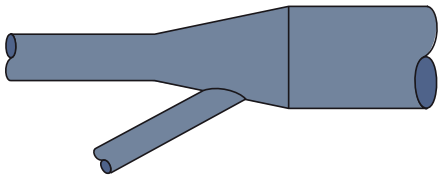

Figure 7. Branch entry fitting.

Like other system energy losses, duct fitting losses are counted as a static pressure and are calculated as a factor which is specific to the particular fitting x the duct design velocity pressure.

Similar to the hood entry loss, factors used to calculate fitting losses are empirically derived and noted in a number of publications. [**1**].

The exception would be mechanical devices, such as dampers, blast gates, abort valves, etc., which normally have their own static pressure loss rating provided by the device supplier.

System component – Air pollution control equipment

A wide variety of air pollution control equipment is used in exhaust systems, ranging from basic static barrier filters to more sophisticated wet scrubbers, dry media collectors, thermal destruction units, etc. Each is designed and employed for its own specific purpose with systems often employing two (2) or more types of equipment in series for progressive air cleaning or conditioning.

The energy losses represented by these types of equipment can either be fixed or variable. An example of a fixed loss would be a venturi scrubber or cyclone designed to operate at a specific flow rate against a corresponding specific static pressure loss. An example of a variable loss would be a dry media collector which has a variable flow and static pressure loss corresponding to the contaminant loading on the media.

In all cases, the equipment supplier should be consulted and advise the fixed or variable static pressure loss required for the air pollution control equipment selected for use. Additionally, the equipment supplier should be consulted for any adaptations of the equipment to the

Figure 8. Air Pollution Control (APC) equipment.

Figure 9. Exhaust fans.

specific application which would result in optimum energy efficiency and minimum energy loss.

System component – Exhaust fan

There are two (2) types of energy losses commonly found in fan applications. The first is the energy loss through the fan itself, which cannot be measured directly and which is already accounted for by the fan manufacturer in the fan capacity ratings. The second is the energy loss which may or may not occur due to the duct system configuration at the fan inlet or outlet. This second energy loss is commonly referred to as *Fan System Effects*.

Fan System Effects occur when the air entering or exiting the fan does so in a way that it either restricts or distorts the air from properly entering or exiting the fan to the extent that the fan performance is changed noticeably.

The Air Movement and Control Association (AMCA) has done considerable empricial research in this area and has published *Fans and Systems, Publication 201-02* which provides guidelines and factors for calculating the energy losses corresponding to specific inlet or outlet duct fittings. [7].

Like other system components, these losses are counted as static pressure and are calculated as a factor which is specific to the individual fitting x the fan inlet or outlet velocity pressure.

Summary: System energy components

The energy components common to exhaust ventilation systems are presented in **Figure 10**.

Of these, the most commonly missed or misunderstood energy components are acceleration, hood entry and fan system effects. Unfortunately, these are often compensated by excessive system design safety factors which results in overdesigned systems operating at low efficiencies – often evidenced by fan dampers with high turndowns.

While it is prudent to allow for a system design safety factor, properly identifying system energy components and computing accurate calculations for each will allow a reasonable factor to be applied to a well defined system and result in the optimum system energy efficiency. [7, 8]

Total System Energy Required
=
Acceleration Energy
+
Hood Entry Loss
+
Duct Friction Loss
+
Fittings Dynamic Loss
+
Air Pollution Control Equipment Loss
+
Fan System Effects Loss

Figure 10. Summary of the total energy loss of industrial exhaust system.

References

[**1**] Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition, ACGIH®, Cincinnati, OH; 2009 ASHRAE Fundamentals Handbook, ASHRAE, 1791 Tullie Circle, N.E. Atlanta, GA 30329.

[**2**] Formula 3.11, Table 6-6 and Fig 9-a; From ACGIH®, Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition. Copyright 2010. Reprinted with permission.

[**3**] 2009 ASHRAE Fundamentals Handbook Chapter 21, Fluid Resistance, Formula 18 and Table 1; Formula 3.15 and Table 3-6; From ACGIH®, Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition. Copyright 2010. Reprinted with permission.

[**4**] Loeffler, J.J., Simpliflied Equations for HVAC Duct Friction Factors, ASHRAE Journal p.76, January 1980.

[**5**] Figure 9-e; From ACGIH®, Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition. Copyright 2010. Reprinted with permission..

[**6**] Figure 9-f ; From ACGIH®, Industrial Ventilation: A Manual of Recommended Practice for Design, 27th Edition. Copyright 2010. Reprinted with permission..

[**7**] Air Movement and Control Association, 30 West University Drive, Arlington Heights, IL 60004, 847.394.0150.

[**8**] See www.Rayhunterandassociates.com/bham-ivc for information on training programs.

Figures 1 & 8, courtesy of Camfil Farr APC, Jonesboro, Arkansas.

Figures 2, 3, 4 & 7, courtesy of Ray Hunter and Associates, Birmingham, Alabama.

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EUROVENT CERTIFICATION

Erick Melquiond
Managing Director of Eurovent Certification Company

In today's international context of a growing pressure on climate control and CO_2 emissions, certification is more than ever the route forward for product selection and specification. The involvement in energy efficiency control of the European Air Conditioning Industry is clearly demonstrated by the very existence of the voluntary certification programmes established and administrated by Eurovent and its evolution throughout the years.

Comparison of product performance by third party testing based on well-defined procedures ensures healthy, solid competition within a market, which is open to all manufacturers.

Founded in 1993, Eurovent Certification Company (ECC) is recognized as a world-class leader in the field of industrial third party product performance certification for Heat, Ventilation, Air-Conditioning and Refrigeration products (HVAC-R), according to European and international standards.

The Eurovent Certification programmes have in common the verification of manufacturer's claimed perform-

ance by third party testing based upon well-defined procedures compliant to ISO/CEN/CENELEC/ECC or equivalent standards.

Eurovent Certification sets new industry standards in Europe and creates the conditions for a fair competition

Throughout the years, Eurovent Certification has contributed to the definition of common set of criteria for rating products, leveling the competition playing field

- ACCREDITIA – **Italy**
- AKKREDITIERUNG – **Austria**
- BELAC – **Belgium**
- CIA – **Czech Republic**
- COFRAC – **France**
- DAkkS – **Germany**
- DANAK – **Denmark**
- ENAC – **Spain**
- FINAS – **Finland**
- INAB – **Ireland**
- IPAC – **Portugal**
- NA – **Norway**
- PCS – **Poland**
- RvA – **The Netherlands**
- SAS – **Switzerland**
- SWEDAC – **Sweden**
- TURKAK – **Turkey**
- UKAS – **United Kingdom**

with the creation of a common and standardized platform allowing comparisons of product performances on an equal basis.

The increased integrity and accuracy of the industrial performance ratings also provide clear benefits for the end users who can be confident that the product will operate in accordance with design specifications, and predicted energy costs are reliable.

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The COFRAC accreditation was granted according to ISO/IEC guide 65:1996 or EN45011:1998. The Scope and Validity can be checked on line at www.cofrac.fr. This accreditation is compliant with the European co-operation of Accreditation [**1**] (EA) also member of International Accreditation Forum [**2**] (IAF) with mutual recognition agreement signed by the following countries:

A voluntary certification scheme open to manufacturers and distributors

ECC offers a wide range of certification programmes. Based on a voluntary scheme, the Eurovent certification is open to any manufacturer willing to participate, but also to distributors who can also apply via our Brand Name (BN) scheme.

When a manufacturer participates in a certification programme he is required to present the list of models or model ranges together with their performance data. The files are then evaluated by ECC and a pre-defined number of units is set. Following a random selection, performance testing in the scope of Certification is carried out by independent laboratories under contract with Eurovent Certification, which clearly means no commercial contact between test houses and participants.

New programmes were launched in 2012 including the Rooftops and Variable Refrigerant Flow Systems (VRF).

To participate in the following programmes, manufacturers must certify all production models in the scope of the programme ("Certify all" programmes).

All models in the production has to be certified in the following programmes:

- Close control air conditioners (CC)
- Comfort Air Conditioners (AC)
- Chilled Beams (CB)
- Fan Coil Units (FCU)
- Air Filters class M5-F9 (FIL)
- Heat Exchangers for Refrigeration (HE)
- Liquid Chilling Packages and Heat Pumps (LCP-HP)
- Rooftop (RT)

[1] www.european-accreditation.org
[2] www.iaf.nu

To participate in the following programmes manufacturers may select ranges of products to be certified.

Selected range of models in the production has to be certified in the following programmes:

- Air to Air Plate Heat Exchangers (AAHE)
- Air to Air Rotary Heat Exchangers (AARE)
- Air Handling Units (AHU)
- Cooling and Heating Coils (COIL)
- Cooling Towers (CT)
- Drift eliminators (DE)
- Refrigerated display cabinets (RDC)
- Variable Refrigerant Flow (VRF)

Third party testing coupled with a stringent certification process can also result in Certification suspension

If a product falls below catalogue performance by more than the specified tolerance in sample testing, the participant will be required to re-rate not only the specific product but also the range from which it was taken. A new performance testing procedure is then carried out. Each participant is only allowed to use this exception process once. If over the years the failure rate is above a defined threshold it will result in a Certification suspension.

Lists of Eurovent certified products and companies are reviewed on a regular basis. Up-to-date data is available in real time and on line at www.eurovent-certification.com or www.certiflash.com.

Eurovent Certified Performance – the mark of confidence

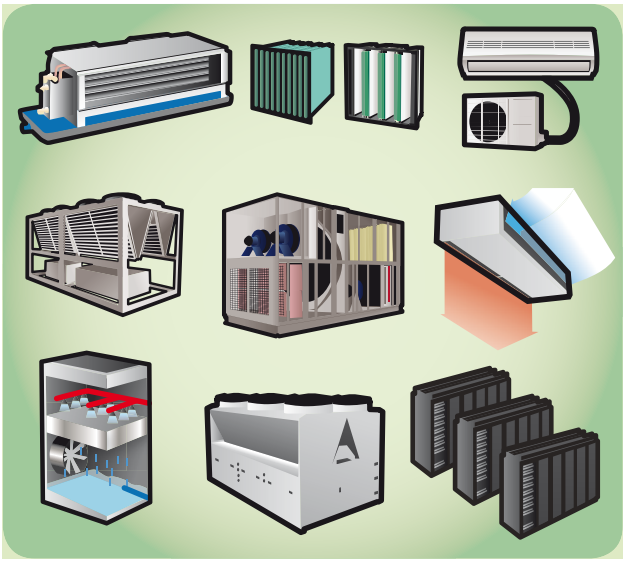
All products certified are listed at Eurovent website.

In addition, certified products display the Eurovent certification symbol that guarantees specifiers that products marketed by a Eurovent certification programme participant have been accurately rated.

Specification sheets, literature and advertising of certified ranges display the Eurovent symbol.

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

ECC MARK LOGO.



Exciting outlook for the HVAC-R industry with the introduction of the 1st European "One Stop Shop" for Certification in 2013

Eurovent Certification and Certita, leading certification companies in the field of HVAC-R products will be merging their activities in 2013. The intention of the signatories is to develop the proposed certification, in line with the services already provided, with the marks NF, CSTBat and Eurovent Certification, while enlarging the scope of products dealt with and increasingly operating at international level. A full service will be proposed, expected to be better suited to the specific background of each country regarding voluntary certification of performance of HVAC-R products.

The aim of the merge is to back up the development of innovative equipment and to provide useful guidance to users and prescribers. This issue is embedded within the general objectives of decreasing the greenhouse gas emissions and improving the energetic efficiency, in which regard the promotion of product performance plays a key role. The considered merge would provide manufacturers with a single access to get the certification best suiting their marketing needs.

CERTITA is mainly involved in the fields of heating (NF Mark Radiators and NF Mark Heat Pumps), Thermal solar (NF Mark Domestic Solar Heaters, CSTBat Mark Solar devices and Solar Keymark) and ventilation (NF Mark Mechanically controlled ventilation and CSTBat Air inlets.).

Both companies are certification bodies accredited against the EN 45011 reference standard.

Eurovent Certification Programmes

Air Filters Class M5-F9 *
Air Handling Units*
Air to Air Plate Heat Exchangers*
Air to Air Rotary Heat Exchangers *
Chilled Beams*
Close Control Air Conditioners*
Comfort Air Conditioners*
Cooling & Heating Coils
Cooling Towers
Drift Eliminators
Fan Coils Units*
Heat Exchangers *
Heat Pumps*
Liquid Chilling Packages *
Remote Refrigerated Display Cabinets
Rooftop (RT)*
Variable Refrigerant Flow (VRF)*

* All models in the production has to be certified

Air Handling Units

CERTIFY ALL

Swegon has participated in the program for Air Handling Units from the start. The first priority at that time, and still is, was to find a way for fair competition. This is a long term struggle were we try to cover all aspects from manufacturing to software performance predictions and its agreement with tests. We discuss and take decisions about mandatory performance in software printout, rules for the energy labelling, how to test and what to apply in the, on site, auditor check. Customers should go for Eurovent certified products, to get reliable data, and then they can cut the main cost and take care of the environment by minimising the use of energy.

Committee chair:
Mr Gunnar Berg
Development Engineer, Swegon

Scope of certification

This Certification Programme applies to selected ranges of Air Handling Units.

Participants shall certify all models in the selected product range up to the maximum stated air flow.

A range to be certified shall include at least one size with a rated air volume flow below 7 m^3/s (25 000 m^3/h).

Certification requirements

For the qualification procedure: the selection software will be audited by our internal auditor. A visit on production site will be organized. During that visit, the auditor will select one real unit per range, as well as several model boxes that will cover all mechanical variations.

The selected models will be tested and performances delivered by the selection software will be compared to the performances measured in an independent laboratory.

For the repetition procedures, the auditor will annually check the software conformity against the production data, and tests will be repeated every 3 to 6 years

Certified characteristics & tolerances

- External Pressure: 4% or 15 Pa
- Absorbed motor power: 3%
- Heat recovery efficiency: 3%-points
- Heat recovery pressure drop (air side): max. of 10% or 15 Pa
- Water coil performances (heating/cooling): 2%
- Water coil pressure drop (water side): max. of 10% or 2 kPa
- Radiated sound power level casing: 3 dB(A)
- Sound power level unit openings:
  - 5 dB @ 125 Hz
  - 3 dB @ 250 – 8 000 Hz

ECC Reference documents

- Certification manual
- Operational Manual OM-5
- Rating Standard RS 6/C/005

Testing standards

- EN 1886: "Ventilation for buildings – Air handling units – Mechanical performance"
- EN 13053: "Ventilation for buildings – Air handling units - Rating & performance for units components and sections"

Air to Air Plate Heat Exchangers

CERTIFY ALL

Scope of certification

This Certification programme applies to selected ranges of Air to Air Plate and Tube Heat Exchangers. Participants shall certify all models in the selected range, including:

- cross flow, counter-flow and parallel flow units
- all sizes
- all materials
- all airflow rates
- all edge lengths

Heat Exchangers with accessories such as bypass and dampers shall not be included.

The programme does not cover other types of Air to Air Heat Exchangers like Rotary Heat Exchangers or Heat Pipes. Combination of units (twin exchangers) shall not be included.

Certification requirements

For each range to be certified, 3 units will be selected by Eurovent Certification and tested in an independent Laboratory.

On a yearly basis, Eurovent Certification checks whether the certified products still fulfil the requirements. One unit selected from regular production will be tested in an independent laboratory. If the previous test campaign has been successfully completed and the unit of the current test campaign is ready for a new test, the certification is granted for another year.

Certified characteristics & tolerances

- Dimensions: ± 2 mm
- Plate spacing: ± 1% or ± 1 plate
- Dry efficiency: –3 percentage points
- Wet efficiency: –5 percentage points
- Pressure drop: +10%, minimum 15 Pa

ECC Reference documents

- Certification manual
- Operational Manual OM-8
- Rating Standard RS 8/C/001

Testing standards

- EN 308

Air to Air Rotary Heat Exchangers

CERTIFY ALL

Scope of certification

Eurovent Air to Air Rotary Heat Exchangers Certification Programme applies to all Rotary Heat Exchangers including casing. Participants shall certify all models, if available, including:

- all classes: condensation rotor / non hygroscopic rotor / enthalpy rotor / hygroscopic rotor / sorption rotor
- all rotor geometry (wave height, foil thickness)
- all sizes (rotor diameters and rotor depths)
- all materials
- all airflow rates
- all different types of sealing (if available)

Certification requirements

For the qualification & repetition procedures: one unit will be selected and tested by an independent laboratory.

Certified characteristics & tolerances

- Sensible Efficiency: –3% points
- Latent Efficiency: –5% points (min. tolerance 0.2 g/kg in absolute humidity of leaving supply air).
- Pressure Drop: –110% (min 10 Pa)

ECC Reference documents

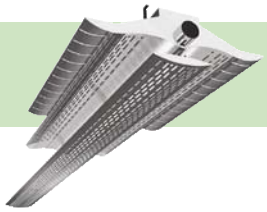
- Certification manual
- Operational Manual OM-10
- Rating Standard RS 8/C/002

Testing standards

- EN 308
- ARI 1060

Chilled Beams

CERTIFY ALL



Scope of certification

This Certification Programme applies to all Active and Passive Chilled Beams.

Chilled Beams are presented by ranges but all ranges must be certified. This applies to all product ranges which have either catalogue leaflets with product details including technical data or similar product information in electronic format.

Certification requirements

For the qualification & repetition procedures (yearly): 3 units are selected from regular production and tested in the independent Laboratory selected by Eurovent Certification.

Obtained performances shall be compared with the values presented in the catalogues or electronic selection from manufacturer's website.

Certified characteristics & tolerances

Cooling capacity: 3 conditions are required.

- Active: 80 – 100 – 120% of the nominal air flow rate.
- Passive: 8 – 10 – 12°C temperature difference.

ECC Reference documents

- Certification manual
- Operational Manual OM-12
- Rating Standard RS 2/C/007

Testing standards

- EN 14518: "Testing and rating of Passive Chilled Beams"
- EN 15116: "Testing and rating of Active Chilled Beams"

Close Control Air Conditioners

CERTIFY ALL

Scope of certification

This Certification Programme applies to factory-made units intended for Close Control Air Conditioning. This programme includes units with cooling capacities up to 100 kW under the specified test conditions.

Participating companies must certify all production models within the scope of the programme.

Certification requirements

For the qualification & repetition procedures: 10% of the units declared will be selected and tested by an independent laboratory.

Certified characteristics & tolerances

Air-Cooled and Water-Cooled Close Control Air Conditioners

- Total cooling capacity (–8%)
- Sensible cooling capacity (–8%)
- EER (–8%)
- A-weighted sound power level (+0 dB)

Chilled-Water Close Controls Air Conditioners

- Total cooling capacity (–8%)
- Sensible cooling capacity (–8%)
- Effective power input (+8%)
- A weighted sound power level (+0 dB)
- Water pressure drop (+10%)

ECC Reference documents

- Certification manual
- Operational Manual OM-1
- Rating Standard RS 6/C/001
- Rating Standard RS 6/C/004
- Rating Standard RS 6/C/006

Testing standards

- EN 14511
- EN 12102 - EUROVENT 8/1

Comfort Air Conditioners

CERTIFY ALL

Scope of certification

This certification programme includes:

- AC1: comfort units with cooling capacity up to 12 kW
- AC2: comfort units with cooling capacity from 12 to 45 kW
- AC3: comfort units with cooling capacity from 45 to 100 kW

This programme applies to factory-made units intended to produce cooled air for comfort air conditioning (AC1, AC2, AC3). It also applies to units intended for both cooling and heating by reversing the cycle. For the AC1 programme class G units are excluded.

Participating Companies must certify all production models within the scope of the programme they enter. However concerning multi-split air conditioners, only systems with maximum two indoor units are included.

Certification requirements

For the qualification & repetition procedures: 10% of the units declared will be selected and tested by an independent laboratory.

Certified characteristics & tolerances

- Capacity (cooling and heating) –5%
- Efficiency (EER and COP) –8%
- A-weighted sound power level +0 dB

ECC Reference documents

- Certification manual
- Operational Manual OM-1
- Rating Standard RS 6/C/001
- Rating Standard RS 6/C/004
- Rating Standard RS 6/C/006

Testing standards

- EN 14511
- EN 12102

Fan Coils Units

CERTIFY ALL

Scope of certification

- This Certification Programme applies to Fan Coil Units using hot or chilled water. It concerns both non ducted and ducted fan coils:
- Non ducted units: Fan Coil Units with air flow less than 0.7 m^3/s and a published external static duct pressure at 40 Pa maximum.
- Ducted units: Fan Coil Units up to 1 m^3/s airflow and 300 Pa available pressure.
- Participating companies must certify all production models within the scope of the programme.

Certification requirements

- Repetition procedure: the number of units to be tested each year will be proportional to the number of his basic models listed in the Directory, in an amount equal to 20% for Fan Coil Units with a minimum of one test.

Certified characteristics & tolerances

- Capacity (cooling, sensible, heating): –5%
- Water pressure drop: +10%
- Fan power input: +10%
- A-weighted sound power: +1 / +2 dB(A)
- Air flow rate: -10%
- Available static pressure 0 Pa for medium speed and –5 Pa for other speeds
- FCEER & FCCOP
- Eurovent energy efficiency class

ECC Reference documents

- Certification manual
- Operational Manual OM-1A
- Rating Standard RS 6/C/002
- Rating Standard RS 6/C/002A

Testing standards

- Performance testing: Eurovent 6/3, 6/11, 6/10
- Acoustic testing: Eurovent 8/2

Cooling Towers

The importance of air conditioning and industrial cooling is constantly increasing in modern architecture and industrial process cooling. The human perception of comfort and the new challenges to reduce the electrical power consumption and CO_2 footprint have designers striving for optimal system performances with the highest possible efficiencies. Reliable thermal performances are crucial to ensure these best efficiencies which are typical for cooling circuits driven by evaporative cooling equipment. On a yearly basis, one random picked cooling tower of each Eurovent-CTI certified product line will be full scale thermal tested by applying the CTI standard 201.

Eurovent Certification Company guarantees the consistency of thermal testing and manufacturing of European and non-European companies that subscribe to the program.

Committee chair:
Mr Rob Vandenboer
Product Manager, Quality Manager
Evapco Europe, BVBA

The first ECC / CTI collaborative certification program for Cooling Towers

The Eurovent Certification Company (ECC, Brussels, Belgium) is pleased to announce the Certification programme for cooling tower thermal performance developed in cooperation with the Cooling Technology Institute Est.1950 (CTI, Houston, Texas, USA). The scope of the program includes standardized model lines for open circuit cooling towers, typically factory assembled. Standardized model lines are composed of individual models that are required to have published thermal rating capacities at corresponding input fan power levels.

Thermal performance certification via this program offers a tower buyer assurance that the capacity published for the product has been confirmed by the initial and on-going performance testing per the requirements of the program using CTI STD-201. It also offers for regulators of energy consumption related to cooling towers, that the capacity of the towers has been validated. Minimum energy efficiency standards such as ASHRAE 90.1, which requires cooling tower energy efficiency validation by the CTI certification process, are used by governments and by green building certification programs such as LEED™.

Scope of certification

The Eurovent Certification Programme for Cooling Towers applies to product ranges (or product lines) of Open-Circuit series Cooling Towers. The programme applies to product ranges that:

- Are manufactured by a company whose headquarter or main facility are located in Europe, Middle-East, Africa or India. After getting the Eurovent Certification, the CTI certificate could be requested.
- Have already achieved and hold current certification by the Cooling Technology Institute (CTI) according to CTI STD-201.

Certification requirements

For the qualification & repetition procedures (yearly): our internal auditor will visit the production place and review the conformity of Data of Records. One unit per range will be selected and tested by an independent test agency.

Certified characteristics & tolerances

- Certified characteristic shall be per CTI STD-201
- Entering wet bulb temperature:
  –12.8°C to 32.2°C (55°F to 90°F)
- Cooling range > 2.2°C (4°F)
- Cooling approach > 2.8°C (5°F)
- Process fluid temperature < 51.7°C (125°F)
- Barometric pressure:
  –91.4 to 105.0 kPa (27” to 31” Hg)

ECC Reference documents

- Certification manual
- Operational Manual OM-4
- Rating Standard RS 9/C/001

Testing standards

- CTI STD-201
- ECC OM-4

Cooling & Heating Coils

Heating Cooling Coils (HCCs) which enable the conditioning of different zones and flexibility in application in buildings are generally employed in compact and central station AHU. To meet the required extra capacity in various processes, they are also used as heating or cooling devices.

With the application of these coils to high energy efficient heat recovery systems, the entire system becomes more compact as well as it avoids occupation of large spaces. Besides, they can be applied to Variable Air Volume (VAV) systems used for conditioning of hospitals, shopping centers and convention facilities.

The Certification programme for the HCCs has increased integrity and accuracy of the industrial performance ratings which provides clear benefits for end users who can be confident that the product will operate in accordance with design specifications. Also, by means of this certification programme users can collect reference data on the fundamental characteristics of the HCCs, such as capacity, pressure drop, mass flow complying with the standard of EN 1216.

Committee chair:
Engin Söylemez
R&D Test Engineer, Friterm A.Ş

Scope of certification

The rating standard applies to ranges of forced circulation air cooling and air heating coils as defined in ENV1216.

Certification requirements

- Qualification and repetition procedures: units declared will be selected and tested by an independent laboratory.
- The number of units will depend on the variety of coil material configurations and their applications for the applied range.
- The selection software will be verified in comparison with the test results.

Certified characteristics & tolerances

- Capacity: –15%
- Air side pressure drop: +20%
- Liquid side pressure drop: +20%

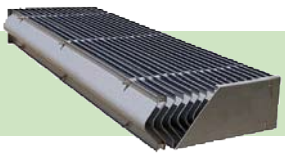
ECC Reference documents

- OM-9
- RS 7/C/005

Testing standards

- ENV 1216

Drift Eliminators



Scope of certification

The Eurovent Certification Programme for Drift Eliminators applies to Drift Eliminators used for evaporative water-cooling equipment.

Certified characteristics & tolerances

The following characteristics of Drift Eliminators shall be certified by tests:

- For counter-flow and cross-flow film fill, the average drift losses of the two tests at 3.5 m/s are less than 0.007% of circulating water flow rate.
- For cross-flow splash fill, the average drift losses of the two tests at 3 m/s are less than 0.007% of circulating water flow rate.

No tolerance will be applied on the average drift losses.

ECC Reference documents

- Certification manual
- Operational Manual OM-14
- Rating Standard RS 9/C/003

Testing standards

- Eurovent Rating Standard 9/C/003
- CTI ATC-140

Air Filters Class M5-F9

CERTIFY ALL

Today, people spend most of the time inside of buildings. Hence, indoor air quality is a key factor to human health. Air filters removing fine dust from the air stream are the key component in building heating, ventilation and air conditioning systems to supply air of the required cleanliness and to ensure a high level of indoor air quality. With the air filter certification program, reliable and transparent filter data are ensured to customers. On a yearly base, four different filters are selected out of the product range of each participant for testing at independent laboratories according to EN 779:2012, verifying the initial pressure drop, the filter class and the initial and minimum efficiency, as well as the energy efficiency class to Eurovent document 4/11. Additionally, with the new energy efficiency label, Eurovent provides valuable data to enable users to select the most energy efficient air filters.

Committee chair:
Dr. Thomas Caesar
Head of Filter Engineering Industrial Filtration Europe
Freudenberg Filtration Technologies SE & Co. KG

Scope of certification

- This Certification Programme applies to air filters elements rated and sold as "Medium or Fine Air Filters F5-F9" as defined in EN 779:2012 and with a front frame size of 592 x 592 mm according to standard EN 15805.
- When a company joins the programme, all relevant air filter elements shall be certified.

Certification requirements

- For the qualification & repetition procedures: 4 units will be selected and tested by an independent Laboratory selected by Eurovent Certification.

Certified characteristics & tolerances

- Filter class: no tolerance.
- Initial pressure drop: +10% + 5 Pa (minimum 15 Pa)
- Initial efficiency for F7 to F9: 10% – point
- Discharge efficiency for F7 to F9: 10% – point
- Eurovent energy class: no tolerance
- Annual energy consumption

ECC Reference documents

- Certification manual
- Operational Manual OM-11
- Rating Standard RS 4/C/001

Testing standards

- EN 779:2012
- Eurovent 4/11

Hydronic Heat Pumps

CERTIFY ALL

Scope of certification

- This programme applies to standard chillers and hydronic heat pumps used for heating, air conditioning and refrigeration.
- They may operate with any type of compressor (hermetic, semi-hermetic and open) but only electrically driven chillers are included.
- Only refrigerants authorised in EU are considered. Chillers may be air cooled, liquid cooled or evaporative cooled.

Certification requirements

Qualification and repetition: a certain number of units will be selected by Eurovent Certification and tested every year, based on the number of ranges and products declared.

Certified characteristics & tolerances

- Cooling & heating capacity and EER & COP at full load: < –5%
- A-weighted sound power level: > +3 dB(A)
- Water pressure drop: +15%
- Available pressure: –15%

ECC Reference documents

- Certification manual
- Operational Manual OM-3
- Rating Standard RS 6/C003
- Rating Standard RS 6/C/003A

Testing standards

- Performance testing: EN 14511
- Sound testing: EN 12102

Heat Exchangers

CERTIFY ALL

EUROVENT CERTIFIED PERFORMANCE ENERGY EFFICIENCY CLASS www.eurovent-certification.com

Air coolers for refrigeration

The purpose of the Eurovent "Certify-All" certification programme for heat exchangers is to encourage honest competition and to assure customers that equipment is correctly rated.

The programme covers 3 product groups:

- Unit Air Coolers
- Air Cooled Condensers
- Dry Coolers

The "Certify-All" principle ensures that, for heat exchangers, all models in the three product categories are submitted for certification, not just some models chosen by the manufacturer.

A product energy class scheme has been incorporated into the certification programme, based on 7 classes from "A++" to "E" in order to provide a guide to the best choice of product: this enables the user to minimize life-cycle costs, including running costs which account for a much superior sum than the initial investment cost.

Committee chair:
Stefano Filippini
Technicalmanager - LUVE

Dry coolers

Air cooled condensers

Scope of certification

The Eurovent Certification Programme for Heat Exchangers applies to products using axial flow fans. The following products are excluded from the Eurovent Certification Programme for Heat Exchangers:

- Products units using centrifugal type fans.
- Units working at 60 Hz

In particular, the following products are also excluded from the Eurovent Certification programme for Dx Air Coolers and Air Cooled Condensers:

- Products using R717 refrigerant (ammonia), CO_2, and refrigerants with high glide like R407C or without correction factors.
- Product ranges of Dx Air Coolers where maximum standard SC2 is below 1.5 kW.
- Product ranges of Air Cooled Condensers where maximum standard capacity under DT1 15K is below 2.0 kW

Certification requirements

- Qualification: units selected by Eurovent Certification shall be tested in an Independent Laboratory selected by Eurovent Certification.
- Repetition procedure: units selected from regular production shall be tested on a yearly basis.

Certified characteristics & tolerances

- Standard capacity -8%
- Fan power input +10%
- Air volume flow ±10%
- External surface area ±4%

For Air Cooled Condensers and Dry Coolers:

- A-weighted sound pressure level: +2 dB(A)
- A-weighted sound power level: +2 dB(A)
- Surface area: ±4%

ECC Reference documents

- Certification manual
- Operational Manual OM-2
- Rating Standard RS 7/C/003
- Rating Standard RS 7/C/001

Testing standards

- Performance ENV 328
- Performance EN 327
- Acoustics EN 13487

Liquid Chilling Packages

Scope of certification

- This programme applies to standard chillers and hydronic heat pumps used for heating, air conditioning and refrigeration.
- They may operate with any type of compressor (hermetic, semi-hermetic and open) but only electrically driven chillers are included.
- Only refrigerants authorised in EU are considered. Chillers may be air cooled, liquid cooled or evaporative cooled.

Certification requirements

Qualification and repetition: a certain number of units will be selected by Eurovent Certification and tested every year, based on the number of ranges and products declared.

Certified characteristics & tolerances

- Cooling & heating capacity and EER & COP at full load: < –5%
- A-weighted sound power level: > +3 dB(A)
- Water pressure drop: +15%
- Available pressure: –15%

ECC Reference documents

- Certification manual
- Operational Manual OM-3
- Rating Standard RS 6/C003
- Rating Standard RS 6/C/003A

Testing standards

- Performance testing: EN 14511
- Sound testing: EN 12102

Remote Refrigerated Display Cabinets

Why do we need transparent information on refrigeration equipment?

Refrigeration in the supermarkets represents between 30 to 60% of the electrical consumption of the store. For design offices, consultants and end-users, the difference in energy efficiency of the products shall be accurate and visible, so that it is possible to make the right choice.

Furthermore the Europe targets an energy saving by 2020 and put in place an Energy Related Product Directive. The less efficient products will be banned from the market.

Only a Certification program via its independent controls guarantees the required transparency and it allows a fair market.

Committee chair:
Stéphane Mousset
Product Manager – Marketing
EPTA Group

Scope of certification

- 100 basic model groups divided in 5 categories: semi-verticals and verticals (with doors); multi-deckers; islands; service counters; combi freezers.
- At least two references per basic model group representing 80% of sales shall be declared.
- One Bill of Material for each declared reference.

Certification requirements

- Qualification: sampling and test of one unit & Audit of one factory.
- Repetition test of one unit per brand every 6 months & Annual audit of each factory.

Certified characteristics & tolerances

- Warmest and coldest product temp. ±0.5°C
- Refrigeration duty (kW) 10%
- Evaporating temperature –1°C
- Direct elec. Energy Consumption +5%
- Refrigeration elec. Energy Cons.
- Total Display Area (TDA) –3%

ECC Reference documents

- Certification manual
- Operational Manual OM-7
- Rating Standard RS 14/C/001

Testing standards

- EN ISO 29953 and amendments
- CEN TC44/WG1 amendments
- "Alternative for filling test packages"

Rooftop (RT)

CERTIFY ALL

The Eurovent rooftop certification (RT) program covers air-cooled and watercooled packaged rooftop units below 100 kW in cooling mode, with an option to certify units from 100 kW to 200 kW. The Rooftop program participants represent the five main European rooftop manufacturers.

Eurovent certifies indoor and outdoor sound levels, cooling and heating capacity and efficiency. Certified performances provide transparency and fair comparison between manufacturers. It is also the basis for the reliable study of HVAC system energy performance.

Currently the program evolves towards part load efficiency (SEER, SCOP) and certification of performance simulation tool data. Current work done on EN 14825 aims to address rooftops in the calculation hypothesis. The software certification is a key item to comply with existing and coming certification of building energy calculations in the EU countries.

Committee chair:
Mr Philippe Tisserand
Product Manager for rooftop & commercial unitary for Trane EMEIA – Chairman of Eurovent Rooftop program compliance committee

Scope of certification

- This Certification Program applies to air-cooled and water cooled rooftops rated below 100 kW.
- Models with cooling or heating capacity ranging from 100 kW to 200 kW can be certified as an option.
- Models of rooftops using gas burners for heating shall be only certified for cooling.

Certification requirements

- For the qualification and repetition procedures (yearly) between 1 & 3 units are selected and tested by Eurovent Certification, depending on the number of products declared.

Certified characteristics & tolerances

- Capacity (Cooling or Heating): –5%
- EER or COP: -8%
- Condenser water pressure drop: +15%
- A-weighted Sound Power Level: +3 dBA.
- Eurovent Energy Efficiency class (cooling and heating)

ECC Reference documents

- Certification manual
- Operational Manual OM -13
- Rating Standard RS 6/C/007

Testing standards

- EN 14511 for Performance Testing
- EN 12102 for Acoustical Testing

Variable Refrigerant Flow (VRF)

CERTIFY ALL

Scope of certification

The certification programme for Variable Refrigerant Flow (VRF) applies to:

- Outdoor units used in Variable Refrigerant Flow systems with the following characteristics:
- Air or water source,
- Reversible, heating-only and cooling-only.

VRF systems with data declared and published as combinations are excluded from the scope.

Heat recovery units are included in the scope but the heat recovery function is not certified.

High ambient systems are included in the scope but tested under standard conditions as specified in RS 6/C/008.

Certification requirements

- Qualification: units selected by Eurovent Certification shall be tested in an independent laboratory selected by Eurovent Certification.
- Repetition procedure: units selected from regular production shall be tested on a yearly basis.

Certified characteristics & tolerances

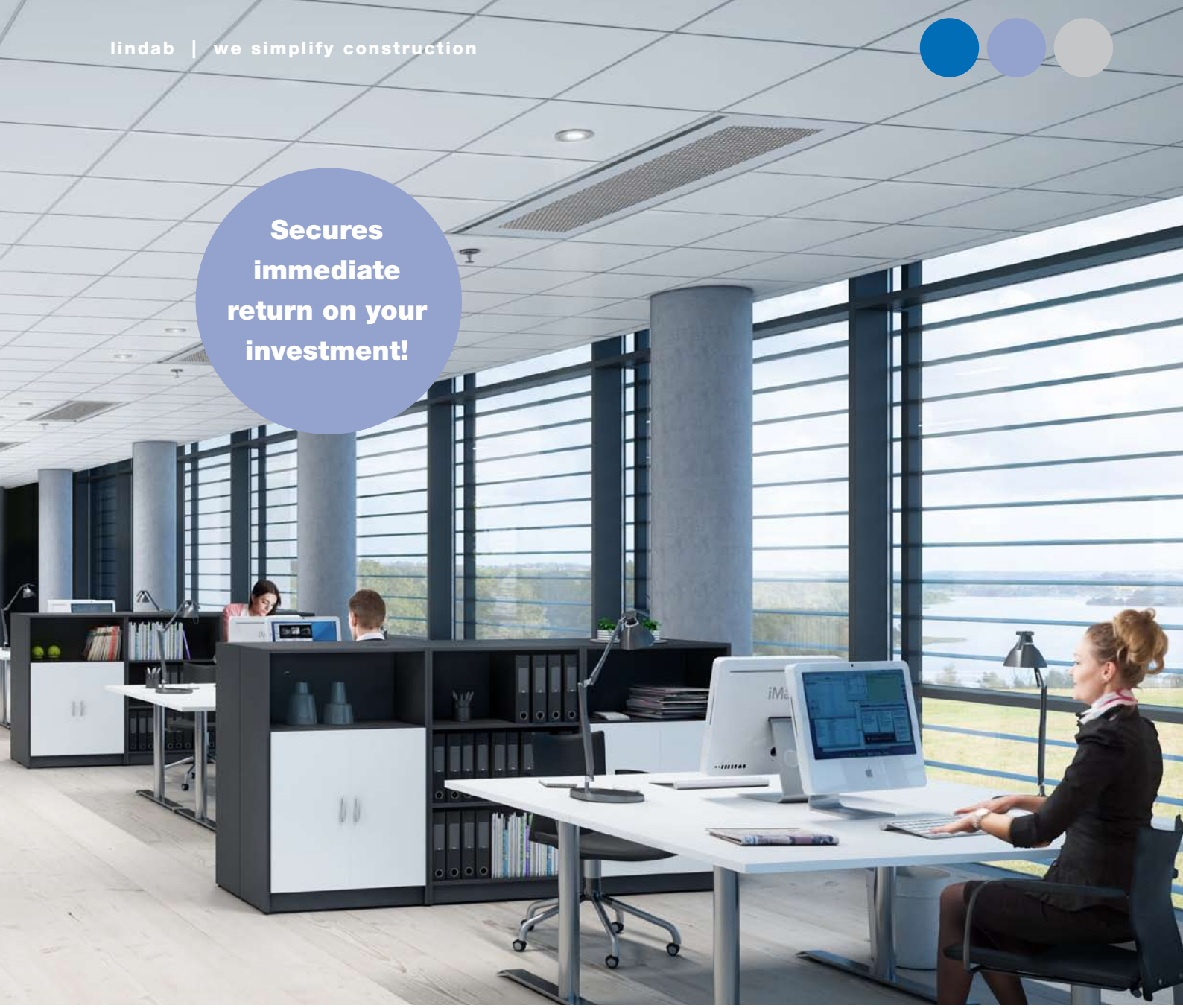
- Outdoor Capacity (cooling and heating): –8%
- Outdoor Efficiency (EER, COP): –10%
- A-weighted sound power level: 0 dB

ECC Reference documents

- Certification manual
- Operation manual OM-15
- Rating Standard RS 6/C/008
- Rating Standard RS 6/C/009

Testing standards

- EN 14511
- EN 12102



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Why certified performance data is needed?

Interview with Jaap Hogeling

Chair of CEN TC 371 Program Committee on EPBD supporting standards

Jaap Hogeling
Manager international projects and standards
Chair CEN TC 371 Program Committee on EPBD
ASHRAE Fellow, REHVA Fellow
ISSO, Dutch Building Services Knowledge Centre
The Netherlands

Why designers and installers need certified data?

For designers and installers this may be the initial approach when these parties have interest in the Life Cycle cost of the building, they will choose for products with a more reliable performance. Choosing for certified products is then the first step. This is similar to a situation when clear performance criteria are contracted and commissioning of the design and installation work (or certified installation work) is required.

What is the impact of the certification in practice?

Product certification is essential to assure the overall performance and energy performance of buildings. Designer and consultant pay a lot of attention to select, project and install HVAC&R products as part of heating, ventilating, air-conditioning and cooling systems in buildings. They have to base their selection on the data presented by the producer or supplier of these products. The system designer or installer has to be sure that these data are reliable and applicable. The building system or sub-system will only perform according the expectation and connected contract obligations if the product data are correct and complete.

If at the end the building or building system doesn't perform according the agreed design specifications, who is to blame?

- The designer because of a poor design?
- The installer because of poor installation work?
- The supplier of the integrated products because of poor performance of these products?

Given the fact that the installer is in many cases the subcontracting party, it is the installer who gets the blame. For the client this is simple, the installer installs and should perform. As professionals in our field we know that this may be clients´ logic, but is very often not correct. The contracted installer may not be paid or responsible for the design. Should he have checked the design or the correct performance of the products? Is he to blame if he trusted the inaccurate or not reliable product data? How could an average installer ever win a dispute on this issue when opposing a specialised producer?

Given these many questions it seems logical that a substantial number of reliable producers in our field agreed to choose for the certification of their products. With certified products they want to convince their clients that the performance data of their products are reliable. This certification is a substantial step in the right direction.

How would you develop the product certification further?

By giving preference to the certified products and promoting this to the client. The contracts should require this, if not we don't have a levelled playing field; non-certified products may often be cheaper.

Product certification should more focus on the requirement of the system designer/installer, report all data needed for good design and installation work. The ECO-design directive requires more data of these products in the near future. This could be a chance for the further development for certification schemes. For products having impact on the energy performance of buildings, the EC (Mandate 495) will make the producers aware that the systems and product standards developed are in line with the EPBD procedures under Mandate 480.

How can the certification schemes be used further to improve the performance of the HVAC systems?

A next step for our HVAC sector could be certifying the designer and installer according an EN45011 based certification scheme. This means that a contractor or client can choose for a certified installing company where the quality assurance it guaranteed by the certification system that requires, among others, a regular 3rd party inspection of the realized projects. These schemes will generally be developed for specific application fields. They will also include to the use of certified products.

Designer needs reliable performance data of products

Interview with Wim Boydens

Professor Wim Boydens is co-owner, technical director and CSTO of Studiebureau Boydens (www.boydens.be), one of leading M&E design and energy-consulting offices in Belgium, well known of their innovative, sustainable and client oriented solutions. He is a visiting professor at Ghent University since 1999.

What kind of criteria you use when the equipment is selected to your buildings. Is the low investments cost the only criteria?

Investment cost is almost in no case the only criteria. LCA, TCO, are more the focus of selection. Impact of equipment on energy efficiency is a major concern, as well as long term behaviour of equipment, quality, maintainability and after sales availability of supplier-support.

Have you ever had problems with products which do not perform as assumed or declared? What kind of problems?

Mainly problems when suppliers declare to be compliant with the specifications imposed by the designer without any test results stating this. Problems occurred already regarding noise levels and heat recovery efficiency.

How important it is to know the performance of the products installed your buildings?

It is extremely important since characteristics influence the building real energy consumption and the energy performance declaration (EPBD). Also in case of retrofitting it is useful to be able to identify performance of installed products. Same issue occurs in trouble-analysis in existing buildings.

What are the benefits of the certification system of product performance?

Major advantage is to verify compliance with the tender specifications, to compare performances of different suppliers of different regions on a correct level, without test procedure uncertainties.

Easy and clear prescription process in tender documents and guaranteed predicted design performance.

How would you develop the product certification further?

It's not easy for me to define feasible strategies, but we welcome every improvement towards a transparent and uniform certified performance identification of products.

Position of Eurovent Certification clarified

Interview with Erick Melquiond

Managing Director of Eurovent Certification

Erick Melquiond
Managing Director of Eurovent Certification Company

QUESTIONS BY
Jaap Hogeling
Manager international projects and standards
Chair CEN TC 371 Program Committee on EPBD
ASHRAE Fellow, REHVA Fellow
ISSO, Dutch Building Services Knowledge Centre
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Jaap Hogeling: Does Eurovent Certification choose for accredited certification schemes? These scheme's for product testing referring to the relevant product standards and could be based on EN45011 and accepted by Accreditation Authority.

Erick Melquiond: Eurovent Certification Company (ECC) is an accredited certifier. ECC is holding the accreditation certificate number 5-0527 for Industrial Product according to ISO guide 65 and EN 45011:1998 delivered by COFRAC, scope and validity of the certificate at www.cofrac.fr. This accreditation is part of EA and IAF signed by a large number of countries [**1**].

Therefore all the product performance certificates ECC deliver have got a legal ground to be recognized by any authorities belonging to a country that have signed the mutual recognition agreement (see www.european-accreditation.org or www.iaf.nu)

Jaap Hogeling: Does Eurovent Certification require ISO17025 or EN45001 accredited testing laboratories, or is the selection just based on the declaration of the testing institute that they work according this standard and why?

Erick Melquiond: All except one laboratory ECC is using out of 14 are holding a valid certificate according to ISO 17025 for the family of product being tested. The only lab not complying is TNO. They have postponed for the last four years to become ISO 17025 for Refrigerated Display Cabinets. Despite this point, as TNO is from our experience the best lab available in Europe for this kind of product , ECC is conducting an audit of the lab to verify and document key points specified in ISO 17025 (last audit December 2012).

Our specification for testing include an Operating Manual and a Rating Standard organized by product that rely on existing ISO or EN standard when available, however, numerous additional requirements are added to generate a reliable performance testing protocol as part of ECC certification. Selection of product to be tested are done according to ECC internal analysis protocol, based on the performance mapping and data mining comparison per product group across all the participating manufacturer´s data.

As part of the certificate process we are also conducting for some certification programs selection software check and manufacturing plant audit.

Jaap Hogeling: Most of the Eurovent certification schemes are based on EN or ISO product standards, did you check if the required and reported product data are really useful for the user of this product as basis for the design of the systems?

Erick Melquiond: Indeed we try to rely on EN or ISO, but not only. Sometimes no standard are available, one

[1] ACCREDIA ITALY, AKKREDITIERUNG AUSTRIA, BELAC BELGIUM, CAI CZECH REPUBLIC, DAkkS GERMANY, DANAK DENMARK, ENAC SPAIN, FINAS FINLAND, INAB IRELAND, IPAC PORTUGAL, NA NORWAY, PCA POLAND, RvA THE NETHERLANDS, SAS SWITZERLAND, SWEDAC SWEDEN , TURKAK TURKEY, UKAS UK

example would be fan coils, the certification scheme is 100% relying on Eurovent standards as current CEN or ISO standard are not fully covering this type of products. We are involved in the revision of EN1397 (European standard for fan coil testing) and we plan to use this standard when the next version is available (hopefully end of 2014).

Sometimes we are completing standard or regulation with an energy labeling scheme requiring more accurate performance measurements , for example for air conditioning with a 8% tolerance when the European standard asks for 15% tolerance in self-declaration (useless for the user). We have also labeling and ranking for several product groups including: Air handling units with a formula taking into account climatic conditions in Europe, Air filters, Fan coil unit, Chillers, Rooftops, Refrigerated display cabinets, Heat exchanger for refrigeration.

***Jaap Hogeling**:* In discussions in product related technical committees (at CEN or ISO level) there is a first priority for just specifying the data to compare products in doing so the market seems well regulated. System designers need more data that are not always visible in the product declaration, they have to rely for these data on the producer self-declaration and documentation. Eurovent Certification will become more welcomed by the system designer if a more complete product declaration is supported. To refer to the product standard is not a good excuse, we all know that non producers are a in the minority in working groups developing these standards and don't have the means to support these activities.

Erick Melquiond: This is a complex and important issue but already included in the ECC strategy at ECC organized in different levels including the following actions:

- to make certified data available on a wider product datapool at the level of the building segment (done end of 2012)
- to add data field required by thermal building calculation software in order to comply to building codes , country by country (done for France in 2012)
- to build up and extend the scope of the product database to include additional data field required and this country by country as building code are different (on-going project 2013-2015).

The product data needs to get smarter, much smarter

Per Sahlin
CEO, EQUA Simulation AB
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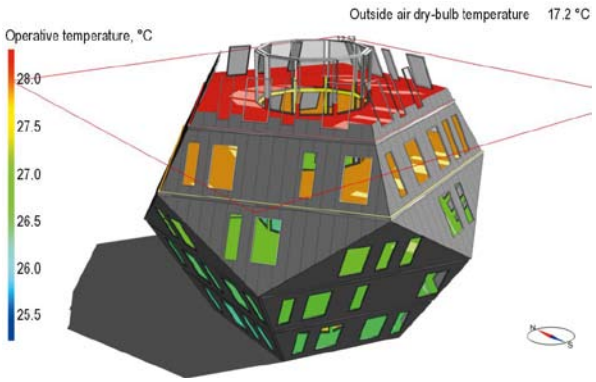
The most obvious and also the traditional place for HVAC component data is the product catalogue. Today, this data is often digitally presented, but it is still designed for human eyes. However, a significant amount of actual product selection also takes place in CAD systems, where the operator picks products from menus that are populated by the manufacturers themselves. The primary focus of this data lies on physical appearance and dimensions, but the graphical information is often complemented by certain behavioral parameters to enable calculations that are supported by the CAD system, such as pressure-flow or sound calculations at design points.

Some CAD systems can even hold data for more advanced computations such as whole-building simulation. The design can then be evaluated in terms of energy use and for some systems indoor climate properties. When such key properties of a design are easily evaluated, the number of what-if questions can be large and the final building is likely to be more optimal. Looking at the trend from other industries, there is reason to believe that even more complex simulations will be supported in the not too distant future. In modern simulation tools, the actual mathematical models of components are treated as data. This opens a scenario where a manufacturer not only provides the parameters for some fixed built-in model, but ships a plug-in component model of their own design, that represents the dynamic behavior of their product. This is still a bit out of range for most of the widely used building simulators that presently offer only a fixed repertoire of component models. But some tools, such as IDA Indoor Climate and Energy, already support this.



The graphical output of temperature simulation with the IDA ICE simulation for a complex geometry building.

Two de-facto standards have emerged for such plug-in dynamical models: Modelica (www.modelica.org) and FMI (www.fmi-standard.org). There is every reason for the HVAC industry to follow the progress of these two standards.

Modelica enables the component modeler to write down equations directly. There is no need to worry about the solution process, which is handled automatically by the simulation environment using a combination of numerical and computer algebra methods. Over the last few years, impressive Modelica component libraries have been developed for a number of industrial domains. It is no longer an issue to prove that this type of modeling is efficient even for the most complex dynamical systems.

Modelica states the individual equations (and parameters) of a model in an open textual format accessible for both human and computer reading. This can be undesirable from a disclosure point of view. Manufacturers may not wish to reveal all details about their models.

On the other hand, FMI is a binary representation of a model with a security level comparable to any of today´s product selection tools. The soon to be released version 2.0 of FMI does not yet fully support the same type of physical component connections that are supported by Modelica. However, work is already under way to improve this, and then FMI should provide an excellent format for HVAC component manufacturers to publish plug-in simulation models.

In this scenario, the need for industry standardization shifts from the precise form and definition of component parameters into the connectors that allow a model to interact with its neighbors. Similar to the irritating variation in electrical plugs between countries, trivial variations in connectors and other key definitions must be avoided by early action of the key standardization bodies.

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Growing interest in market intelligence of HVAC products

Interview with Yannick Lu-Cotrelle

Manager of Eurovent Market Intelligence

Yannick Lu-Cotrelle
Manager of Eurovent Market Intelligence

Eurovent Market Intelligence (EMI) is the **European Statistics Office on the HVAC&R market**, and provides key market data like:

- **Annual** and **Quarterly** analyses
- Market **Trends and Forecasts** (annually and quarterly)
- **Detailed information** on the equipments sold (technology, capacity...)
- Analyses **by country** (in Europe, Middle-East and Africa)

Detailed information on statistic program & database can be found at **www.eurovent-marketintelligence.eu**

In 2013, Eurovent Market Intelligence will celebrate 20 years of service to businesses in the field of market intelligence.

How do you explain the growing interest of businesses in market intelligence?

In this difficult and very competitive economic climate, business leaders have more need than ever for points of reference for making rational decisions as to the direction of their activities.

For example, the last quarter of 2012 was particularly difficult in Germany for the chiller market, with a drop in sales of around -12% when manufacturers had instead been counting on a slight improvement. In this context, if a manager, who had been expecting an increase, sees that their sales representative for Germany records -8% in their sector, they are going to wonder why and will ask themselves two types of questions: 1) Is it my product that is not any good? 2) Is it my sales representative who is not any good? In the first case they will review their product range and perhaps drop the product in question; in the second case they will be tempted to part with their employee. But the answer to their question is perhaps elsewhere.

By receiving the results of our data collections, they could deduce that the performance of their sales representative and/or product were not that bad (4%-points above the average drop in the market).

Moreover, from our results available on-line, it is possible to extract, by geographical sector and by product and sub-product segmentation, the company's market position as well as its market share and that is what is much more important for effectively managing sales. Saying that in the second half of 2012 your sales of chillers on the English market increased to €2.5 million against €2.3 million in the previous year has no strategic value in itself. However, knowing that in 2011 you were in 4th position, with a market share of 12%, and that in 2012 you are in 6th position with a market share of 8% is much more relevant and puts the previously mentioned figures into perspective. (It is important to understand that the market grew by around +15% in England during the second quarter).

Quarterly Forecasts for HVAC-R Market Trends in Europe, 4th Quarter 2012.

Product *	Quarter 2012Q4 Evolution vs 2011Q4	Year 2012 Evolution vs 2011
AHU	-7.4%	+7.9%
Fan Coils	-2.8%	-3.5%
Chillers	-8.3%	-3.2%
Rooftops	-8.2%	-2.8%

Apart from the management of sales forces, are there any other advantages to be drawn from this market data?

One of the main advantages is at the product level. For example, in certain segments we are seeing a downward trend in sales over the long term, which is a reliable indicator for predicting that these products will have virtually disappeared within 5 or 10 years. A manufacturer which often recorded bad performances in this market and which did not participate in our data collections could think that it was an internal problem and would use up all its resources in trying to find it. Conversely, a manufacturer which, thanks to our data, had the necessary perspective would quickly understand that it is a losing battle and would transfer its resources to launching new products.

Who draws up your statistics collection questionnaires and what criteria do you take into account?

Contrary to what certain external players may believe, the data collection questionnaires are not created by us but by... the manufacturers themselves. It is in fact during our working group meetings that the questionnaires are created either from scratch, if it is a new programme, or discussed, reviewed and improved if they are for existing programmes. Each questionnaire amendment is put to the vote of our participants.

As regards criteria, we take two parameters into account:

1) Is the requested information easily extractable?

2) Will the information be relevant from the market's point of view?

It is only when the answer to these two questions is "yes" that we consider changing the questionnaire.

Are businesses reluctant to provide you with their confidential sales data? Might they not want to cheat?

Yes, traditionally businesses are very reluctant to provide this kind of data. It is only through working on creating trust in the long term that we have been able to achieve such results. Many are very cautious when we contact them. Sometimes they take several years to reach a decision, then one day they make up their mind, just to see, and then they realise that there really was nothing to worry about and appreciate all the more what they gain from participating. Since taking up my position almost four years ago, the manufacturers I've seen not renew their participation can be counted on the fingers of one hand.

Regarding the possible presence of cheats, it's a phenomenon which should be dismissed on the whole, because by doing so, the participant would bias the results it receives, and in an irretrievable way on data such as market evolution or market position. This kind of participant does not generally stay for more than a year, because it is not worth paying for a service that you can only half use. It should also not be forgotten that, by our participants' own admission, EMI is the statistics office which carries out the most extensive validation of manufacturers' data; we have such expertise that we have already automatically excluded new applicants after analysing the data file that was sent to us. As for the rest, a large number of our participants are still with us since our creation

20 years ago, which is a sign of the confidence they have in our work.

You say that your participants are satisfied, but, apart from the growing number of businesses that are members of your programmes, do you have other tangible indicators of "customer satisfaction"?

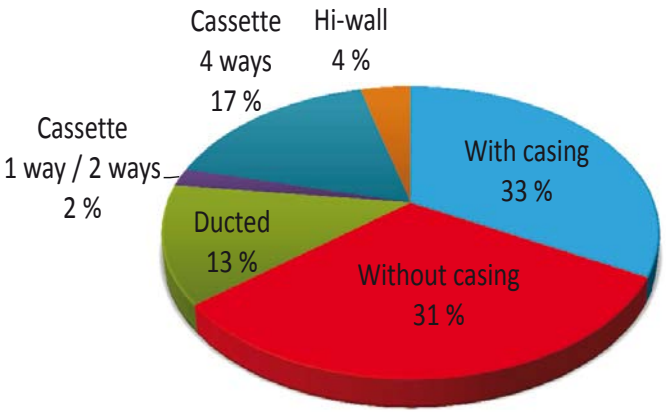
Yes, of course. In 2012 we carried out a major customer satisfaction survey with all of our participants, the detailed results of which were presented to them during our last committee meeting. 91% of our participants said they were satisfied or very satisfied with our programmes. Obviously, this figure means nothing if we are not able to maintain it or improve on it in the future.

Another indicator is the abundance of expressions of confidence from manufacturers. We have therefore decided to create a new section on our website in February 2013, to maintain a directory of these numerous testimonies. What is appreciated overall is our policy for continuous improvement in the various programmes. Each year we enhance the amount of data collected and, each year, we improve the nature of the audits that are carried out on the files received.

Eurovent is based in Paris and you yourself are French; is there not a danger that French manufacturers will be over-represented?

No, on the contrary. You should know that French manufacturers barely represent 5% of our participants. A large number are from Italy (about a quarter), from Germany and from Northern European countries. However, we also have Spanish, Portuguese, English and many Eastern European manufacturers. What's more, for many years we have been welcoming participants from Turkey and the Middle East.

As for the rest, our commercial approach is resolutely international. Each year EMI recruits trainees from different backgrounds in order to diversify the languages spoken and the regions canvassed. This year the spotlight is on Turkey with the arrival of Miss Dila Algan, who comes from Galatasaray University and Miss Ebru Erdinç, also from Istanbul.



An example of the summary data created by EMI. Break down of fan coil unit sales in Europe, Middle-East and Africa.

What are EMI's projects for the next three years?

Our priority will be to consolidate our existing programmes and to extend our service offering. Among the additional services, we plan, for example, to further position ourselves in the heating or solar sectors. The other focus for development is to refine our market forecasts in the short and medium term:

– on the one hand, through studying correlations with economic indicators outside the business activity, such as trends in granting building permits, for example;

– on the other hand, through continuing to develop our own expertise in the principles of the workings of the market.

From there on, it is not impossible that, over time, we will move towards advisory activities.

Do you have anything to say about the economy?

Regarding the HVAC&R market in general, we can already say that 2012 was a sluggish year for the majority of chiller, rooftop and fan coil manufacturers, with a fall of around -3% for the year as a whole, according to our initial estimates. Overall, the last quarter of 2012 was the most difficult, as many manufacturers waited for the last quarter to make up for their losses, whereas it was very disappointing. Spain, Italy and France suffered fairly badly, whilst the United Kingdom, Russia and Eastern Europe fared somewhat better.

For AHUs, the year was not so bad, even positive for countries such as Germany, Russia, the Alpine countries and Northern Europe.

News from the European Commission

Commission declares 2013 the year of air


PHOTO: BARBRO WICKSTRÖM

The EU has been tackling air pollution since the 1970s. Steps like controlling emissions of harmful substances into the atmosphere and improving fuel quality have contributed to progress in this area, but the problem still remains. This is mainly as a result of human activities: the burning of fossil fuels and the dramatic rise in traffic on the roads, for instance. As a consequence, air pollution is cited as the main cause of lung conditions such as asthma (there are twice as many sufferers today compared to 30 years ago), and as the cause of over 350 000 premature deaths in the EU every year. Now, the European Commission is adopting a new strategy and has declared 2013 as the year of air, with new proposals on improving air quality across Europe.

National NZEB plans

National plans on Nearly Zero-Energy Buildings (NZEBs) are progressing fast. The first national definitions are now available, as are the minutes from the workshop "Towards Nearly Zero-Energy Buildings – Definition of common principles under EPBD". Two recent overview articles summarize how the targets for energy efficiency are to be met in social housing, and how solar control can contribute to achieving NZEBs.

BUILD UP Skills

In the framework of the BUILD UP Skills initiative, 30 EU countries are working on national roadmaps to qualifying the building workforce for the 2020 challenges. Already about 20 national teams have completed their analyses of the status quo. During the recent BUILD UP Skills EU Exchange Meeting, over 100 representatives shared information on the development of training roadmaps. Material and presentations have been posted in the recently launched BUILD UP Skills website **www.buildupskills.eu**.

Country facts at BUILD UP

The BUILD UP Country Facts page, provided in collaboration with the Concerted Action EPBD, is regularly upgraded with key information on national policies, regulations, registries, software, financing mechanisms, contacts and more. **www.buildup.eu/factsheets**

Renovate Europe

The European Parliament's Report on the Energy Roadmap 2050, adopted in the ITRE (Industry, Research and Energy) Committee in January, echoes the call already voiced in the EU Roadmap for a low-carbon economy in 2050 as well as in the Energy Efficiency Directive, to urgently address the energy efficient renovation of Europe's buildings.

The own-initiative report on the Commission's Energy Roadmap 2050 underlines the need to substantially scale up the rate and quality of building renovation in order to reduce the energy consumption of the existing building stock "**by 80% by 2050 compared to 2010 levels**".

Achieving the reduction in energy demand of the EU's building stock by 80% by 2050 was already established as a cornerstone of the EU Roadmap for moving towards a Low-carbon economy in 2050, agreed in 2011. Setting this long-term perspective for energy efficiency is essential to providing market certainty in the long-term, to unleash the needed investment in energy efficiency.

"Aligning all actors, in the public and private sector, but also at consumer level, around the same goals of reducing the energy demand of the EU's existing building stock by 80% by 2050 is a fundamental step to achieving the EU's goal of a competitive low-carbon and low-energy economy by 2050", explained **Adrian Joyce**, Campaign Director of the Renovate Europe Campaign. "The Renovate Europe Campaign recognized this logical step in 2011, and set this target as the main vision of its Campaign, with the aim of **delivering jobs, growth and lower energy bills** for EU citizens."

The Parliament's Report also calls on the Member States to fully implement the recently adopted Energy Efficiency Directive, and to adopt ambitious long-term building renovation strategies accordingly.
www.europarl.europa.eu/committees/en/itre/home.html
www.renovate-europe.eu

Eurovent certified performance data now available on CLE@ database – The online portal for building products

CLE@ database is a single portal dedicated to the building industry that allows easy and real time access to product technical data needed by consultants, contractors, architects and building project managers. For manufacturers this is also a unique opportunity to have their products included in this database that incorporates different building calculation software.

Launched in June 2012, CLE@ is the result of the merge of the EDIBATEC and PROMODUL technical databases. It covers different product segment of the building industry, such as: building insulation products, building construction materials, glass & solar protection products, windows, heating and cooling equipment & components, building management systems & components, ventilation & air treatment equipment, and solar equipment.

Technical data displayed are clearly identified as manufacturer's data or third party certified performance data such as Eurovent Certified Performance or Certita certified products.

At per today, this database is only available in French. The English version is planned to be launched in April 2013.

Free database access at **http://www.catalogue-clea.fr**

Manufacturers and building calculation software suppliers are invited to contact Vincent Jammet at **v.jammet@edibatec.org** or Erick Melquiond at **e.melquiond@eurovent-certification.com** for more information.

Certification of Remote Refrigerated Display Cabinets

In the past few years, General Directorates (DG) of European Commission have worked on a large project of reduction of energy use, which lead to publication of directives as Energy related Products (2009/125/EC) or Labeling (2010/30/EC).

Refrigerated display cabinets were studied in one of the several lots prepared (TREN lot 12). Draft of the implementing measures is currently under preparation for definition of minimum efficiencies to be reached for a unit to be allowed carrying the CE marking. A mandatory efficiency label (A-G letters) could also be put in place in parallel by the European Commission.

To guarantee that efficiency levels offered to customers are reached and more generally to increase transparency of data on the European market, Eurovent Certification Company (ECC) certifies more than 50000 references of 20 types of products in the fields of ventilation, air-conditioning and refrigeration. Amongst these, the voluntary certification programme for remote refrigeration display cabinets includes several international brands, some certified for 10 years now. Principle of this certification is that facilities are annually audited and cabinets are tested in independent laboratories every six months. The goal of the audit is to make sure that production in factories perfectly corresponds with declaration of models submitted to ECC. During the visit, the auditor checks the production line and reviews recent orders to verify conformity. By regularly testing complete products according to conditions of international testing standard ISO 23953 and relevant amendments, ECC makes sure that heat extraction rate, evaporation temperature, and range of product temperature (through temperatures classes) of cabinets placed on the market are in compliance with performance displayed in catalogues.

ECC publishes with a new format performance of models on its website since May 2010, through representative models defined by their cross-section. The additional novelty is that are available not only performance under laboratory conditions, but also uniformly transposed data in order to fit with store conditions. Indeed, in supermarkets, cabinets are usually placed together so the ambient conditions are more clement than the ones issued from the standard. The efficiency of the cabinet is then closer to real conditions, so installations are better dimensioned, reducing the final energy bill of the installation. Finally, an energy classification of these cabinets has been prepared in order to help specifiers and contractors in choosing the best solution for their installation.

Sandrine Marinhas
s.marinhas@eurovent-certification.com

Joop Hoogkamer retires from Eurovent

Joop Hoogkamer retires from the position of Eurovent Executive Director, which he held since November 2009. There has been vast appreciation inside and outside Eurovent for his work, passion and vast professional experience. The President, General Secretary and Eurovent Board express their sincere and warm thanks for his remarkable contributions. Eurovent is committed to insure the continuity and quality of its activities and services improving these where possible. This is now the responsibility of the Eurovent Board. **Félix van Eycken** continues as Secretary General, and is in charge of all operational activities.

The REHVA Journal with Eurovent Board wishes Joop Hoogkamer all the very best for a long, happy and healthy retirement.

Eurovent, the European Committee of Air Handling and Refrigeration, is the representative of the European refrigeration, air conditioning, air handling, heating and ventilation industry and representing trade associations from European and non-European countries. Eurovent represents over 1,000 companies in 13 European countries, employing 150,000 people who generate more than €25 to 30 billion of annual output. Eurovent was founded in 1958.

Eurovent represents, promotes and defends the industry towards relevant European, national and worldwide bodies and cooperates with other European umbrella Associations. Eurovent has become over the years a well-known and respected stakeholder for all industry related issues such as the environment, energy efficiency, refrigerants, life cycle costs, etc.

Eurovent deals with the needs of the air conditioning, air-handling, heating, refrigeration and ventilation markets from the point of view of the industry. Its scope includes: the European regulatory framework, its implementation and global aspects relating to the industry.

One of its objectives is to improve communication on general issues as refrigerant, energy efficiency or indoor air quality. Most of the **Eurovent** documents are downloadable free of charge in pdf format. The hard copies of the **Eurovent** documents remain available after payment. To view the list of all available documents and for more information, please visit **www.eurovent-association.eu.**

EUROVENT

REHVA at ASHRAE winter meeting and AHR Expo in Dallas

The REHVA reception was well attended. It was the place to be on Monday afternoon January 28th. REHVA's president **Michael Schmidt** and our board members **Karel Kabele** (president elect), **Jarek Kurnitski**, **Bjarne W. Olesen** and **Jan Aufderheijde**, REHVA's Secretary General were very happy to welcome all the guests. Those present raised their glasses to REHVAs' upcoming 50th anniversary and to congratulate Bjarne Olesens' election as an ASHRAE board member.

REHVA seminar speakers: Jarek Kurnitski, Jaap Hogeling and Bjarn Olesen.

REHVA's Seminar "Building Labeling in Europe, European Standardization to meet the Energy Performance Directive" was well attended, too. The seminar speakers reviewed the European initiatives to evaluate building energy performance and to couple energy use with environmental quality. This involves revision of several CEN standards. **Jaap Hogeling** explained the EU mandate to develop the second generation of energy performance standards. Jarek Kurnitski informed the audience about REHVA's work concerning definitions and system boundaries of nZEB buildings. Bjarne W. Olesen presented the revision of EN 15251, 'Indoor Environmental Criteria'. All presentations will be available on REHVA's website.

The REHVA Journal January 2013 special issue on Airtightness was available at ASHRAE's bookstore in the Conference Center, at REHVA's Reception and in the Magazine Resource Center at the AHRI Show.

€ 65 million funding available in the 2013 call of the Intelligent Energy Europe programme

The 2013 call for proposals of the Intelligent Energy Europe (IEE) programme was launched in December 2012, followed by the official Infoday on the 23rd of January 2013. This call is the last one within the recent financial period. From 2014 the IEE program will be part of the HORIZON2020 programme, which joins the EU Research Framework Programme (FP7) and the IEE.

Several areas and priorities of the call are related to HVAC and the buildings sector targeting the energy efficiency of buildings, renewable heating and cooling systems, as well as energy efficiency services.

Priorities of the area **Energy efficiency and renewables in buildings** in 2013 are the following:

- Energy Performance Certification as a driver for step-by-step renovation
- Transforming the existing building stock towards nearly zero-energy buildings
- Continuous professional development for decision-makers
- Tracking market transition by monitoring energy performance certificates and their quality and the transition towards nearly-zero energy buildings

Relevant priorities in the area **RES in heating and cooling**:

- Deploying efficient RES H/C on a large scale, e.g. district heating/cooling, or by owners of large building stocks
- Measures to encourage RES H/C, e.g. incentives, codes, obligations by regional / local authorities
- Implementation of EU labeling on RES H/C products

INTELLIGENT ENERGY EUROPE
FOR A SUSTAINABLE FUTURE

Relevant priorities in the area **Energy efficiency services**:

- Actions for the uptake of energy performance contracts
- Sharing of knowledge on energy efficiency obligation schemes (or alternatives)

EP supports the continuation of IEE – member state level action is needed

IEE is not mentioned as separate programme (with separate budget line) in the EC proposal on HORIZON2020. Fortunately the European Parliament supports the continuation of the programme asking for a nominated 15% of the available budget for the period 2014–2020, meaning € 980 Million.

The coming months are very important to influence EU policy making to continue with this successful programme promoting buildings energy efficiency. Also the support of member state representatives in the European Council is of key importance, so national level professional bodies should convince their energy ministries to support the EP's modification request.

The deadline for submission of proposals is 8 May 2013. The detailed call documentation as well as presentations of the Infoday are available on the official IEE website: http://ec.europa.eu/energy/intelligent/getting-funds/call-for-proposals/how-to-apply/index_en.htm

Increase Your HVAC knowledge by attending REHVA Courses at CLIMA 2013

2013 CLIMA CZ

Sharpen your skills and stay in the forefront of the latest HVAC technologies by attending REHVA courses at CLIMA 2013 in Prague, Czech Republic. Choose from four short courses to help you stay current on industry trends and cutting edge technology.

REHVA Courses available at CLIMA 2013:

- Low Temperature Heating and High Temperature Cooling
- HVAC in Sustainable Office Buildings
- Design of Energy Efficient Ventilation and Air Conditioning Systems
- Chilled Beam application

For more information and to register, please visit directly **www.rehva.eu**.


Our members build quality HVACR & water heating equipment.
AHRI CERTIFIED®
www.ahridirectory.org
Globally Recognized. Industry Respected.
We build trust.

Eurovent certification launches the first certification program for Variable Refrigerant Flow (VRF) systems

After nearly 2 years, the Launching Committee - 8 manufacturing companies - has finished its task and drew up the Operational Manual and Rating Standards for Variable Refrigerant Flow (VRF) systems.

Companies willing to join the VRF certification programme long awaited and very much sought for by the market are invited to contact us at apply@eurovent-certification.com. Operational manual and rating standard are available upon request at: apply@eurovent-certification.com

The following schedule is being proposed:

Signing of agreement by manufacturers for VRF programme from now onwards. There is no deadline as this is a voluntary registration. Declaration file for products below 50 kW to be provided by applicant as soon as possible. Selection of products to be followed.

Declaration file for products above 50 kW up to agreed scope of programme (to be defined) before 30 April 2013. Delivery of products below than 50 kW before 30 April 2013. Selection of products to be tested with participant laboratories before 30 May 2013.Test reports to be made available to Participants before 30 Sept. 2013, this date being also the deadline for Eurovent Certification to publish certified performance for the full scope of the programme.

Also like any other certified data since end of November 2012, data will be made available in the Edibatec – CLA@ database used as a data library by major thermal calculation software for building. More information at www.catalogue-clea.fr.

Certified product lists and certified product performances are available at **www.eurovent-certification.com** or at **www.certiflash.com**

About Eurovent Certification

Founded in 1993, Eurovent Certification Company is recognized as a world class leader in the field of industrial third party product performance certification for Heat Ventilation Air Conditioning and Refrigeration products. Offering HVAC consultants, Energy Engineering offices, Architects and product end-users the most comprehensive certification program that covers up to 15 product families, Eurovent Certification delivers performance certificate and energy efficiency labeling according to European and international standards.

Signhild Gehlin leaves Swedvac to lead new geothermal energy competence center

After 14 years at the service of Swedvac, the Swedish Society of HVAC Engineers, as technical secretary, chief editor and since 2009 Secretary General, **Signhild Gehlin** leaves Swedvac to lead the newly initiated geothermal energy competence center Svensk Geoenergi. Svensk Geoenergi is founded by Geotec, the Swedish drillers association, to strengthen dissemination of information on thermal energy usage from the ground. The competence center will provide statistics, market analyzes, training courses, research overviews, standards, and a printed magazine in Swedish, within geothermal energy technology. Signhild Gehlin started in her new position on March 1st.

Photo: Ingar Lindholm

Signhild Gehlin

Photo: Marie Grammar

Veronica Eade

Veronica Eade is the new Secretary General of Swedvac

Veronica Eade is appointed Secretary General of Swedvac, the Swedish Society of HVAC Engineers, from March 1st. Veronica Eade has a background as engineer, with experience from research and energy usage in the building sector. She has also experience from work at the Swedish Agency of Housing and Planning.

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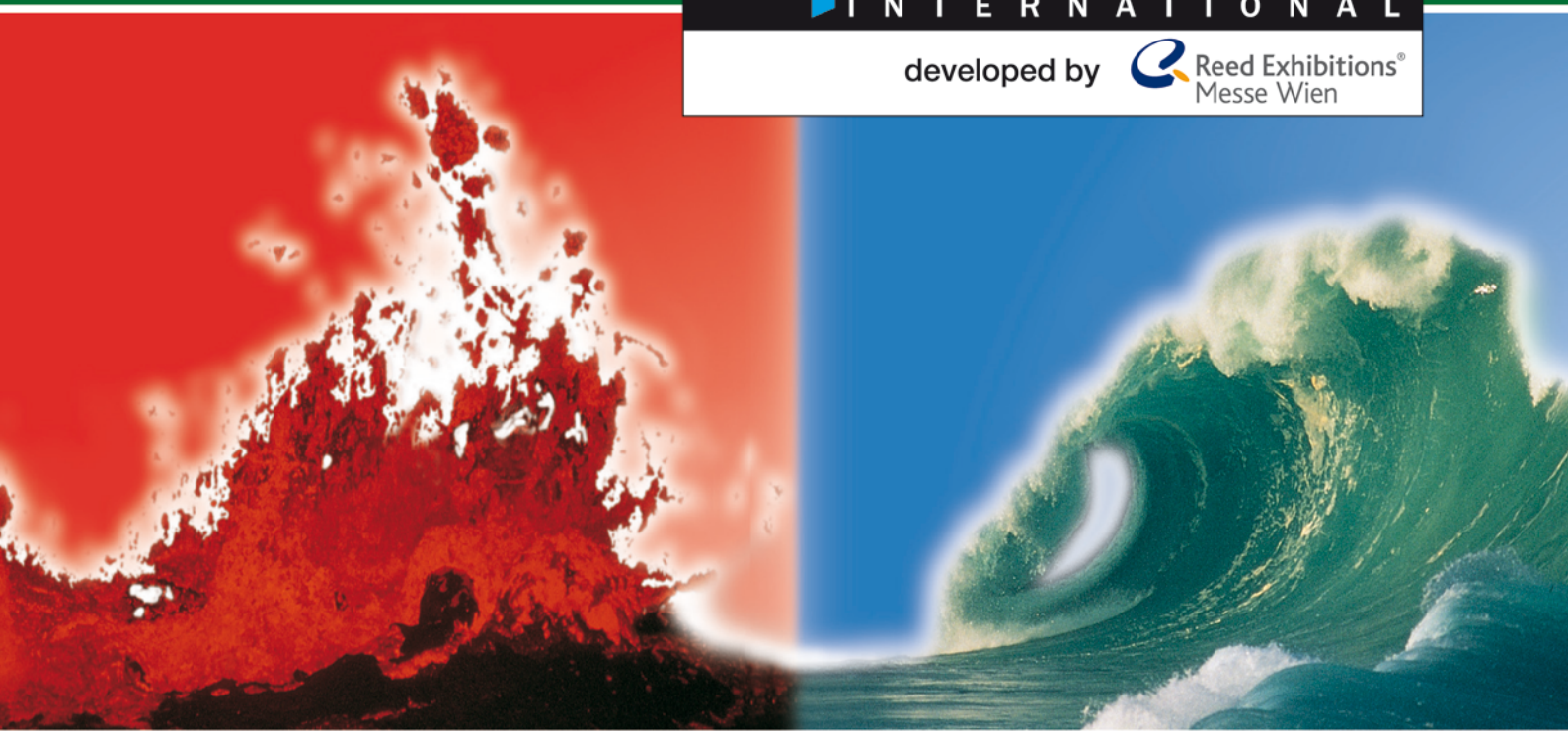

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REHVA Workshops programme * at CLIMA 2013

* Programme subjects to alterations

The REHVA workshops will take place parallel to other sessions at CLIMA 2013 congress. Each workshop will focus on a specific question or questions. The result of the workshops could be an international action plan, a list of research needs, outline for a guideline, a policy statement, etc. The results will be presented to the Conference participants in a summary report that will be sent to all participants after the conference. The results of the workshops will be used to develop future REHVA activities. The workshop reports will be also available later at the REHVA bookstore at **www.rehva.eu**.

	Meeting Room A	Meeting Room B	Meeting Room C
MONDAY – June 17			
Monday-June 17 10.30-12.30	**WS 1** Clean Air, Sustainability and IAQ technology – a holistic Approach *CAMFIL*	**WS 4** Cross-disciplinary education on NZEB *IDES-EDU*	**WS 7** Gaining control of the solar situation: Shading solutions for comfort and energy efficiency in buildings *ESSO*
Monday-June 17 12.30-14.30	**WS 2** The Value of Product Certification -The First Best Practice- Chillers and VRF systems *AHRI*	**WS 5** The Practical Benchmarking of HVAC Systems Energy Efficiency in Use *iSERV*	**WS 8** Personal control over indoor climate and user behaviour *Atze Boerstra*
Monday-June 17 14.30-16.30	**WS 3** *UPONOR*	**WS 6** Special HVAC solutions for the refurbishment of historic buildings *3ENCULT*	**WS 9** CEN-EPBD - revision of European standards *Jaap Hogeling*
TUESDAY – June 18			
Tuesday- June 18 10.30-12.30	**WS 10** Clean Air, Sustainability and IAQ technology – a holistic Approach *CAMFIL*	**WS 13** *GRUNDFOS*	**WS 16** Nearly zero energy buildings *Jarek Kurnitski*
Tuesday- June 18 12.30-14.30	**WS 11** *SWEGON*	**WS 14** Cold Climate HVAC Design Guide *Bjarne Olesen*	**WS 17** Cutting-edge Japanese Technologies for HVAC *SHASE*
Tuesday- June 18 14.30-16.30	**WS 12** *CAISSE DES DÉPÔTS*	**WS 15** IEA Annex 53 *Hiroshi Yoshino*	**WS 18** Experience with Energy Efficiency *BELIMO*
WEDNESDAY – June 19			
Wednesday- June 19 10.30-12.30	**WS 19** Energy Efficiency with Cogeneration (CHP) on Building Level *Klaus Sommer*	**WS 21** Reference Buildings for cost optimality to analyse energy performance of buildings *Stefano Corgnati*	**WS 23** Mixing ventilation in a nutshell *Risto Kosonen*
Wednesday- June 19 12.30-14.30	**WS 20** Energy Refurbishments *Marija Todorovic*	**WS 22** Environmentally friendly refrigerants *Attila Zoltan*	**WS 24** China Forum *CCHVAC*

Short descriptions of the REHVA Workshops at CLIMA 2013

WORKSHOP 1 and 10 – Clean Air, Sustainability and IAQ Technology – a Holistic Approach

ORGANISER: CAMFIL

DESCRIPTION: The workshop will cover clean air solutions in the perspective of sustainable manufacturing, handling and operation of air filters. To create healthy and sustainable environments for humans, new and existing technology will be discussed. Detection and analysis of airborne contaminants is an important part of creating a better IAQ. The seminar will take a holistic approach to the clean air solutions of today and tomorrow. Seminar will include a visit of the Camfil mobile laboratory, for a real life experience of energy efficient clean air benefits.

TARGET GROUP: architects, engineers, building professionals

CONTACT: Myriam Tryjefaczka myriam.tryjefaczka@camfil.fr

WORKSHOP 2 – The Value of Product Certification – Best Practice: Chillers and VRF Systems

ORGANISER: AHRI

DESCRIPTION: The workshop will provide a review of the practical application of The First Best Practice – product certification. It will demonstrate the value of product performance verification to improving cost estimates, designs, and equipment/system choices for both new and retrofitted buildings. It will demonstrate the value of a data-based system to accurately incorporate both heating and cooling systems in buildings so as to achieve true sustainability in any climate. It also will relate the energy savings that come from installing equipment with proven efficiencies as a step to meeting challenges imposed by climate change and energy efficiency issues. And it will demonstrate the value of a certification system for both industry and government with a focus on chillers and VRF systems.

TARGET GROUP: Consulting specifying engineers, architects, government officials

EXPECTED RESULTS: Attendees should be able to understand the value of third party product performance certification and specify HVACR products whose performance has been certified by globally recognized and industry respected certification bodies.

CONTACT: James Walters JWalters@ahrinet.org

WORKSHOP 7 – Gaining Control of The Solar Situation: Shading Solutions for Comfort and Energy Efficiency in Buildings

ORGANISER: ES-SO, European Solar-Shading Organization

DESCRIPTION: The energy balance of the advanced facade is strongly dependent on the glazing and shade selection. Spectrally selective glazing integrated with solar shading affords effective and dynamic control of solar and thermal radiation, whilst combating glare, maintaining visual comfort and the entry of daylight. Such advanced complex glazing systems satisfy the architectural aesthetic and provide opportunities for innovative design of energy efficient buildings in heating and cooling dominated climates. This workshop will review modern glazing and shading solutions, tools for their selection, integration and control strategies and their impact on building energy performance. In particular, the focus will be on a number of case studies which demonstrate the range and extent to which building energy demand can be significantly lowered without detriment to the visual and thermal comfort of the occupants.

TARGET GROUP: engineers, architects, building professionals involved in the concept and execution of sustainable energy efficient buildings.

EXPECTED RESULTS: Policy statement on the need of solar shading as part of the solution of sustainable energy efficient buildings; demonstration of the added value of solar shading to the thermal and visual comfort for the occupants in low energy buildings.

CONTACT: Ann Van Eycken Ann.vaneycken@es-so.com

WORKSHOP 18 – Experience with Energy Efficiency

ORGANISER: BELIMO Automation AG

DESCRIPTION:

Fan Optimiser. More comfort and at the same time massive energy savings: The MP-Bus® from Belimo conveys the actual damper positions of the volumetric flow units and the needs signals from the room temperature controllers to the Fan Optimiser on a continuous basis. The Fan Optimiser calculates from this the actual requirements of the system and generates the control values for the ventilators. This way they achieve a considerable reduction in pressure loss and electricity consumption and an audible reduction the flow noise.

Energy Valve from Belimo. In addition to the flow rate, the sensors in our electronically regulated pressure-independent valves also measure the temperatures in the supply and return lines, e.g. with heat exchangers. The values are saved in the integrated webserver for 13 months and are visible, e.g. onsite on the laptop. The current consumption can also be depicted on the management system. This way, you can analyse and document which direction the energy is flowing to and optimise the energy flows of the hot and cold water circuits at any time.

TARGET GROUP: Consultants, System integrators, Mechanical contractors, Building owners, Building operators, Facility contractors, People from the building automation business in general

EXPECTED RESULTS: Demonstration of the added value of Belimo Energy Valve and Fan Otimizer. People will be informed about these solutions.

CONTACT: Markus Keel Markus.Keel@belimo.ch

EQUA releases new version of IDA Indoor Climate and Energy

Per Sahlin
CEO, EQUA Simulation AB
per.sahlin@equa.se

The time of cheap energy is more than likely a thing of the past. Building owners and buyers are now focusing on energy performance, which means large discrepancies between predicted and actual energy use are less and less acceptable.

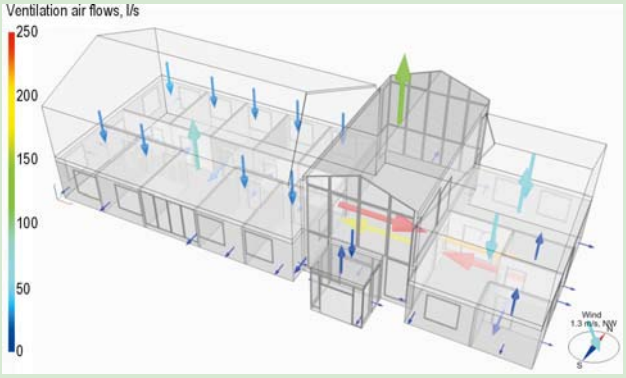
While still not commonplace, some new buildings today are sold with a performance guarantee based on computed results. The Swedish implementation of the EU Building Performance Directive includes a legal requirement on measured energy use during the first two years of a building's operation. In these situations (as well as many others), accurate building energy performance prediction is becoming an absolute necessity. Building professionals need to know beforehand how a building will perform. Dynamic whole-building simulation can help.

Dynamic whole-building simulation means that the building structure, with all its relevant flows of light, heat, air, and moisture, is represented at a timescale of less than an hour, often minutes. Such a model will capture the true dynamic behavior of a building, including how heat is first stored and then released from the building material. This is key to good predictions.

In the HVAC design process, selection of systems and controls invariably plays a key role. So far, this has rarely been reflected in simulation practice. It has been far too cumbersome. In fact, if HVAC professionals wanted to simulate the behavior of complex systems, plants, and controls for a real building, they not only needed a sizeable research grant but also a lot of time.

With the new release of EQUA's popular building simulator, IDA ICE 4.5, this is about to change.

In addition to the leading multi-zone envelope model, IDA ICE version 4.5 features new models for boreholes, solar collectors, tanks, heat pumps, and other renewable energy components. Complex systems can be defined in seconds. A new wizard for Early Stage Building Optimization (IDA ESBO) provides a smart method of describing complex buildings with minimum time and effort.



The graphical output of air flow simulation with the IDA ICE simulation for an office building with an atrium.

The user interface of IDA ICE is organized in levels, so that the full complexity of the model can be approached in steps. Beginners can quickly become productive without knowledge of the full details. For the most advanced users, every equation is available for inspection. In fact, advanced users can even write their own equations. Separate add-ins are available for special needs, including automatic generation of LEED Baseline buildings.

The new release also offers a range of new productivity features. Geometry of complex zones and buildings can now be directly imported from SketchUp and other geometry tools. Even the strangest architectural conception can be adequately modeled. The IFC BIM import has been significantly improved. For on-board geometry work, a new grid object speeds up the definition of repetitive objects, such as façade windows.

On a more fundamental level, even more powerful control concepts have been added. It is possible and efficient to manage customized controls without resorting to the advanced level (mathematical) user interface. Every active component can be controlled with respect to any variable in the model. A layered control architecture is possible, with multiple supervisory and device levels. Sampling MIMO controllers can be efficiently simulated even if their timestep is very small in comparison to the (variable) global step.

The tools-of-the-trade of an HVAC engineer are becoming more complex. Mastery of sophisticated modeling has been a critical success factor in the automotive industry and other fields for years. With the recent energy focus, a similar development is not unlikely within the building industry.

Visit **www.equa.se/ice** for more information.

Spinchiller² Third Generation – The New Frontier in High Seasonal Efficiency Modular Scroll Technology

Clivet, the company specialized in air conditioning systems with high efficiency modular Scroll technology, presents SPINCHILLER² third generation combining "A class" efficiency at full load with the best part load performance.

HVAC plants operate at full load for less than 5% of the time. This is the reason why for over 10 years Clivet has been producing liquid chillers capable to deliver maximum efficiency at partial load operation (and therefore in the seasonal cycle) thanks to the reliable modular Scroll technology, now internationally known and acknowledged.

Clivet's continuous research of the best climate and energy saving has recently created **SPINCHILLER²** third generation, the new **air cooled liquid chiller** series **from 240 to 665 kW**, which combine **"A class" efficiency at full load with the best performance at part load**.

SPINCHILLER² is a unit for outdoor installation with multiple Scroll compressors on the same circuit, electronic expansion valves, and high efficiency plate evaporator.

Thanks to ECOBREEZE fans with permanent magnet electronic controlled motor, the seasonal efficiency **ESEER reaches 4.5** while operating at constant supply temperature, **but can also go over the equivalent value of 5.3** thanks to the new control system with constant return temperature and dynamic supply temperature variation on the basis of the load.

The third generation of SPINCHILLER² is available in **two versions**: EXCELLENCE and PREMIUM. **EXCELLENCE** stands out also for the very high full load efficiency (EER) which goes over 3.1 and places it in Eurovent energy efficiency "A class". As an alternative, Clivet offers the **PREMIUM** version, which has excellent performances at partial load, but privileges the compactness, being also economically more competitive.

SPINCHILLER² is also available with:

- total or partial energy recovery for free hot domestic water production
- operation with low liquid temperature (Brine configuration)
- double operating set-point for industrial processes and applications with high dehumidification
- direct FREE-COOLING in all applications that need cooling even with low ambient temperature.

Moreover, SPINCHILLER² simplifies the plant, because it can integrate in itself many components such as HYDROPACK pumping groups with assisted start-up, storage tank for plants with low water content and also primary circuit on board.

SPINCHILLER² is suitable for **different types of application**, with **fan coils, air handling units, radiant energy distribution and chilled beams**. It is the ideal solution for all applications that require high performance, ongoing operation and reduced management cost, such as **trade centres, residential** applications **with centralized systems**, **industrial applications** which require chilled water as service fluid, process fluid or vector fluid for operator comfort, for conserving goods and enabling cycles to function correctly.

For further information: Barbara Casagrande, phone +39 0439/313235 – e-mail: b.casagrande@clivet.it - **www.clivet.com**

Heat recovery unit RePuro from Aermec

REPURO is an innovative system for recovering heat in counter- flow, which ensures the correct exchange of air in closed environments. Thanks to the adoption of high efficiency heat exchangers up to 90%, REPURO allows the introduction of fresh air at a temperature close to that of the room concerned, reducing energy costs that you would incur if having to assure air exchange in the traditional way or by mechanical ventilation alone.

Technical data:

- Available in 5 sizes: 250–650 m^3/h
- 2 versions:
  - standard, self-protected against frost formation at temperature > –10°C
  - **R**, with pre-heating electric heater for continuous operation in cold climates < –10°C
- Vertical installation
- High efficiency also up to 90% (UNI EN 308)
- Free-cooling during spring and autumn thanks to automatic by-pass function
- **By-pass** no frost (Repuro 450–550–650)
- Flow rate regulation 0-100% of nominal air flow rate
- Centrifugal fans, directly coupled to "Brushless" EC electric motors with high efficiency variable speed (ERP2015)

RePuro

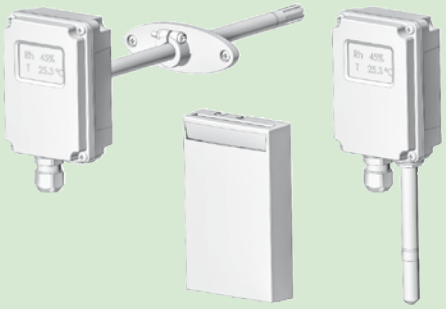
Variable Multi Flow

VMF

90% high efficiency

ERP Ready 2015

New Family of Humidity and Temperature Transmitters from Vaisala for HVAC Applications



Vaisala introduces a new family of humidity and temperature transmitters for the heating, ventilation and air-conditioning industry. Combining top quality with affordable price, the versatile Vaisala INTERCAP® Humidity and Temperature Transmitter Series HMDW80 is the complete set for collecting the basic humidity and temperature information needed for a variety of HVAC applications.

The new transmitters are optimized for reliable operation and easy installation with very little maintenance. The excellent stability of the INTERCAP® sensor ensures reliable measurement with minimal maintenance, and if needed, the sensor can be easily exchanged on location with practically no downtime at all.

The Vaisala HMDW80 series includes basic transmitters for walls and ventilation ducts as well as IP65-classified transmitters for wash-down areas and other humid spaces. It will be complemented by an additional outdoor measurement kit later this year. The series also contains transmitters that measure temperature only as well as transmitters with an optional display, and also provides calculated humidity parameters of dew point, wet bulb and enthalpy in addition to the direct output parameters.

More information: **www.vaisala.com**

Lindab Solo – Simply the natural choice

Lindab has worked with simplified constructions for many years and their knowledge and experience has resulted in the innovation of a brand new indoor climate solution – Lindab Solo.

Imagine a temperature balancing chilled beam solution where simultaneous cooling and heating is a thing of the past. Lindab Solo secures immediate savings on your investment, installation and running costs, by offering a simple yet highly effective new way of handling ventilation, cooling and heating.

By using the same water inlet temperature for both cooling and heating, the Solo solution will simultaneously cool and heat the individual rooms, according to the need. Mixing the return water from the different zones results in a water temperature close to or equal to the needed inlet temperature a part of the year. This allows you to simply recirculate the water, instead of having to cool or heat the water once more.

When using renewable energy sources you are able to gain very high energy savings compared to conventional cooling systems.

Lindab Solo an energy efficient solution with up to 45% cooling energy savings

Lindab has designed a new sustainable waterborne solution with naturally optimized energy savings.

Lindab Solo is a solution where you balance the cold and hot water in the building's water circuit and thereby save a lot of energy, limiting the amount of water you have to heat or cool to get the right temperature in your circuit. A solution like this is only possible with Lindab's new Solo chilled beam due to the high efficiency Solo coil.

The new Solo chilled beam features high temperature cooling and low temperature heating as the first active chilled beam solution on the market. High temperature cooling and low temperature heating are two new ways of handling the cooling and heating needs in buildings today. High temperature cooling utilizes high temperatures in the cooling circuit. Low temperature heating implies using relatively low temperatures for heating with a great indoor climate and lover energy costs as a result. Both features present potential large savings of the energy you normally needed to heat and cool the building.

The main element generating the large energy savings within the Lindab Solo solution is the regaining of thermal energy from the water circuit. Buildings often have a sunny side, typically the south facade, where the water in the coil is used to cool down the room. Traditional systems use a lot of energy to cool and heat the water in the water circuit before returning it back to the rooms once more. The north facade of the building is typically colder and the coil needs to deliver heating to the room instead. As the outlet temperature will differ from zone to zone within the building, a mixed outlet temperature is closer to the needed inlet temperature and reducing the need for heating and cooling. As a result of this, the heating and cooling units can be fully or partially turned off, while still keeping a perfect indoor climate just by circulating the water. It will not be necessary to run both the heating and cooling unit at the same time ever again! Over time, this will result in large savings on the running costs of the system, compared with a conventional chilled beam system. Lindab calls it "Optimized recycled energy use".

By combining the Lindab Solo solution with free cooling you can save up to 45% cooling energy compared to a traditional chilled beam solution with free cooling.

Save up to 50% on quick and easy installation, low operation and low maintenance costs

Lindab Solo´s simple design with its single water circuit and regulation equipment free beams leads to direct savings on material purchases. The Solo solution makes it possible to avoid installation of radiators and other expensive heating or cooling sources. This reduces investment in heating and cooling devices to a minimum. This will save up to 50% of the installation cost and subsequent maintenance costs.

All parts in the Solo solution are produced in Lindab's factory in Sweden where high quality control ensures a long product life cycle. It's a tested and well documented solution from the R&D department at the Lindab Comfort competence centre in Farum, Denmark.

Lindab is the world's leading manufacturer of chilled beams and have produced innovative chilled beam solutions since 1988.

For further information about Lindab Solo, please visit **www.lindab.com**

Contacts: **Anders G. Madsen** – Lindab Comfort – Email: anders.madsen@lindab.com – Tel. +45 73 23 26 80

A comparison between a polyvalent heat recovery system and a traditional chiller/boiler combination in a refurbishment project

Michele Albieri
Manager of
R&D activity
Rhoss Spa

Matteo Janes
Manager for the Applied
Systems Business Unit
Rhoss Spa

Introduction

In downtown Milan a 40-year-old office building has been refurbished and extended implementing two more floors, thus resulting in a total of six floors. The building comprises typical areas such as offices (open spaces, but not only), meeting rooms and conference rooms, a reception area, press rooms, server rooms and an internal garden among others. The design of the building has followed the parameters required by LEED, Italy for new constructions and refurbishment. One opportunity to meet the targets set by the LEED certification has been given by the replacement of the existing heating and cooling plant composed by a liquid chiller and a boiler with an EXP system TXAVSZ 2550, a polyvalent heat recovery heat pump able to work in 2-pipe and 4-pipe-configuration producing hot water and chilled water both independently and at the same time. Being the building of an L shape with very different exposures, the various areas have very different cooling and heating needs, with areas which may require cooling and areas which may require heating at the same time, particularly in between the seasons. In order to better meet these requirements, the old 2-pipe-system has been replaced by a more efficient and versatile 4-pipe-system composed of ductable FCUs and AHUs. Being a renewable energy source, the heat pump will contribute to reduce the CO_2 emissions and cut the energy bill.

System operation

The TXAVSZ 2550 is an air cooled heat pump of about 500 kW equipped with a flexible and versatile heat recovery system. The unit features two semihermetic screw compressors and refrigerant R134a and can provide both the AHUs and the FCUs with chilled and hot water thanks to an additional heat recovery heat exchanger (shell and tube) which is added to the main heat exchanger (shell and tube) and the condensing coil heat exchanger (copper pipes and aluminium fins). The system can work according to two modes: Automatic and Select.

- in Automatic mode the unit can recover 100% of the heat rejection to produce hot water at the heat recovery heat exchanger (secondary heat exchanger) and/or produce chilled water at the main heat exchanger. The system automatically manages the request for hot and/or chilled water. If there is no request for hot water, the unit will work as a standard chiller. If there is request for hot water and chilled water at the same time, the refrigerant flow from the compressor will be directed to the secondary heat exchanger rather than to the condensing coil to produce hot water and then to the primary heat exchanger to produce chilled water. If no chilled water is required, but hot water only, the refrigerant from the secondary heat exchanger will be directed to the condensing coil which will work as an evaporator instead.
- in Select mode the unit will produce hot water at the main heat exchanger (Select 1) and/or hot water at the secondary heat exchanger (Select 2). The system is set to give priority to the production of hot water at the secondary heat exchanger, but this can be modified by setting the electronic control.

The energy consumption of the building will be monitored by implementing energy meters on the water distribution lines in order to check the energy saving granted by the EXP system in comparison with the data calculated on the paper.

The case building

- Office building in Milan – Italy
- 4-pipe-system for space cooling and space heating
- Daytime operation only
- Cooling required from -5°C (15%) to +35°C (100%)
- Heating required from -5°C (100%) to +18°C (20%)
- Cooling/heating capacity required varies linearly with outdoor air temperature (**Figure 1 and 2**)

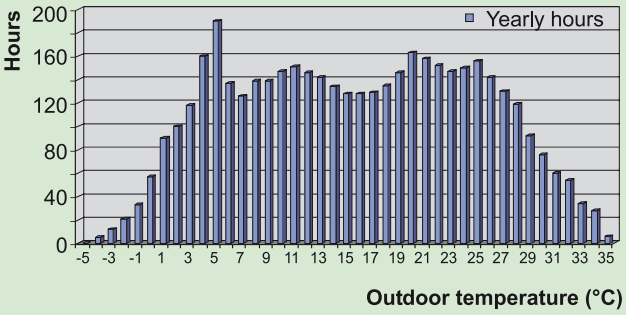


Figure 1. Daytime temperature profile in Milan.
[Source: www.weatherbase.com]

System solutions

Option 1

➡ one unit **TXAVZ 2550** to provide

- Cooling only
- Cooling and heating (HR mode)
- Heating only (EXP mode)
- No boiler required all year round

Operating mode:

- Over 18°C outdoor temperatures the unit is required to work in cooling only mode
  - Power input of a normal chiller ➡ EER based analysis
- Between 5°C and 18°C the unit can supply the required heating and cooling capacity together
  - Single power input, double effect ➡ Combined COP based analysis
- Below 5°C the unit can supply the cooling capacity required and only a fraction of the heating capacity required together. The rest of heating capacity must be topped up by the unit working in heating only mode.
  - Power input of chiller + heat recovery (single power input, double effect) ➡ Combined COP based analysis
  - Power input of a normal heat pump ➡ COP based analysis
- Total energy consumption has been calculated considering 0,75 utilisation factor all year round.
- Current price for electricity in Italy: 0,15 €/kWhe
- **Total running costs:**
  323.458,5 x 0,15 = 48.518,78 €/year

Option 2

Chiller + Gas Fired Boiler

➡ one **TCAVZ 2551** to provide cooling only

➡ one gas fired boiler to provide heating only

- Chiller runs all year round to supply the required cooling capacity, from 100% at 35°C ambient, to 15% required at -5°C ambient
- Boiler works to supply the required heating capacity, from 100% required at -5°C ambient, to 20% required at 18°C ambient
- Following assumptions have been made for the boiler:

1. Condensation boiler

2. Using natural gas (lower calorific power 35.880 kJ/Nmc)

3. Boiler efficiency: 105% (based on lower calorific power), independent from ambient temperature

- Total energy consumption has been calculated considering 0,75 utilisation factor all year round.
- Total energy consumption of the chiller: **306.634,5 kWhe**
- Total heating energy supplied to the system: 386.700,7 kWh
- Gas consumption of the boiler
  (386.700,7x3.600)/35.880 = **38.800 Nmc**
- Cost of electricity in Italy: 0,15 €/kWhe
- Cost of natural gas in Italy: 0,55 €/Nmc
- **Total running costs:**
  306.634,5 x 0,15 + 38.800 x 0,55= 67.335,18 €/year

Table 1. Running costs comparison.

	YEARLY ELECTRICITY CONSUMPTION		YEARLY NATURAL GAS CONSUMPTION		TOTAL RUNNING COSTS (€)
	kWhe	COST (€)	Nmc	COST (€)	
EXP SYSTEM WITHOUT BOILER Option 1	323.458,5	48.518,78	0	0	**48.518,78**
TRADITIONAL SYSTEM CHILLERAND BOILER Option 2	306.634,5	45.995,18	38.800	21.340,00	**67.335,18**

18.816 €/year saving = 28%

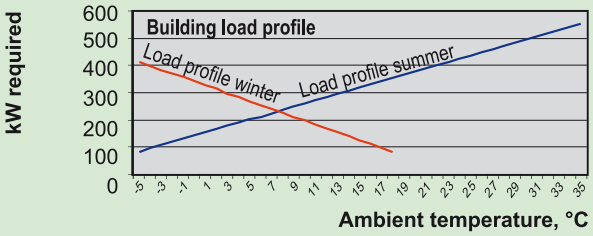


Figure 2. Design data in summer: 555 kW at 12/7°C (35°C ambient). Design data in winter: 415 kW at 40/45°C (-5°C ambient).

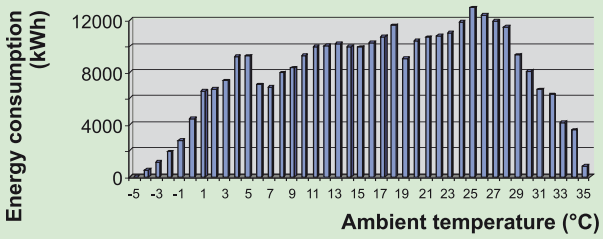


Figure 3. Total energy consumption = 323.458,5 kWh/year.

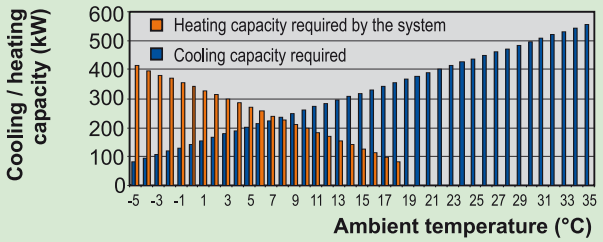


Figure 4. Cooling and heating capacity required by the system.

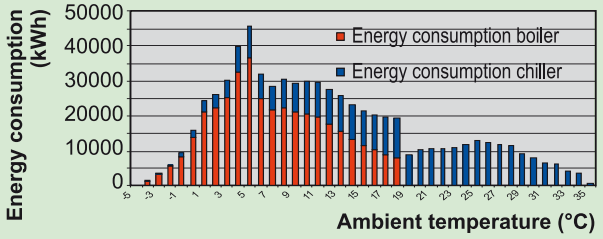


Figure 5. Total energy consumption.

Running Costs comparison – Payback time

The following considerations have been made considering indicative installation costs. Real calculation could vary according to different conditions.

Option 1

- Indicative cost to customer of **TXAVZ 2550**: **127.160,00 €**

Option 2

- Indicative cost to customer of **TCAVBZ 2551**: 72.650,00 €
- Estimated cost to customer of technical room c/w boiler: 25.000,00 €
- **Total:** **97.650,00 €**

- **Difference:** **30.000,00 €**

The installation costs of the EXP system exceed the costs of the traditional system with chiller and boiler by ca. 30.000 €. Thanks to the running costs saving (18.816 €/year) the payback time is less than 2 years. If a backup boiler is required, the payback time will be slightly longer.

Conclusions

- EXP units can grant concrete and significant savings in the system running costs all year round and make the LCC logic possible
- EXP systems can provide the required cooling and heating capacity in a 4-pipe-system without an additional boiler
- The system is then completely oil and gas free, no fossil fuel/no CO_2
- An energy based calculation can show significant savings even at low ambient temperatures where heat pumps are usually less efficient
- If the ambient temperatures are very low (-10°C/-15°C) a back boiler will be recommended in order to avoid the heat pump work with low efficiency. In this case a smart control logic will optimise the heat pump/boiler functioning

GEA Grasso BluAstrum: natural refrigeration

GEA Grasso BluAstrum chillers are ideally suited for employment in a great number and variety of applications. According to Eurovent Certification, they have an ESEER value considerably higher than 8, and they operate with ammonia, the natural refrigerant. BluAstrum chillers are designed for indoor installation and for operation between 5 and 40°C. Six model sizes are available, with maximum cooling duty from approx. 550 to 1,730 kW, to supply refrigeration between –15 and +15°C at low levels of vibration and noise emission.

The BluAstrum range is characterized by a compact, slender structural form with minimal footprint: the GEA Grasso BluAstrum 1000 (mid-performance range) distributes its weight of 7 tons over a surface of 5 m² and is only 2.1 m high. With a width of only 1 m, it fits throughout almost any door. Per kW of cooling duty, it is filled with only 100 g of ammonia. Its highly efficient operation – even under low loads – is based among other factors on new screw compressors from the GEA Grasso M range. In all standard versions of BluAstrum models, these compressors are equipped with an inverter as well as infinitely variable V_i and speed control. Smooth operation is assured by the simple and operator-friendly menu guidance of the touch panels of GEA Grasso

System Control, integrated into the chillers – as well as by various functions for communication with higher-level control systems.

The natural refrigerant ammonia (R717) has outstanding basic thermodynamic values, owing to its physical characteristics: high specific evaporation enthalpy and excellent volumetric cooling duty. In addition, it does not contribute to the greenhouse effect (its global warming potential, GWP, is zero), and it does not harm the ozone layer (its ozone depletion potential, ODP, is also zero). As a result, ammonia protects the environment, goes easy on investment budgets, and reduces total operational costs.

More information: **www.gearefrigeration.com**

First order for CIAT's Coadis Line in the UK

CIAT´s Coadis Line was chosen within the framework of the modernisation process at Collindale thanks to its exceptional quality and results both in terms of design and performance. Coadis Line integrates a modern and aesthetic complete air discharge/return panel with Coanda effect diffusion and is equipped with a low energy High Energy Efficiency (HEE) motor, which reduces energy consumption by up to 85%. In addition, "Epure" technology exclusive to CIAT safeguards occupants' health and guarantees excellent indoor air quality thanks to an ultra-high quality filtration system that takes concentration levels of PM 2.5 particles suspended in the air to below the threshold recommended by the WHO (10 µg/m³).

The Colindale Police Station in West London.

CIAT has created the Flexiway concept to cater for all types of space, their modular characteristics and future developments, making Coadis Line the ideal product for harmonising open area and partitioned spaces. The Coadis Line's single-slit, one- or four-way diffusion system on a single type of frame, which allows it to be installed in partitioned or open-space office layouts alike. The "one-way" version is designed for partitioned areas covering 10 to 20 m² with each unit placed at the edge of the area.

All the VDI Guidelines are available in hard copy or in PDF at www.beuth.de

VDI Guidelines published in 2013

VDI 2083/1 "Cleanroom technology; Particulate air cleanliness classes"

This guideline specifies the classification of particulate air cleanliness in cleanrooms as per ISO 14644-1, FED STD 209E and the EU GMP Guide; the classification is based on measured concentrations of particles of various standardized sizes.

D VDI 6022/4.1 "Ventilation and indoor-air quality; Qualification of personnel for hygiene checking's, hygiene inspections, and assessment of indoor air quality; Certificate of competence in category A and category B"

This guideline complements the guideline VDI 6022 Part 4 with a simplified method for the declaration of the qualification in categories A and B according to VDI 6022. For entering VDI 6022 Part 4 VDI-pass "air hygiene", the entry requirements and the issue of the VDI-pass are regulated.

D VDI 3802/1 "Air conditioning systems for factories"

This guideline applies to ventilating and air-conditioning systems in production facilities. It covers supply and extract air systems as well as capture devices for process extract air. Recommendations for the implementation of ventilating and air-conditioning systems are given for all types of production facilities, in order to largely protect man at the workplace from avoidable stress. In production facilities where the process affords heat loads, acceptable thermal conditions must also be observed. Also, ventilating and air-conditioning systems in production facilities can also ensure thermal and air-quality requirements required for the process.

VDI 6006 "Pressure surges in drinking-water installations; Causes, noise emissions and prevention"

The guideline applies to drinking-water installations. Particularly fast-closing shut-off and tapping valves (magnetic valves, ball cocks, single-levermixer taps) can incur transient pressure surges in such systems, which can become apparent as annoying noise or even damage the system. The guideline contains guidance on the avoidance and reduction of such pressure surges and noises. It addresses all persons involved in the planning, execution and upkeep of buildings. The guideline does not apply to pressure booster, fire-extinguishing, service water and wastewater installations.

D = Draft Guideline

Sustainable building technologies

The new e-magazine in Russia to professionals from professionals

The new e-magazine «Sustainable Building Technologies» is ABOK´s new mission for Russia to familiarize all local participants in making-decision-building process - investors, developers, architects, engineers and operators - with the benefits of high performance technologies, «green» building approaches and efficient management for implementation in Russia. The e-magazine is mostly in Russian but we have a special section in English describing completed and ongoing projects in Russia in the field of «green» construction and trend estimates for now and the nearest future, with examples and analysis on these topics. In the end of the last issue there are English pages and the review about Russian Green buildings market.

Marianne Brodach
The Editor-in-chief of
"Sustainable Building Technologies" magazine
Vice-president of ABOK
Professor at Moscow Architectural Institute
Visit: **www.zvt.abok.ru**

Proceeding of the Healthy Buildings Conference now available

The 10th International Conference on Healthy Buildings, the main conference of the International Society of Indoor Air Quality and Climate (ISIAQ) was held in Queensland, Brisbane, Australia in Summer 2012. ISIAQ is pleased to offer you the ***Healthy Buildings 2012*** Proceedings on flash drive, $25 for members and $99 for non-members, shipping included.

Order form can be downloaded from
http://www.isiaq.org/publications/PublicationOrderFormfl.pdf

New book from Swegon Air Academy:

Simply GREEN – Certification systems in a nutshell

Swegon Air Academy published a new book 'Simply GREEN' on energy and environmental certification systems for sustainable buildings written in an intelligible way. The book describes how the different environmental and energy systems actually affect the daily work from a practical point of view. The book can be used primarily for orientation purposes, as teaching material and as a basis for helping to decide which system to use.

In the book, several *environmental* certification systems are described including BREEAM, LEED, DGNB, GREEN STAR, Miljöbyggnad and HQE. The book also contains *energy-based* certification systems such as GreenBuilding, Minergie and Passive House. Other certification systems compromise of brief description of Casbee, IGBC, ENERGY STAR and Effinergie.

Professor Emeritus Brian Edwards evaluates the book with the following: *"In this publication I am struck by the way a complex field is reduced to simple language and straightforward principles and facts. Too often building certification is mired by excessive technical description and construction jargon. In the spirit of knowledge sharing and technological exchange, Swegon Air Academy has served Europe's construction industry well by funding this simple GREEN guide to environmental and en- ergy certification."*

The book is available in English and Swedish languages at the Swegon Air Academy´s Bookstore for external price of € 20 and the special price of € 15 (this price applies for Swegon Air Academy´s members). The prices include VAT and exclude postage. The iBOOK and eBOOK versions will be available early in 2013!

www.swegonairacademy.com/bookstore

Send information of your event to Ms Cynthia Despradel cd@rehva.eu

Events in 2013 - 2014

Conferences and seminars 2013

March 18 - 19	International Workshop – Quality of Ventilation Systems in Residential Buildings	Brussels, Belgium	http://tightvent.eu/events/qvs-workshop-2013
April 2 - 4	2nd IIR International Conference on Sustainability and the Cold Chain	Paris, France	www.iccc2013.com
April 10 - 11	European Biomass to Power	Krakow, Poland	www.wplgroup.com/aci/conferences/eu-ebp3.asp
April 11 - 12	CIBSE Technical Symposium 2013	Liverpool, UK	www.cibse.org
April 15 - 17	3rd International Conference in Microgeneration and Related Technologies in Buildings - Microgen III	Naples, Italy	www.microgen3.eu
April 18 - 19	AIVC-TightVent Workshop on Building and Ductwork Airtightness	Washington, DC, USA	www.aivc.org
April 22 - 23	4th European Conference on Renewable Heating and Cooling	Dublin, Ireland	www.rhc-platform.org
April 24 - 26	SB13 Munich: Implementing Sustainability - Barriers and Chances	Munich, Germany	www.sb13-munich.com
May 9 - 11	5th International Conference on Amonia Refrigeration Technology	Ohrid, Macedonia	www.mf.edu.mk
May 27 - 28	36th Euroheat and Power Congress	Vienna Austria	www.ehpcongress.org
May 30 - 31	Energy Performance of Buildings and Related Facilities	Bucharest, Romania	www.aiiro.ro
June 3 - 8	eceee 2013 Summer Study on energy efficiency	Toulon/Hyere, France	www.eceee.org/summerstudy
June 7 - 8	The Latest Technology in Air Conditioning and Refrigeration Industry	Milan, Italy	www.centrogalileo.it/milano/CONGRESSODIMILANO2013english.html
June 16 - 19	11th REHVA world congress Clima 2013	Prague, Czech Republic	www.clima2013.org
June 19 - 21	Intersolar Europe 2013: Innovative Technologies and New Markets	Munich, Germany	www.intersolar.de
June 22 - 26	2013 ASHRAE Annual Conference	Denver, Colorado	www.ashrae.org/membership--conferences/conferences/ashrae-conferences/denver-2013
June 24 - 28	EU Sustainable Energy Week 2013 in Brussels	Brussels, Belgium	www.eusew.eu
June 26 - 28	Central Europe towards Sustainable Building Prague 2013	Prague, Czech Republic	www.cesb.cz/en
September 25 - 26	34th AIVC- 3rd TightVent- 2nd Cool Roofs' - 1st Venticool	Athens, Greece	www.AIVC2013Conference.org
September 25 - 27	5th International Conference Solar Air-Conditioning	Germany	www.otti.eu
September 25 - 29	International Conference on Sustainable Building Restoration and Revitalisation	Shanghai, China	www.wta-conferences.org/conference/1869
October 3 - 4	CLIMAMED - VII Mediterranean Congress of Climatizacion	Istanbul, Turkey	www.climamed.org
October 15 - 16	European Heat Pump Summit	Nürnberg, Germany	www.hp-summit.de
October 15 - 18	IAQ 2013 - Environmental Health in Low Energy Buildings	Canada	www.ashrae.org/membership--conferences/conferences/ashrae-conferences/iaq-2013
October 16 - 18	Building Services for the Third Millenium	Sinaia, Romania	www.aiiro.ro
October 18 - 19	COGEN Europe Annual Conference & Dinner	Brussels, Belgium	www.cogeneurope.eu
October 19 - 21	ISHVAC	Xi'an, China	
October 20 - 21	Energy Efficiency & Behaviour	Helsinki, Finland	www.behave2012.info
November 5 - 6	8th ENERGY FORUM on Solar Building Skins	Bressanone, Italy	www.energy-forum.com
December 4 - 6	44 International Congress of HVAC&R	Belgrade, Serbia	www.kgh-kongres.org

Conferences and seminars 2014

February 26 - 28	49th AiCARR International Conference	Rome, Italy	www.aicarr.org
May 13 - 15	11th IEA Heat Pump Conference 2014	Montreal, Canada	www.geo-exchange.ca/en/canada_to_host_the_11th_international_energy_agenc_nw211.php
August 31 - Sep 2	11th IIR-Gustav Lorentzen Conference on Natural Refrigerants - GL2014	Hangzhou, China	
October 18 - 19	CCHVAC Congress	China	

Exhibitions 2013

March 5 - 7	ecobuild 2013	London, UK	www.ecobuild.co.uk
March 7 - 9	ACREX 2013	Mumbai, India	www.ishrae.in
March 12 - 16	ISH Frankfurt	Frankfurt, Germany	www.ish.messefrankfurt.com
March 20 - 22	écobat Paris 2013	Paris, France	www.salon-ecobat.com
March 21 - 24	SODEX ANKARA 2013	Ankara, Turkey	www.sodexankara.com
April 8 - 10	ISH China & CIHE	Beijing, China	www.ishc-cihe.com
April 23 - 24	VVS Mässa Öresund - Trade Fair for Heating and Air Conditioning	Malmö, Sweden	www.easyfairs.com/fr/events_216/byggmaessa-oeresund-vvs-maessa-oeresund_23609/vvs-maessa-2013_24034/
May 14 - 17	Aqua-Therm Kyiv	Kiev, Ukraine	www.en.aqua-therm.kiev.ua
September 3 - 6	Aqua-Therm Almaty	Almaty, Kazakhstan	www.aquatherm-almaty.com
October 23 - 26	Aqua-Therm Baku	Baku, Kazakhstan	www.aquatherm-baku.com
November 4 - 8	Interclima+Elec	Paris, France	www.interclimaelec.com

Exhibitions 2014

January 21 - 23	AHR Expo	New York, NY, USA	www.ahrexpo.com
April 1 - 4	NORDBYGG 2014	Stockholm, Sweden	www.nordbygg.se
March 18 - 21	MCE - Mostra Convegno Expocomfort 2014	Fiera Milano, Italy	www.mcexpocomfort.it
March 30 - Apr 4	Light + Building	Frankfurt, Germany	www.light-building.messefrankfurt.com
May 7 - 10	ISK - SODEX 2014	Istanbul, Turkey	www.hmsf.com
October 14 - 16	Chillventa 2014	Nuremberg, Germany	www.chillventa.de/en/
September 30 - Oct 3	Finnbuild 2014	Helsinki, Finland	www.finnbuild.fi

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ESSO EUROPEAN SOLAR-SHADING ORGANIZATION Energy Savings & Comfort

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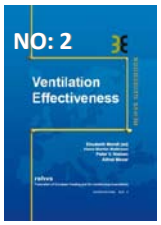
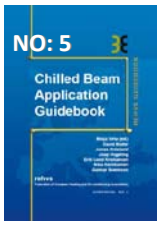
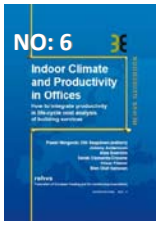


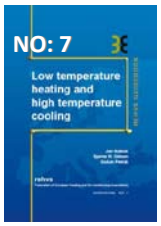
Improving the ventilation effectiveness allows the indoor air quality to be significantly enhanced without the need for higher air changes in the building, thereby avoiding the higher costs and energy consumption associated with increasing the ventilation rates. This Guidebook provides easy-to-understand descriptions of the indices used to mesure the performance of a ventilation system and which indices to use in different cases.



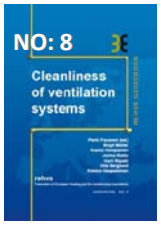
Chilled beam systems are primarily used for cooling and ventilation in spaces, which appreciate good indoor environmental quality and individual space control. Active chilled beams are connected to the ventilation ductwork, high temperature cold water, and when desired, low temperature hot water system. Primary air supply induces room air to be recirculated through the heat exchanger of the chilled beam. In order to cool or heat the room either cold or warm water is cycled through the heat exchanger.



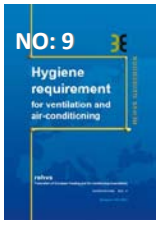
Indoor Climate and Productivity in Offices Guidebook shows how to quantify the effects of indoor environment on office work and also how to include these effects in the calculation of building costs. Such calculations have not been performed previously, because very little data has been available. The quantitative relationships presented in this Guidebook can be used to calculate the costs and benefits of running and operating the building.



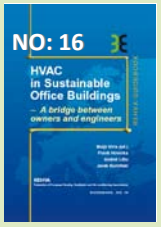
This Guidebook describes the systems that use water as heat-carrier and when the heat exchange within the conditioned space is more than 50% radiant. Embedded systems insulated from the main building structure (floor, wall and ceiling) are used in all types of buildings and work with heat carriers at low temperatures for heating and relatively high temperature for cooling.



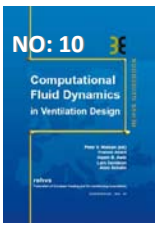
Cleanliness of ventilation systems Guidebook aims to show that indoor environmental conditions substantially influence health and productivity. This Guidebook presents criteria and methods on how to design, install and maintain clean air handling systems for better indoor air quality.



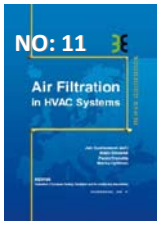
Hygiene requirement is intended to provide a holistic formulation of hygiene-related constructional, technical and organisational requirements to be observed in the planning, manufacture, execution, operation and maintenance of ventilating and air-conditioning systems. These requirements for ventilating and air-conditioning systems primarily serve to protect human health.



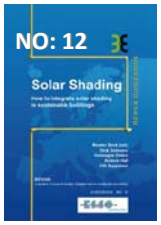
This guidebook talks about the interaction of sustainability and Heating, ventilation and air–conditioning. HVAC technologies used in sustainable buildings are described. This book also provides a list of questions to be asked in various phrases of building's life time. Different case studies of sustainable office buildings are presented.



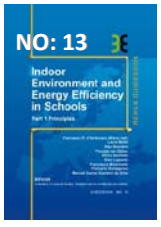
CFD-calculations have been rapidly developed to a powerful tool for the analysis of air pollution distribution in various spaces. However, the user of CFD-calculation should be aware of the basic principles of calculations and specifically the boundary conditions. Computational Fluid Dynamics (CFD) – in Ventilation Design models is written by a working group of highly qualified international experts representing research, consulting and design.



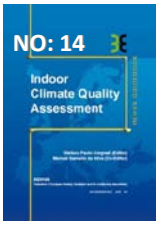
Air filtration Guidebook will help the designer and user to understand the background and criteria for air filtration, how to select air filters and avoid problems associated with hygienic and other conditions at operation of air filters. The selection of air filters is based on external conditions such as levels of existing pollutants, indoor air quality and energy efficiency requirements.



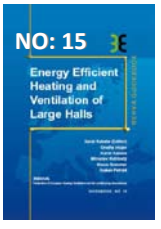
Solar Shading Guidebook gives a solid background on the physics of solar radiation and its behaviour in window with solar shading systems. Major focus of the Guidebook is on the effect of solar shading in the use of energy for cooling, heating and lighting. The book gives also practical guidance for selection, installation and operation of solar shading as well as future trends in integration of HVAC-systems with solar control.



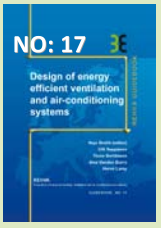
School buildings represent a significant part of the building stock and also a noteworthy part of the total energy use. Indoor and Energy Efficiency in Schools Guidebook describes the optimal design and operation of schools with respect to low energy cost and performance of the students. It focuses particularly on energy efficient systems for a healthy indoor environment.



This new REHVA Guidebook gives building professionals a useful support in the practical measurements and monitoring of the indoor climate in buildings. Wireless technologies for measurement and monitoring has allowed enlarging significantly number of possible applications, especially in existing buildings. The Guidebook illustrates with several cases the instrumentation for the monitoring and assessment of indoor climate.



This guidebook is focused on modern methods for design, control and operation of energy efficient heating systems in large spaces and industrial halls. The book deals with thermal comfort, light and dark gas radiant heaters, panel radiant heating, floor heating and industrial air heating systems. Various heating systems are illustrated with case studies. Design principles, methods and modeling tools are presented for various systems.



This guidebook covers numerous system components of ventilation and air-conditioning systems and shows how they can be improved by applying the latest technology products. Special attention is paid to details, which are often overlooked in the daily design practice, resulting in poor performance of high quality products once they are installed in the building system.

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