Title	On site air filter test system
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Citation	Aerosol Technology 2015, AT2015, 15 - 17 June 2015, Tampere, Finland
Date	2015
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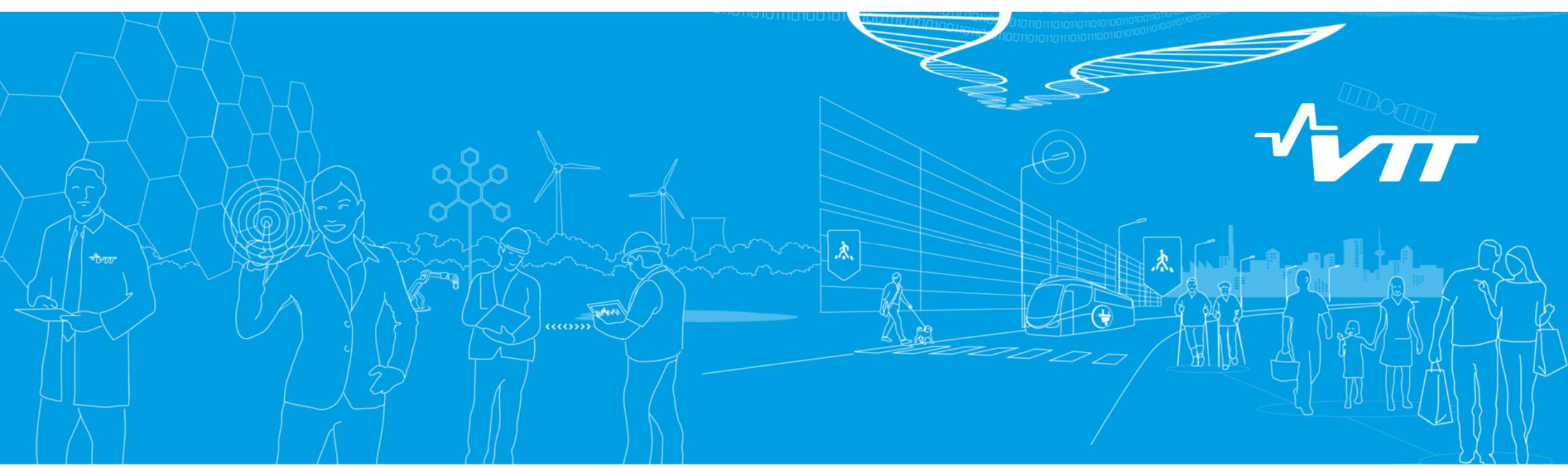

On site air filter test system

Aerosol Technology 2015

VTT Technical Research Centre of Finland

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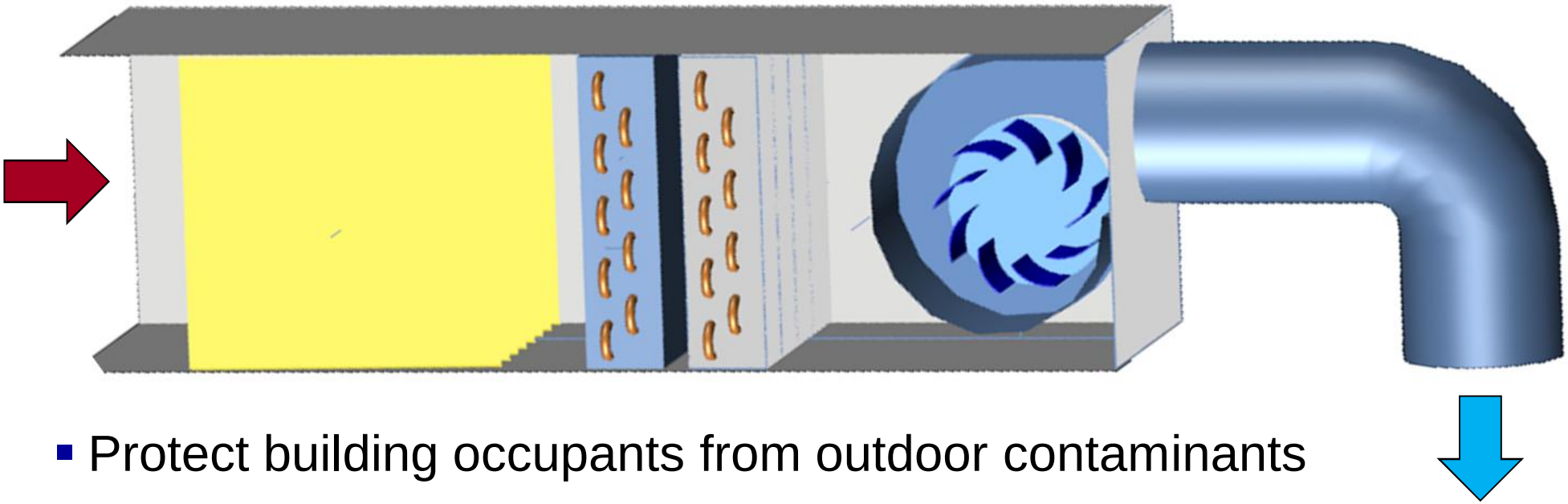
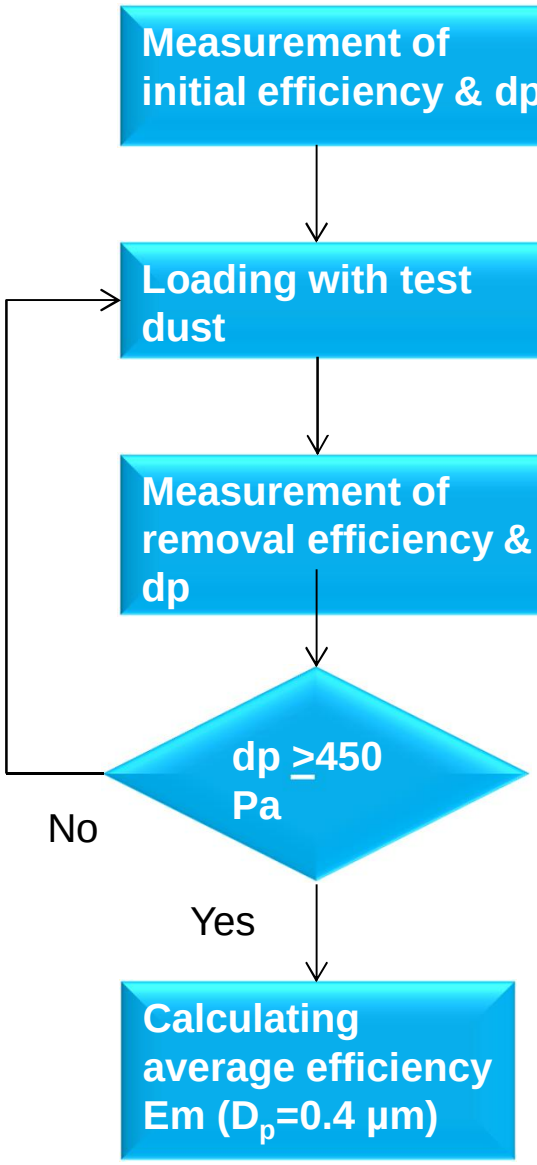
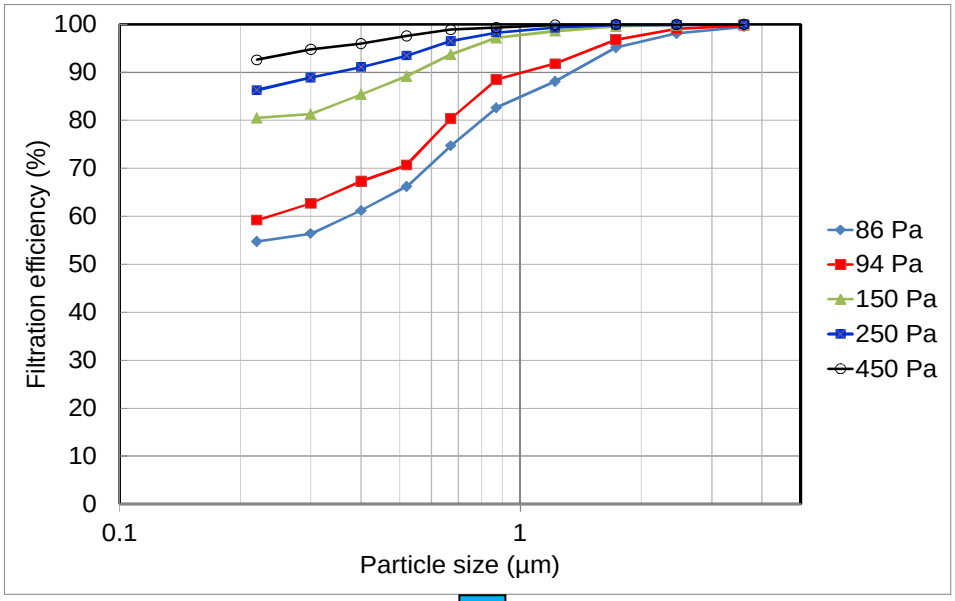
General ventilation air filters

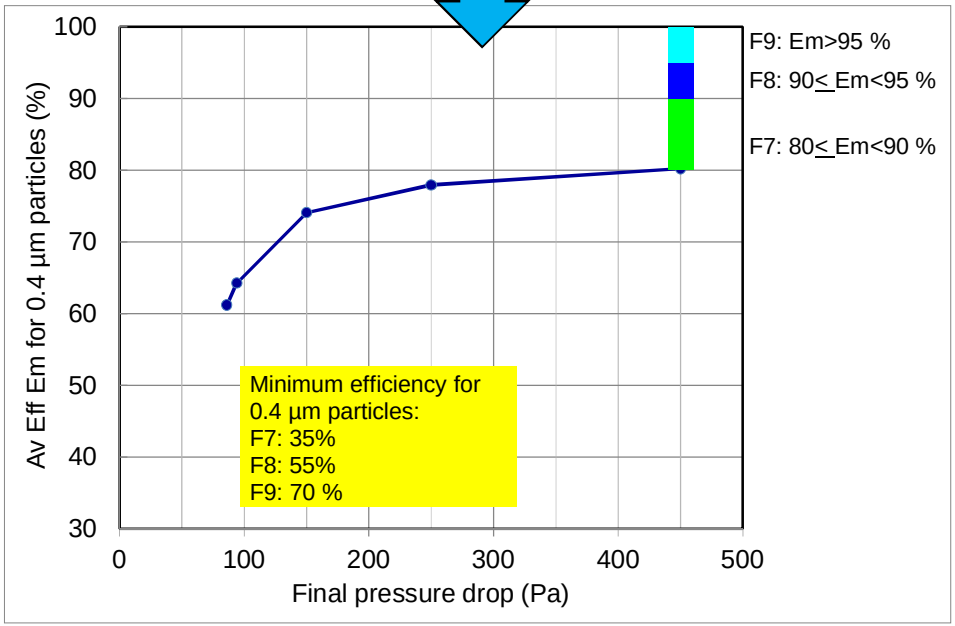


- Protect building occupants from outdoor contaminants
- Reduce the soiling of the HVAC system (heating and cooling coils, ductwork)
- Key properties:
  - Filtration efficiency
  - Pressure drop
  - Dust holding capacity

Filter testing according to EN 779



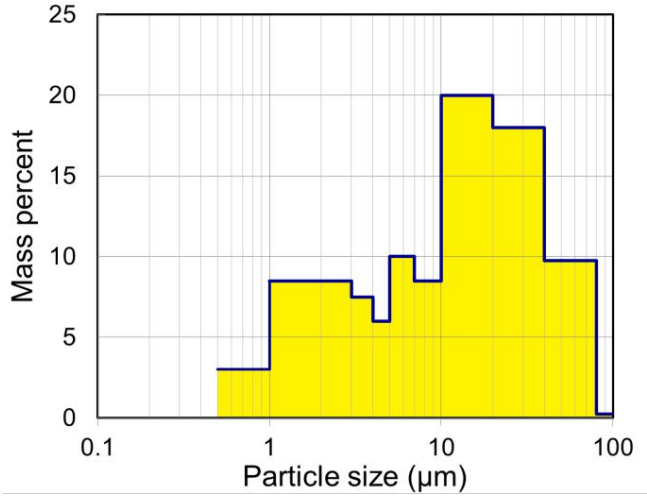




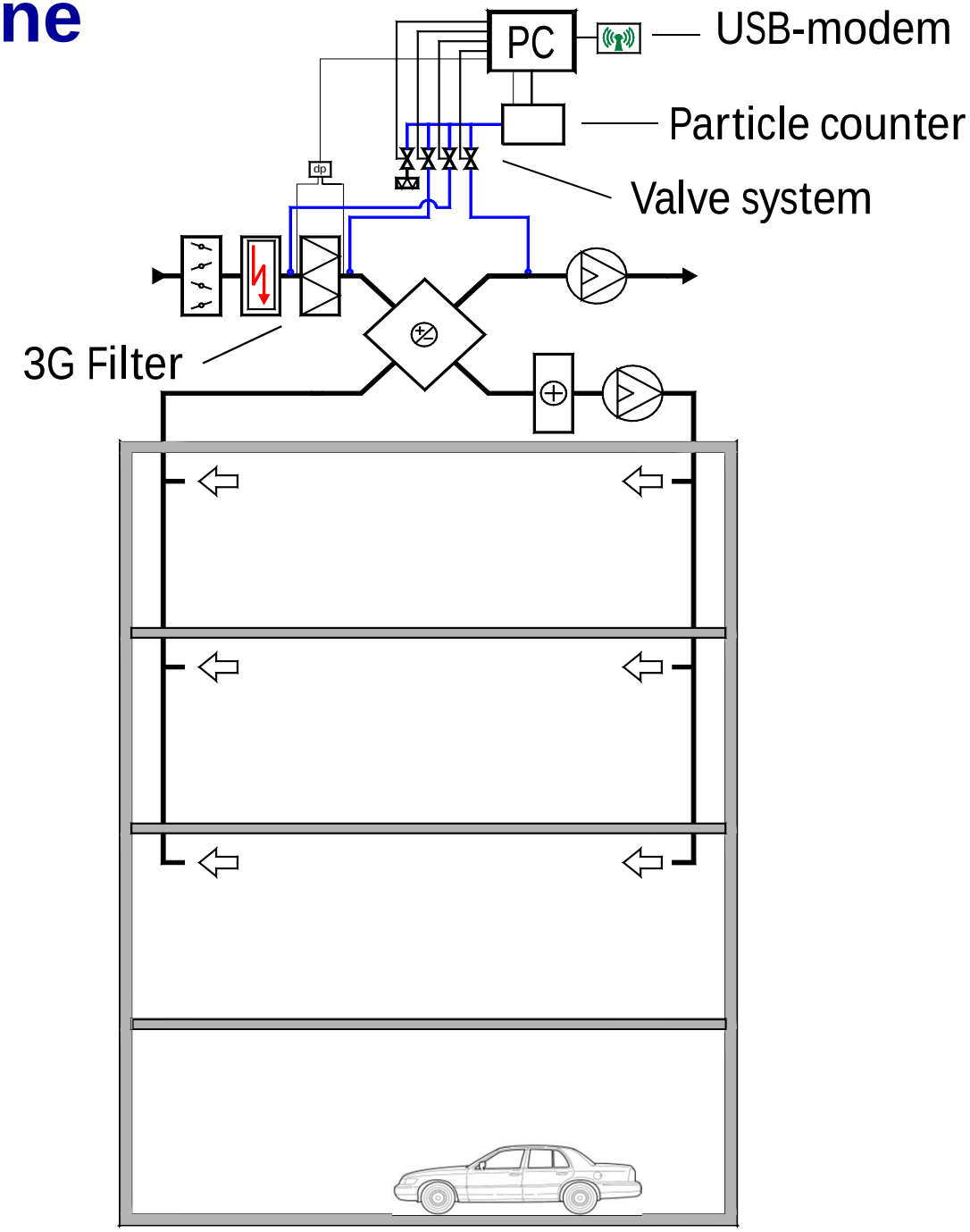
Why additional tests are needed?

- The EN 779 provides a comparable but simplified evaluation process of air filters which does not describe the real life behaviour
- In real operating conditions, the filter performance may differ greatly from that obtained in laboratory due to
  - Differences between ambient aerosol characteristics and the test dust used in EN 779: concentrations and particle size distributions
  - Ambient conditions
  - Filter face velocity distribution, and filter operating and loading conditions.
- Some parameters are time-dependent!

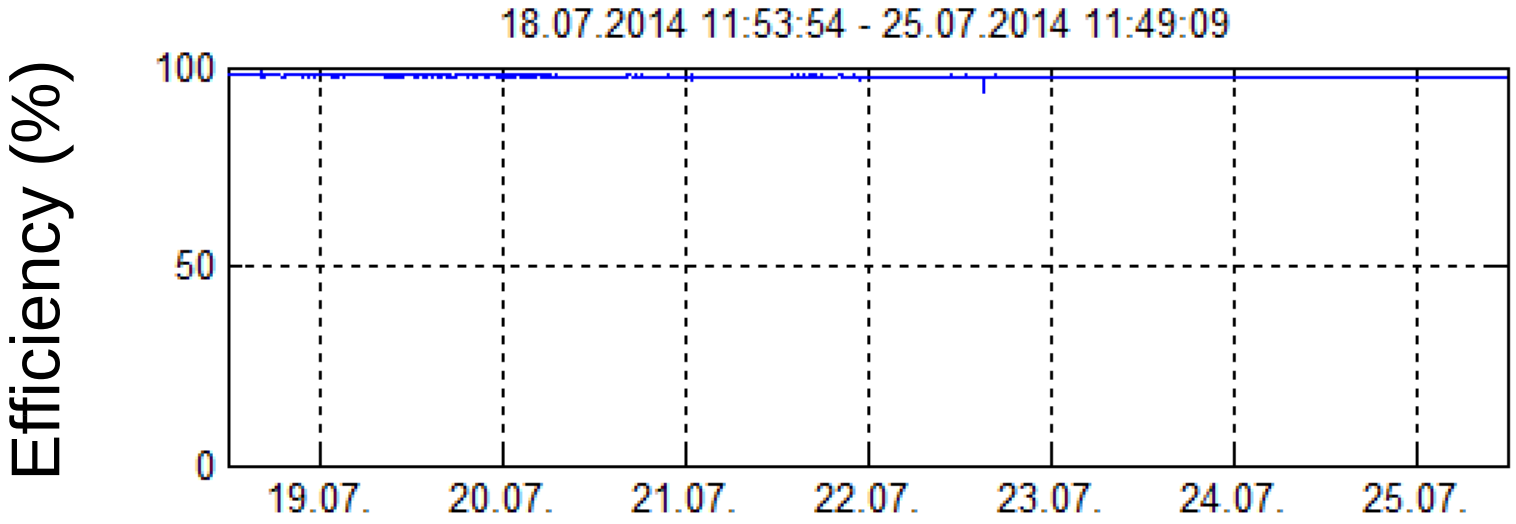
Average size distribution of ISO 12103-A2 loading dust



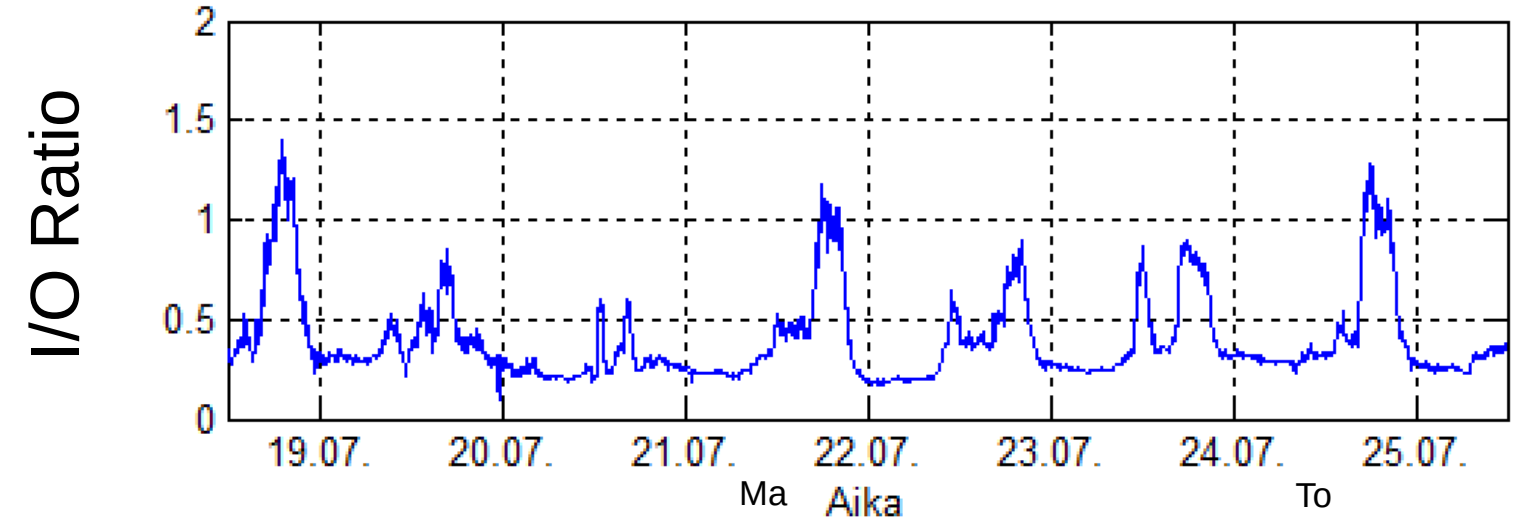
On-site on-line test system



Test results – filter used for 2 weeks



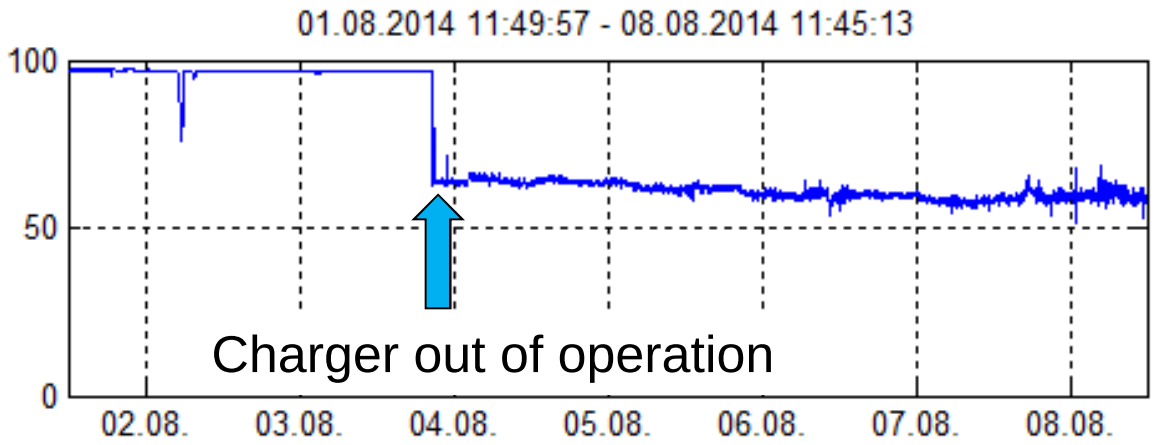
Filtration efficiency for fine particles (0.4 um) is high



Indoor/Outdoor ratio varies greatly due to indoor activities (and sources)

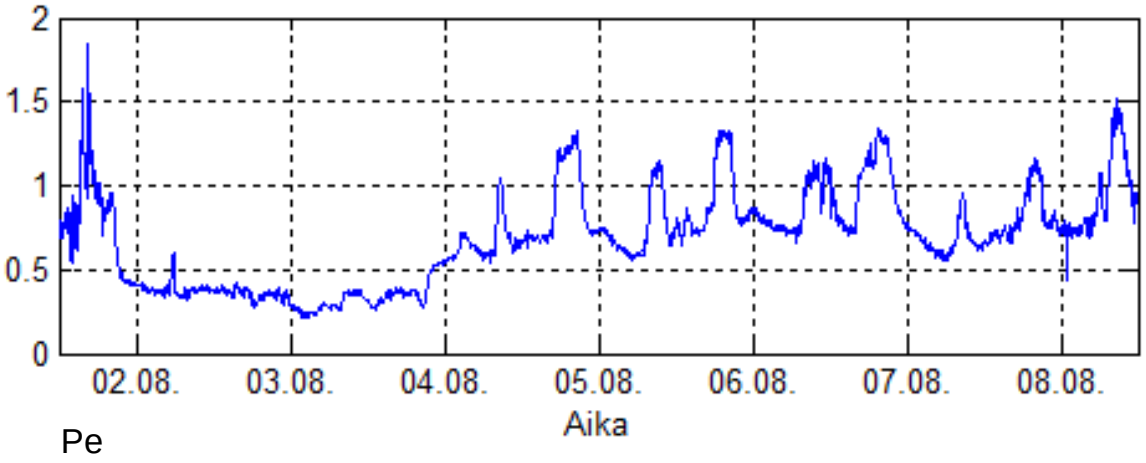
Test results: detection of anomalies

Efficiency (%)



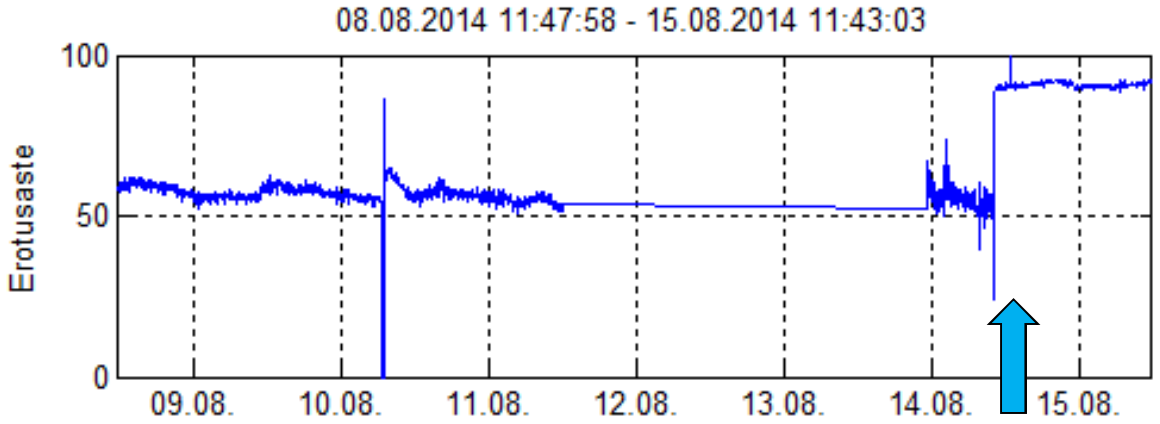
Changes in performance affecting the protection efficiency can be seen in real time

I/O Ratio

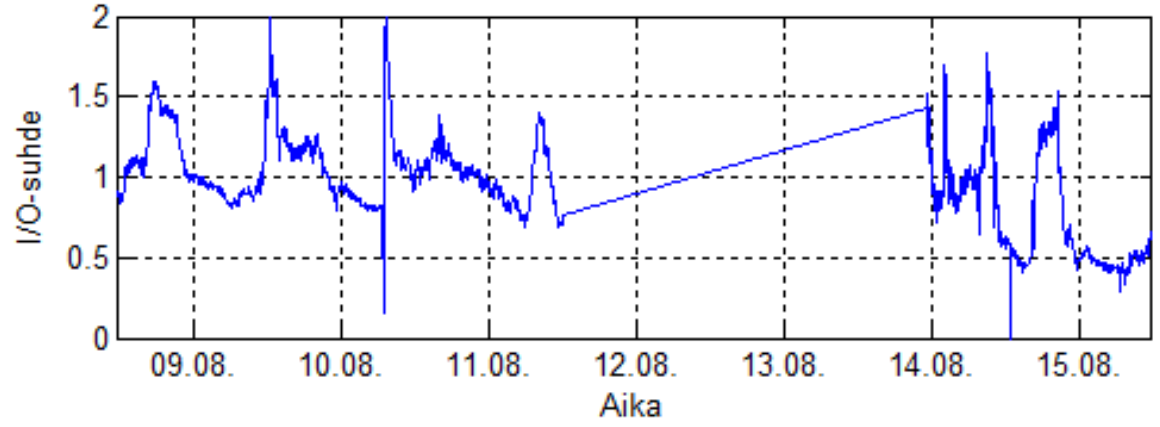


Indoor/Outdoor ratio changes due to reduced efficiency

Filter used for 6 weeks – charger back in operation

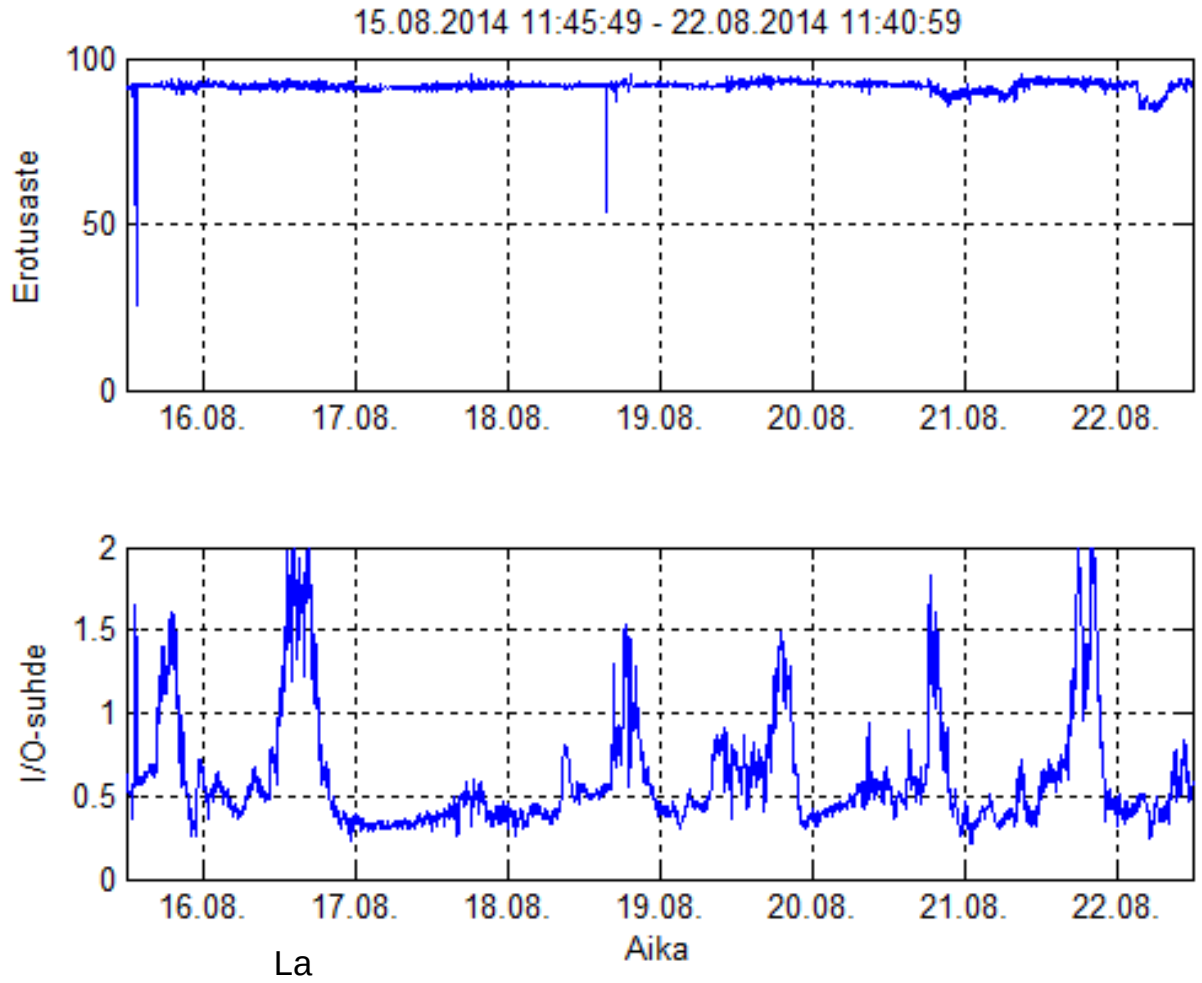


Remediation of charger

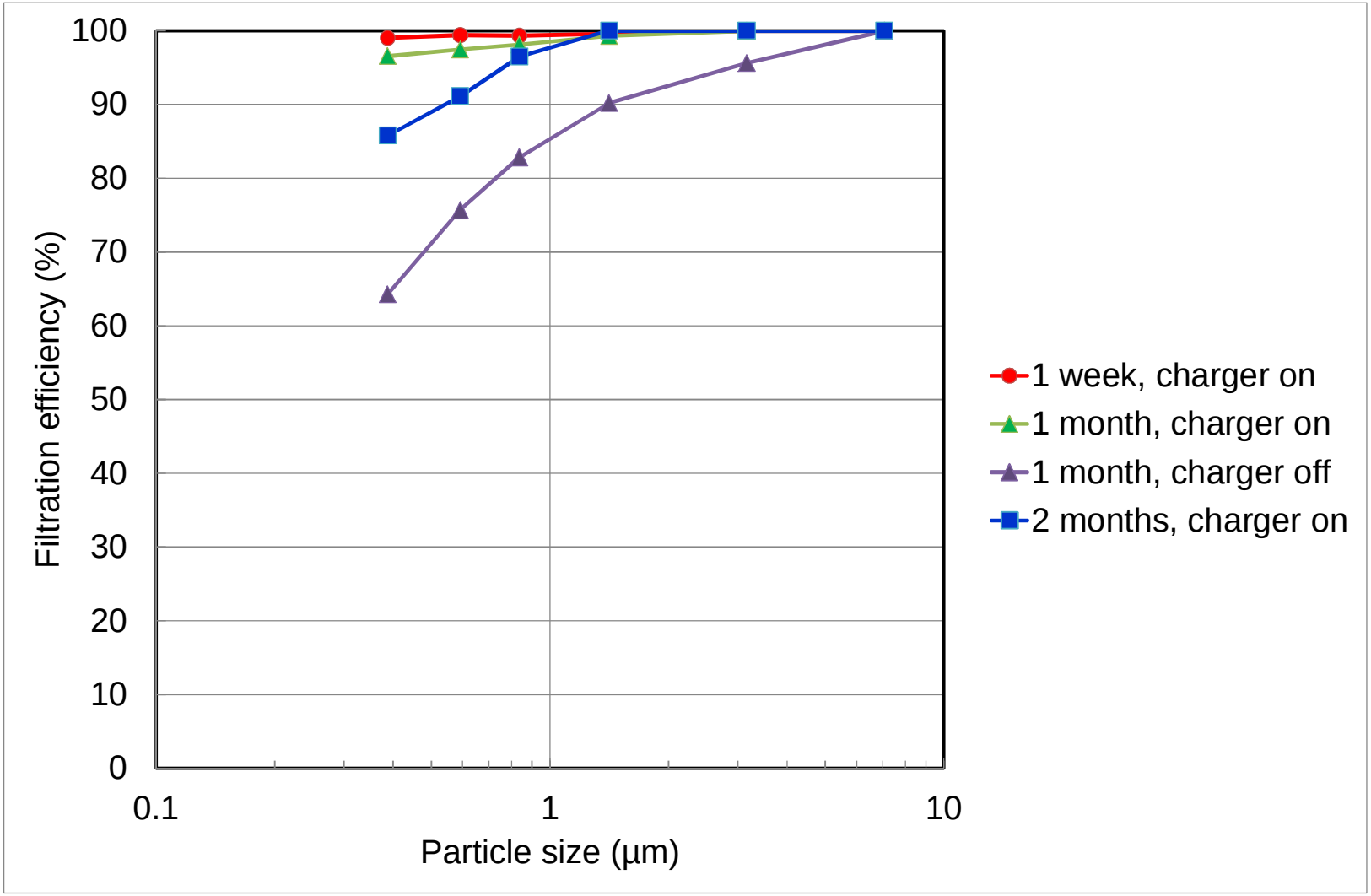


Su

Filter used for 7 weeks

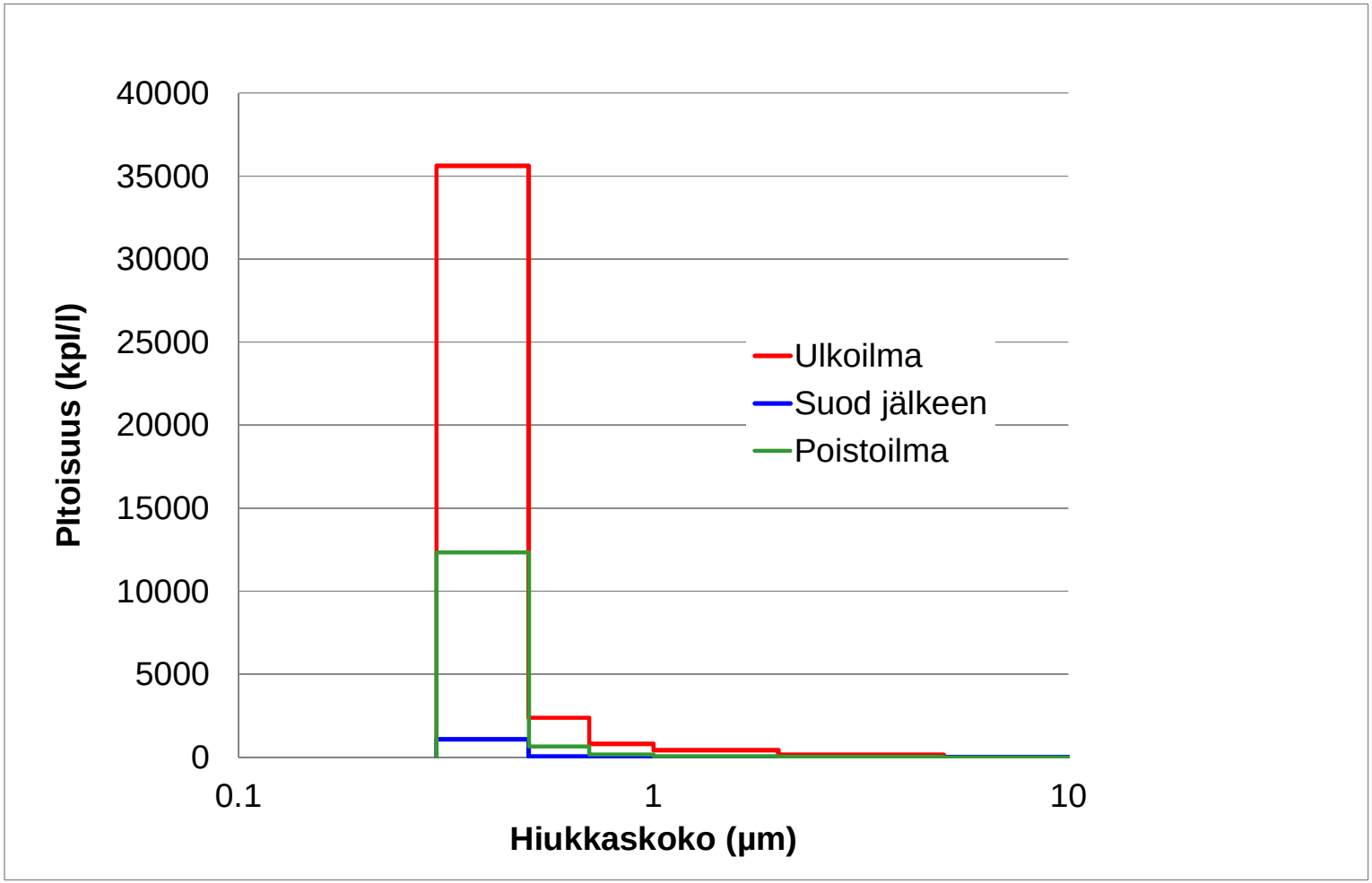


Fractional filtration efficiency



Particle size distributions

Size distribution 1.8.2014 in the range 0.3 - >5 µm



Conclusions

- The developed test system can measure and monitor filter performance in real time and on-line
- The results describe real life behaviour of the filter:
  - Filtration efficiency
  - Pressure drop increase due to loading
  - Dust holding capacity
- Based on the results the optimal filter change time can be estimated accurately
- It is possible to enhance the filtration efficiency for electret filters with High Voltage charging
- The effect of enhanced filtration efficiency on indoor air quality and improved protection of occupants could be clearly seen

Acknowledgements

The research leading to these results has received funding from the European Union's Seventh Framework Programme under grant agreement n° 313077 within the EDEN Project (End-user driven DEmo for cbrNe).


Thank you!