Energy efficiency with certified products

REHVA Annual meeting, Timisoara Romania

20 April 2012, 13h30-15h00

Sandrine MARINHAS

Sylvain COURTEY

Energy efficiency with certified products

- Certification of HVAC products
  - Eurovent Association and Eurovent Certification
  - How does it work?
    - Programmes and laboratories
  - Certification programme highlights
  - Key benefits at a glance
- Discussion
- Regulations using certified data of HVAC products
  - National application of EPBD: French Building Thermal regulation « RT2012 »
  - White certificates: Replacement of Fan Coil units
  - Overview of regulation types
- Discussion
- Value of voluntary vs. mandatory certification
  - Reasons, issues
  - Mandatory certification
    - White goods for labelling
  - Tentative of comparison
  - Synergies
  - Perspectives
- Discussion
- Conclusion

Workshop part 1
Certification of HVAC products

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Eurovent Association and Eurovent Certification

- **Eurovent Association**
  - What is it?
    - European Committee of Air Handling and Refrigeration
    - Refrigeration, air conditioning, air handling, heating and ventilation industry
    - Composed by the national trade associations of manufacturers
  - Organisation
    - Board, President, General secretary and Executive Director
    - Eurovent Commission with national associations
    - Dedicated Products Groups with manufacturers
  - Activities
    - Technical recommendations and standardisation
    - Joint Industry Product Groups and common position papers with other associations like about current focuses:
      - Energy related Products
      - F-gases
      - Compliance with European regulations

5/45 Apr 2012

Eurovent Association and Eurovent Certification

- **Eurovent Certification**
  - What is it?
    - Daughter company of the Eurovent Association
    - Accreditation according to EN 45011 for certification bodies
  - Organisation
    - Eurovent Certification Board
    - 18 people in the offices in Paris dealing with certification
    - Commission for harmonisation and integrity of the programmes
      - Authorities, consultants, laboratories, manufacturers
    - Dedicated Committees with manufacturers for each product
    - Market intelligence department for collection of data on the HVAC market
  - Activities…

CPPC
Certification Programmes and Policy Commission

EUROVENT Market Intelligence

How does it work?

Declaration lists
Product ranges (and models)
+ Technical characteristics & Performances
or Selection software

Selection on-site & visit of the
Production place

After study of the list
Selection
Random selection of models
No. of tests based on lifetime of models
or Selection software

Performance data registered from
Software outputs

Delivery, verification of testing object
Testing in an independent laboratory

Comparison declared vs. measured data
If necessary: correction of catalogues or software

File rejected

Review, Approval, certificate and
Publication of data
www.eurovent-certification.com & www.certiflash.com

List of products and laboratories

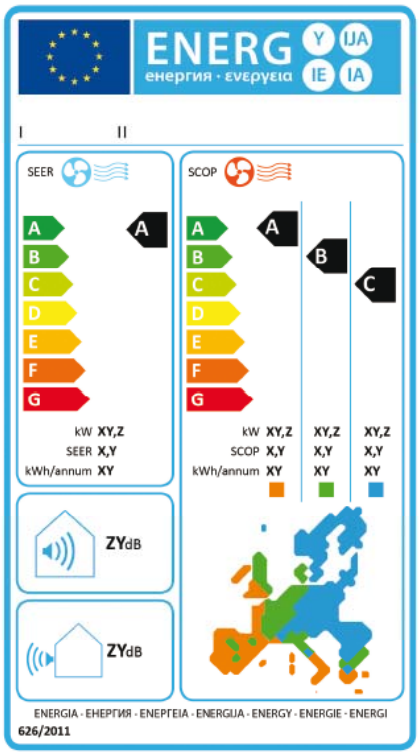
Air handling units	Plate & rotary heat exchangers
Residential air handling units	F5-F9 air filters

- Components and products tested in dedicated laboratories (ISO 17025)
- All through Europe

Liquid chilling packages & Heat pumps	
Fan coil units	
Chilled beams	
Air conditioners & HP < 12 kW	
12-45 kW	>45 kW
Close-control air conditioners	
Rooftop units	
Variable refrigerant flow	
Heating & cooling coils	
Dx air coolers, Condensers, Dry coolers	
Cooling towers	Drift eliminators
Refrigerated display cabinets	

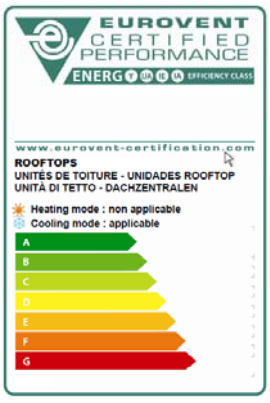
EU energy label for residential AC

- Scope
  - For cooling only and reversible residential AC up to 12 kW
- Time frame
  - Commission Delegated Regulation (EU) No 626/2011 supplementing Directive 2010/30/EU published on 4 May 2011
  - Label to be applied from **1 January 2013**
- Key facts
  - Efficiency in heating mode (SCOP) depends on the climate (warm, average or cold)
  - Based on seasonal efficiencies (SEER & SCOP)



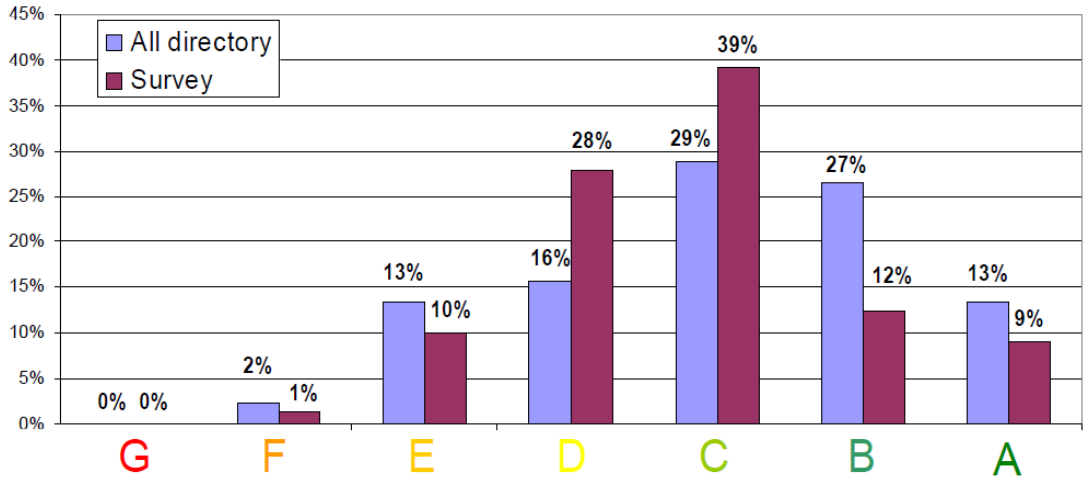
Rooftops

- Scope
  - Air and water source
  - Cooling only and reversible
  - Up to 100 kW
- Timeframe
  - Available since 2010
- Key facts
  - Based on EER and COP at full load operation
  - Will be updated when seasonal efficiency SEER and SCOP standard will be available (2012?)
  - Free cooling function to be included in the future



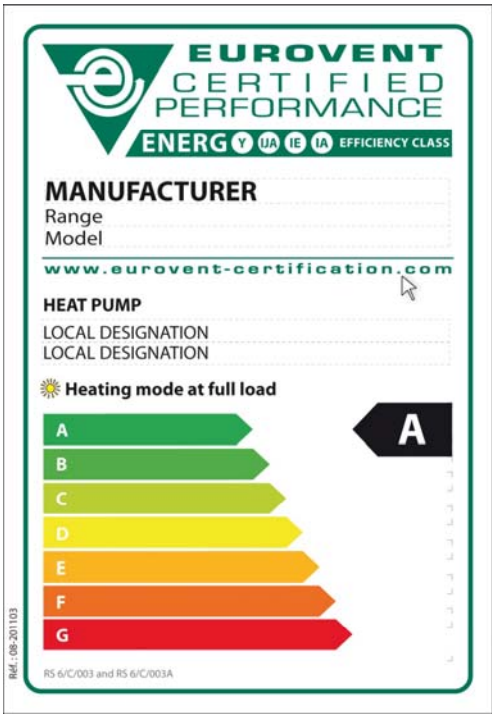
Rooftops

- Distribution of ranking of certified manufacturers in 2010
  - certified units
  - weigthed according to market evaluation

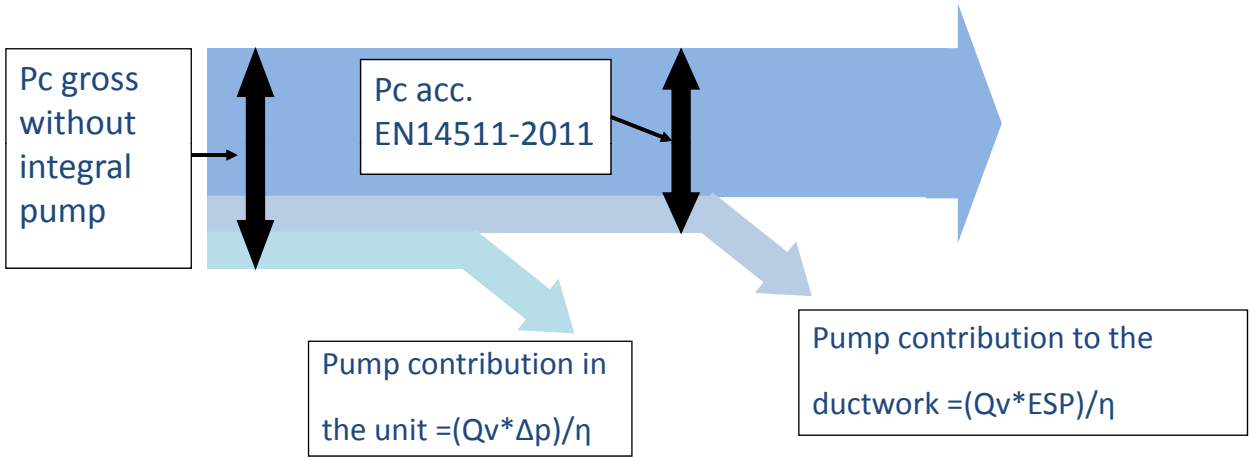


ECC energy label for chillers and hydronic heat-pumps

- Timeframe
  - Eurovent energy rating available since 2004
- Key facts
  - Rating system was changed in 2011 according to **EN14511-2011**
  - Take into account the proportional heat given off from **fans & pumps**: pressure drop in the HE is taken into account (**system approach**)
  - Different from the US approach (AHRI 550/590) for which only the thermodynamic efficiency is considered (gross performances)



ECC energy label for chillers and hydronic heat-pumps



- $EER_{EN14511\text{-}2011} \approx 98.5\%\ (\pm 6) * EER_{gross}$
- $COP_{EN14511\text{-}2011} \approx 98.6\%\ (\pm 10) * COP_{gross}$

(source: www.eurovent-certification.com)

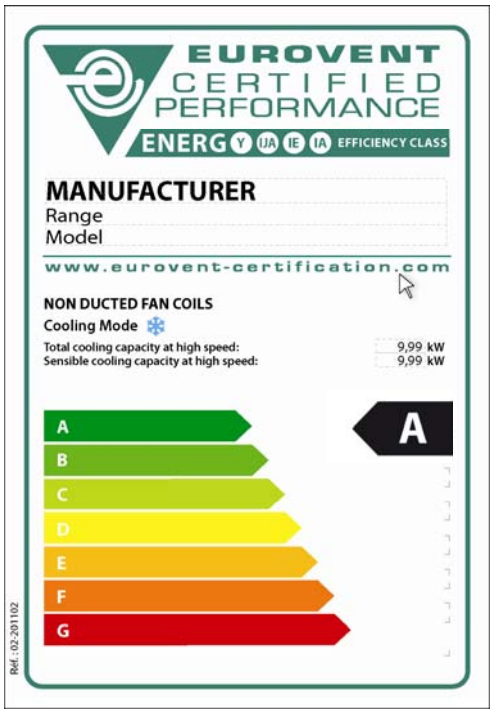
ECC energy label for Fan coil units

- Timeframe
  - Available since 2011
  - First energy label for FCU in the world!
- Key facts
  - Weighted average of performance of low, medium and high speeds

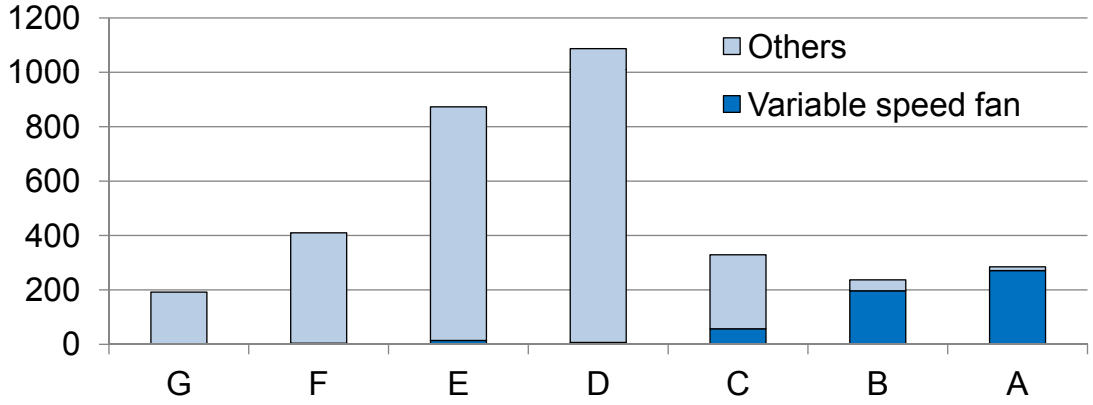
$$FCEER = \frac{5\% \cdot Pc_{high} + 30\% \cdot Pc_{med} + 65\% \cdot Pc_{low}}{5\% \cdot Pe(c)_{high} + 30\% \cdot Pe(c)_{med} + 65\% \cdot Pe(c)_{low}}$$

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

  - Consider both sensible and latent capacities



ECC energy label for Fan coil units



- Classes A and B only achieved by variable speed fan units

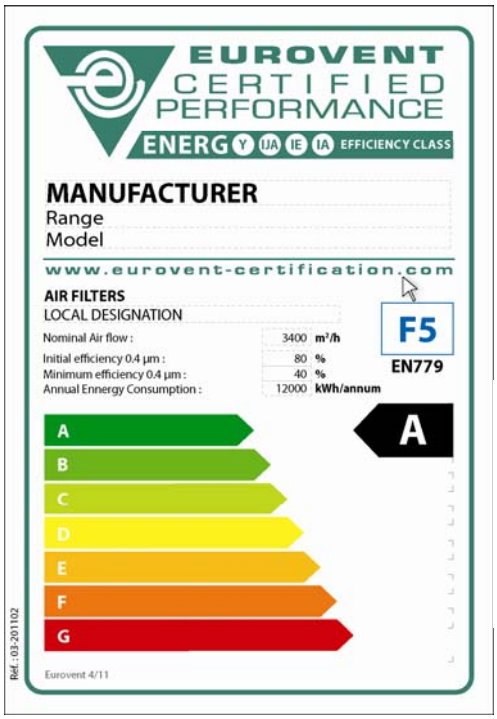
ECC energy label for Air filters

- Timeframe
  - Available since 2011
  - First energy label for air filters in the world!

- Key facts
  - Based on average pressure drop measured during an EN779 test
  - Estimated annual energy consumption in kWh/year is given

$$W = \frac{q_V \cdot \overline{\Delta p} \cdot t}{\eta \cdot 1000}$$

Where qv = 0.944 m³/s ; t = 6000 h and η = 0.50



ECC energy label 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

- Energy efficiency only defined for filters fulfilling **minimum discharge efficiency** given in **EN779:2012**
- Method described in **Eurovent 4/11** available at: www.eurovent-association.eu

ECC energy label for Air filters

- Important note: **energy efficiency** shall be chosen **after filtration efficiency**!
  1. Targeted indoor air quality to be defined
  2. Filters to be chosen according to international guidelines (e.g.: EN13779):

Outdoor Air Quality (see 6.2.3)	Indoor Air Quality (see 6.2.5)			
	IDA 1 (High)	IDA 2 (Medium)	IDA 3 (Moderate)	IDA 4 (Low)
ODA 1 (pure air) ODA 2 (dust) ODA 3 (very high concentrations of dust or gases)	F9 F7+F9 F7+GF+F9[a]	F8 F6+F8 F7+GF+F9[a]	F7 F5+F7 F5+F7	F5 F5+F6 F5+F6

[a] GF = Gas filter (carbon filter) and/or chemical filter.

  3. Energy efficiency to be chosen according to **Eurovent 4/11**

Air handling units

- Interrelationships to evaluate the energy efficiency of AHU are complex and even depend on climate conditions ⇒ Single letter to represent balanced effects
  - Heat recovery efficiency and pressure drop
  - Air velocity in the fan section
  - Fan efficiency

- EN 1886 / EN 13053+A1
- 3 subgroups
  - Design outdoor T < 9°C (HRS will save much energy)
  - Design outdoor T > 9°C : ↳
  - Single extract units : ↑
- Classes from A to <E, A+ under discussion

Heat exchangers for refrigeration

- Labelling implementation
  - Air Cooled Condensers (2005)
  - Dry Coolers (2005)
  - Dx Air coolers (2011)
- 7 classes A++ to E

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

Key benefits in one glance and best practice

- Easy product selection in HVAC-R
  - Direct comparison of competitive products
- Good for customer, good for the planet
  - New installations as well as retrofitting
  - Less energy consumption as the unit runs as expected to achieve the required performance ⇒ reduced product climate and environmental impact as well as electricity costs
  - Task incentives for more energy savings?
- In all cases, the best practice is the following

  Good design (avoid oversizing) ⇒ ask for third party certified performances

  Good energy efficiency ⇒ ask for thirrd party certified best classes

Thank you for your attention

Questions ?

Discussion

How to link product and building certification ?

Workshop part 2
Examples of regulations using certified data of HVAC products

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Overview of existing certified performance of HVAC products

HVAC product group	Energy efficiency index	Energy label
Residential air conditioners	YES	YES (EU)
Chillers / Heat-pumps	YES	YES (ECC)
Rooftops	YES	YES (ECC)
VRF		
Fan coil units	YES	YES (ECC)
Chilled beams		
Filters	YES	YES (ECC)
Fans		
Air handling units		YES (ECC)
Ducts		
A/A Heat exchanger	YES	

French building energy regulation “RT 2012”

- Mandatory regulation (not a voluntary label)
- Applicable to
  - October 2011: new schools and new office buildings
  - January 2012: all new buildings
- Requirements on
  - Building enveloppe (promotion of bio-climatic buildings)
  - Maximum energy consumption
    Mean target: 50 kWh/(m².year)
  - Summer confort (Max indoor temperature)

French building energy regulation "RT 2012"

- How does it work?
  - Computerized building simulation tool
  - Heat transfer calculation on an hourly basis
  - Need to be fed with HVAC products characteristics
- Examples of inputs
  - Efficiencies of cooling/heating generators
  - Heat recovery efficiency

French building energy regulation « RT 2012 »

- **Cooling/heating generators**
  Efficiencies are required as inputs (e.g.: EER for chillers, COP for heat-pumps)
- Four levels of performance are considered

Efficiency (EER, COP) is:	Value considered in the simulation tool
Certified by a certification body accredited according to EN45011	100%*Declared Value
Justified by a laboratory accredited according to EN17025	90%*Declared Value
Self declared	Min (80%*Declared Value, Default Value)
Not available	80% * Default Value

French building energy regulation « RT 2012 »

- **Ventilation:**
  Heat recovery efficiencies are required as inputs (in %-point)
- Three levels of performances are considered:

Efficiency of the heat-recovery system is:	Value considered in the simulation tool
Certified by a certification body accredited according to EN45011	100%*Declared Value
Justified by a laboratory accredited according to EN17025	90%%*Declared Value
Self declared	Min (80%*Declared Value, Default Value)

White certificates

- French white certificate scheme (Certificat d'Econome d'Energie – CEE)
  - By law energy suppliers are obliged to help their customers to save energy.
  - « Saved energy » is the number of kWh saved over the lifetime of the product / equipment generating the savings.
  - Standard operations are defined by public authorities

White certificates

- Example of standard operation for Fan Coil units (BAT-TH-43)
  - Refurbishment of old FCUs by new ones
  - In tertiary buildings with heated and/or cooled surface < 5000 m²
  - Eurovent class A
  - **Certified** by Eurovent or a certification body accredited EN45011 or **justified** by independant laboratory accredited according to EN17025

Other fiscal incentive initiatives

- The Netherlands
  - ➢ Government Capital Rebate programme for Air Handling units with certified A product
- Spain
  - ➢ Government incentives for High Efficiency Refrigeration Display Cabinets (Energy Class A & B only)

Where certified data can be used?

- National implementation of EPBD (RT 2012)
- White certificates (CEE)
- Green public procurements
- Building energy labels
- Tax incentives
- …

Thank you for your attention

Questions ?

Discussion

Are there other examples where certified performance are used (national or European European regulations, product or building related regulations)?

Workshop part 3
Value of voluntary vs. mandatory certification

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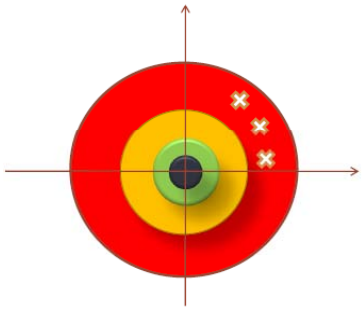
Why all this?

- 3 kinds of possible data
  - ➢ True performance
  - ➢ Customer acceptance
  - ➢ Self declaration
    - self declared data could be anywhere in the data crowd…



- Low control can lead to an economic vicious circle
  - ➢ low surveillance can lead to loss of market share of European manufacturers
    - 68% of black-listed products come from *****
  - ➢ decrease of possibility of research so innovation
  - ➢ SME's are even more fragile and need protection

Isn't that easy?

- Critical elements
  - ➢ A test is expansive, and is only half of the work (selection, verification of conformity)
    - Who pays? European funds? National funds? Other?
  - ➢ Verification of products arriving at the laboratory: the expected one?
  - ➢ How to deal with damaged products? responsibility?
  - ➢ Contacts between the test laboratory and the manufacturer to be as limited as possible
  - ➢ Choice and management of the test facilities
    - Tests between 4h and 2 weeks! It keeps the testing rigs very busy
    - Limit: weight, dimensions, capacity limitations of the testing laboratories
    - Optimum geographical choice? Limited options in reality
    - Driving force for improvements?

What about mandatory certification managed by European authorities?

- Market Surveillance
  - Activities carried out by public authorities to ensure that products comply with the requirements set out in the relevant legislation
  - Health, safety, consumer protection
  - Level playing field
- Sanctions
  - Warnings and fines most of the time
  - Product withdrawal from the market rarely happened or too long: for obsolete product!
  - “Black-list” under preparation

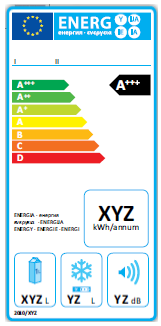
What about mandatory certification managed by European authorities?

- Reference documents
  - General Product Safety Directive (GPSD) EC 95/2001 gives general minimum requirements for market surveillance of non-food consumer products
  - The new EC Regulation no. 765/2008 specifies MS as one of the instruments for opening and regulating the Single European Market
    - Reinforcing measures and controls
    - Improving reports (public) monitoring to EU mandatory
    - Cooperation (RAPEX system)
  - Decision 768/2008
    - Not only manufacturers anymore, but also importers and distributors
    - Increase of traceability
  - Further progress in MS framework
    - Specific expert group
    - Tools for customs (especially at EU borders)
    - Alignment of legislation

Experience of white goods for labelling

atlete
Appliance Testing for Energy Label Evaluation

- European project: 80 randomly selected refrigerating appliances
- "Only" 20% didn't comply with the energy efficiency class declaration and the two related key parameters: energy consumption and storage volume
- When all 5 parameters are taken into consideration 57% of them do not comply with at least one parameter



- Hypothetical reasons for wrong values
  - Display errors
    - Data displayed by resellers? "Marketing creativity"?
  - Manufacturing uncertainty
    - Not on the safe-side?
  - Evaluation errors
    - Not enough measurement and testing

Can we compare?

Current mandatory	Voluntary certification
Managed by each Member-State	European-wide certification
Public funds (a priori)	Manufacturers pay the bill
Purchase costs	Direct delivery to laboratory
Potentially covers all manufacturers	Only who applies is tested
Punctual testing	Regular testing (+ software + factory)
Low number of tests (a priori)	~800 tests/year and ~100 factories
Potentially very special units (but how?)	Well-defined scope
Covers all products, all sectors	Dedicated HVAC-R (technical knowledge)
Covers all CE aspects	Capacity, energy efficiency and noise only
Tests done in any European laboratory	Tests in selected choice of laboratories
Repressive tool	Positive marketing tool

Synergies are possible in our sector

- Two complementary approaches
  - ➢Voluntary certification
    - a pro-active initiative from manufacturers for a level playing field for performances
    - allows to carry out a large number of tests for the 17 covered HVAC-R products (and new programmes under preparation)
    - 17 years of experience

  - ➢ Market surveillance
    - other directives (pressure, refrigerants…)
    - necessary to test non-certified products too

  - ➢Dentists are necessary but still you should brush your teeth regularly!

Perspectives

- Some ideas…
  - ➢Sampling
    - Very detailed market analysis before testing
    - In trade fairs, spotting non-compliances?
- And more open questions…
  - ➢What to do with non-compliant products at the borders?
    - Sold somewhere else than EU?
    - Destroyed? Recycled?

Thank you for your attention
Questions ?

Discussion: How could voluntary certification help control by authorities of performances and energy efficiency labels?

Please complete attendance list

Conclusion & Follow-up

Compliance with regulations
Event organised by Eurovent Association & REHVA
Brussels, 27 November 2012: save the date!