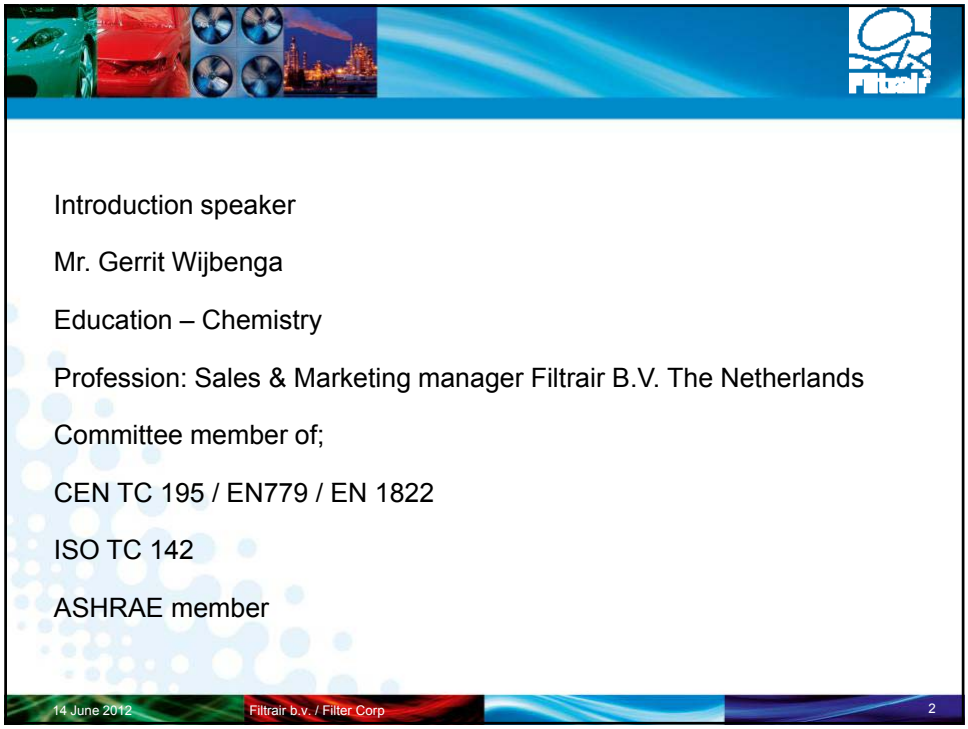

Automotive OEM assembly plants
Automotive aftermarket
HVAC
Power systems
European Air Filter Test Standard
EN 779:2012
Filtrair B.V. The Netherlands , Gerrit Wijbenga, Sales & Marketing Manager
Filtrair


Introduction speaker
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Filtrair b.v. / Filter Corp
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Subject to cover

- Why do we have test standards
- History of test standards
- EN 779 test standard
- Principal of EN 779:2012 air filter test
- Eurovent Energy label for air filters
- Conclusions

Why do we have test standards

- **Compare** certain defined product properties
- **Create** an equal measuring environment with defined conditions
- **Simulate** and measure real life behaviour

*They are for **product comparison** purpose only, **not to detect real life behaviour!***

History of test standards

USA

- Filter testing starts around 1930 (ASHVE and AFI code)
- ASHRAE 52-68 (1968) / ASHRAE 52-76 (1976)
- ASHRAE-ANSI 52.1-1992
- ASHRAE 52.2-2007

Europe

- Eurovent 4/5, European modification (1974) of ASHRAE 52-68
- Din 24185
- EN 779:1993 first European Air filter test method
- EN 779:2002
- New Standard EN779:2012

Performance during test and in real operation greatly depend on

- Final pressure drop
- Media air velocity
- Type of dust loading
- Humidity/weather conditions/season
- Flow pattern of airstreams used
- Mechanical forces (vibration)
- Forces between filter and particles (adhesive coatings, electrostatic charges)

EN 779:2012 Testing

EN 779:2012

- Air flow range for testing 850 m^3/h – 5000 m^3/h
- Standard air flow is 3400 m^3/h for complete filter units 592mmx592mm (pocket filter / compact filter)
- Flat sheet testing for media @ media velocity 0.25m/s or 1.5 m/s (1.0 m^2 or 0.36 m^2)
- Coarse filters(G) Average Arrestance in according to Ashrae dust
- Medium filters (M) Average efficiency measurement with OPC
- Fine filters (F) minimum efficiency and Average efficiency measurement with OPC
- Test aerosol DEHS
- Distribution particle size 0.2 – 3.0 µm
- Average particle size for classification 0.4 µm

Classification EN 779:2012

Classification

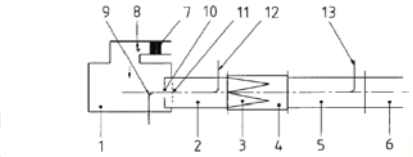
- G-filters – based on average arrestance (gravimetric method)with Ashrae 52.1 test dust at final pressure drop of 250 Pa
- M- Filters - based on average particle size efficiency at 0.4 µm at final pressure drop of 450
- F-filters – based on minimum efficiency and average particle size efficiency at 0.4 µm at final pressure drop of 450
- Discharge Efficiency Annex A – normative and Shedding Annex B (informative)

ASHRAE 52 test dust is;

- Designed to detect alterations in filter performance over lifetime
- An artificial dust, however not close to real ambient air dust

- Composition of standard ASHRAE test dust is
  - SAE standard J726 test dust fine 72 %
  - Carbon black soot 23 %
  - Cotton linters/fibers 5 %

EN779:2002 test duct



Key
1 Duct section of the test rig
2 Duct section of the test rig
3 Filter to be tested
4 Duct section including the filter to be tested
5 Duct section of the test rig
6 Duct section of the test rig
7 HEPA filter (at least H13)
8 Inlet point for DEHS particles
9 Dust injection nozzle
10 Mixing orifice
11 Perforated plate
12 Upstream sampling head
13 Downstream sampling head

Figure 1 — Schematic diagram of the test rig

EN779:2012 test duct of Filtrair

Principal of EN 779 testing, coarse filter

Criteria EN 779:2012 test standard Coarse Filter

- Initial pressure drop of a clean filter measured at 25% till 125% of the nominal air flow
- Ashrae test dust will be loaded on the test filter till the final pressure drop has reached
- The average arrestance will be calculated of measuring points between the initial and final pressure drop
- The dust holding capacity is calculated of the amount of loading dust x the average arrestance.

Principal of EN 779 testing, medium filter

Criteria EN 779:2012 test standard Medium Filter

- Initial pressure drop of a clean filter measured at 25% till 125% of the nominal air flow
- Initial efficiency test met DEHS aerosol
- Ashrae test dust will be loaded on the filter till a certain pressure drop is reached
- Repeating and alternating the efficiency test and the dust loading test will be done till the final pressure drop is reached
- The average arrestance and efficiency will be calculated of measuring points between the initial and final pressure drop
- The dust holding capacity is calculated of the amount of loading dust x the average arrestance.

Principal of EN 779 testing, fine filter

Criteria EN 779:2012 test standard Fine Filter

- Initial pressure drop of a clean filter measured at 25% till 125% of the nominal air flow
- Initial efficiency test met DEHS aerosol
- Ashrae test dust will be loaded on the filter till a certain pressure drop is reached
- Repeating and alternating the efficiency test and the dust loading test will be done till the final pressure drop is reached
- The average arrestance and efficiency will be calculated of measuring points between the initial and final pressure drop
- The dust holding capacity is calculated of the amount of loading dust x the average arrestance.
- Minimum efficiency according Annex A EN 779:2012

Classification EN 779:2002

Filter Type	EN 779:2002 classification	Average Arrestance (%) (Ashrae Dust)	Average Efficiency DEHS(%) @ 0,4µm	Final pressure drop (Pa)
Coarse Filter	G1 G2 G3 G4	50≤Am<65 65≤Am<80 80≤Am<90 90≤Am		250 250 250 250
Fine Filter	F5 F6 F7 F8 F9		40≤Em<60 60≤Em<80 80≤Em<90 90≤Em<95 95≤Em	450 450 450 450 450

Classification EN 779:2012

Filter Type	New EN779 classification	Average Arrestance (%)	Average Efficiency (%) @ 0,4 µm	Final pressure drop (Pa)	Minimum Efficiency @ 0,4 µm
Coarse Filter	G1 G2 G3 G4	50≤Am<65 65≤Am<80 80≤Am<90 90≤Am		250 250 250 250	
Medium Filter	M5 M6		40≤Em<60 60≤Em<80	450 450	
Fine Filter	F7 F8 F9		80≤Em<90 90≤Em<95 95≤Em	450 450 450	35 55 70

Eurovent Certify all – EN779:2012 - Energy rating system

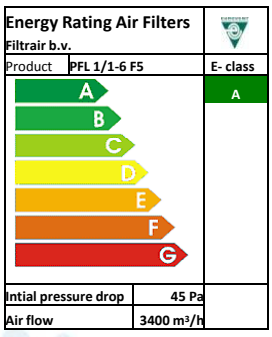
- Eurovent Certify all program – certifies filter ranges according EN 779:2012.
- Criteria certification program – filter class according EN779:2012 and initial pressure drop must be in correspondence with public data and technical information
- Each filter certified by Eurovent has an energy label. Energy label is set up by filter class. (Eurovent guideline 4/11)
- Energy rating will be done on the filter classes G4 up to F9

Energy Consumption, the Cost of Clean Air

- Energy costs grow steadily in all countries
- Energy costs of air filters in the total system is approximately 30%
- Select a correct filter with lowest optimized pressure drop
  This filter will create significant savings on energy
- 1 additional Pa over an air filter adds 1 euro in extra energy costs
- This principle shows the difference between a good or bad filter even if they have the same filter class
- With the energy consumption principle, filters can be sold on technical performance

Energy Rating System for Air Filters

- Eurovent will introduce in 2012 to the certification program; air filters Class M5-F9 an ENERGY RATING SYSTEM FOR AIR FILTERS
- Same type of rating system as white goods, i.e refrigerator, washing machines, television, cars etc.



Eurovent Certification program

Eurovent Certification programs - Air filters Class M5-F9 (certify all)

- Eurovents accreditation can be used as quality label (similar to DIN)
- DIN geprüft is product certification according EN779:2012
- All filters M5-F9 will be certified (total group certification)
- Certification according EN779:2012
- Eurovent sent filters at independent labs – SP Sweden / VTT Finland
- Eurovent checks test data of independent lab with the given data by the filter manufacturer
- Validity of certificate – 1 year
- Every year group audit by Eurovent
- All certified filters are present on website of Eurovent
- 2012 introduction Energy Rating System in Certification program Air Filters M5-F9

Eurovent Energy Rating System

Energy Rating System is based on;

- EN779:2012 classification system
- EN779 data for G, M and F filters
- Average pressure drop G filters @ 350 g Ashrae dust,
- M filters @ 250 g Ashrae dust and F filters @ 150 g Ashrae dust
- Energy rating is based on the energy consumption in kWh

$$E\ (kWh) = \frac{V \cdot \Delta P \cdot t}{\eta * 1000}$$

E: energy consumption (kWh)
V: Air flow(m3/s)
ΔP: Average pressure drop of the filter during life time
t: operation time (h)
η: efficiency of the fan

Eurovent Energy Rating System

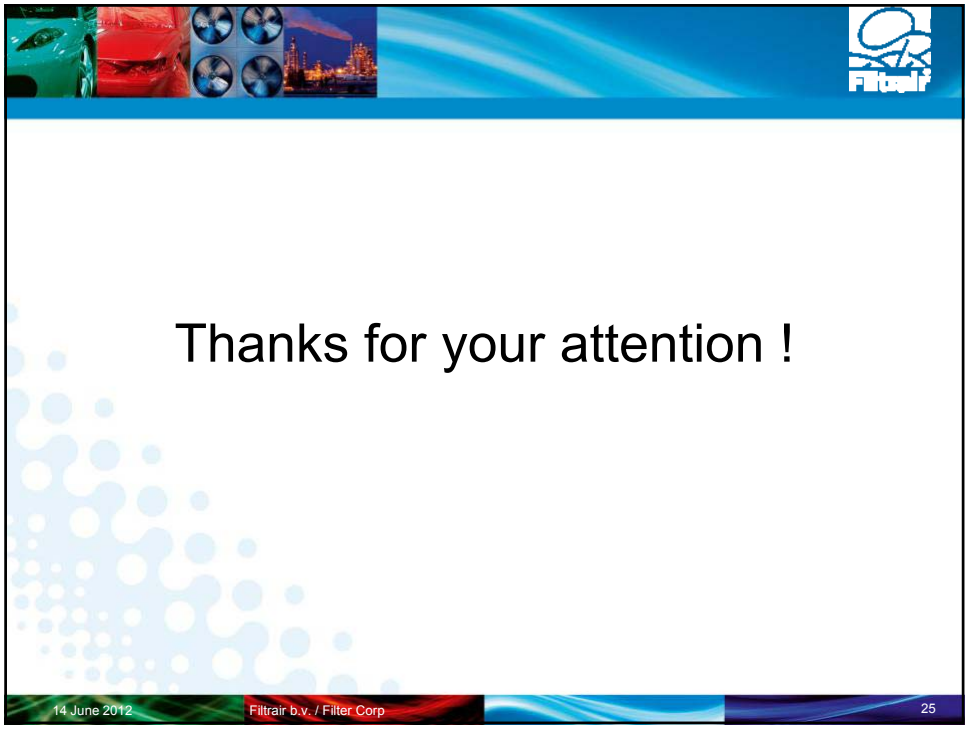
Energy Rating System per Filter Class ; G4-M5-M6-F7-F8-F9

Medium filters Threshold M5-M6 filters

Filter Class	M5	M6	M5	M6
IPA Intiial Efficiency @ 0,4 µm	n.a.	n.a	n.a	n.a
Eurovent Energy label	Ave. ΔP @ 250 g. Ashrae dust		Energy @ 250 g Ashrae dust	
A	0-57 Pa	0-71 Pa	0-650 kWh	0-800 kWh
B	57-69 Pa	71-84 Pa	650-780 kWh	800-950 kWh
C	69-80 Pa	84-97 Pa	780-910 kWh	950-1100 kWh
D	80-92 Pa	97-110 Pa	910-1040 kWh	1100-1250 kWh
E	92-103 Pa	110-124 Pa	1040-1170 kWh	1250-1400 kWh
F	103-115 Pa	124-137 Pa	1170-1300 kWh	1400-1550 kWh
G	>115 Pa	>137 Pa	>1300 kWh	>1550 kWh

Conclusions

- New EN779:2012 test procedure is equal to EN779:2002
- The classification system makes a shift in G, M and F filters
- EN779:2012 is a laboratory test and is not predicting real life performance
- Energy rating system contributes to a lower cost environmental friendly system
- The filter is the base of the success


Thanks for your attention !
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