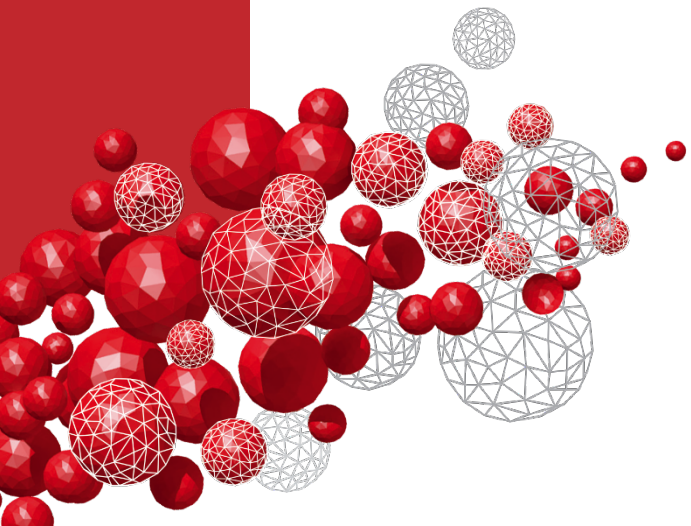
Dekati® Application example:
Blow-By –measurement (Crankcase ventilation)



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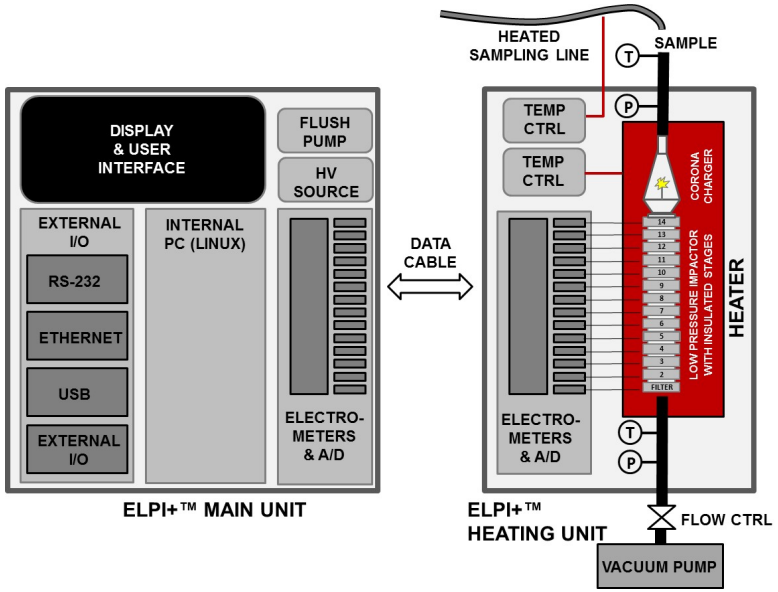
A story…

- blowby filter efficiency measurements are needed to develop/verify filter performance
- Typical particle size and concentration?
  - 0.05 – 5 microns, 5-10 mg/m3
- HR/HT-ELPI+ wide size range, real-time data

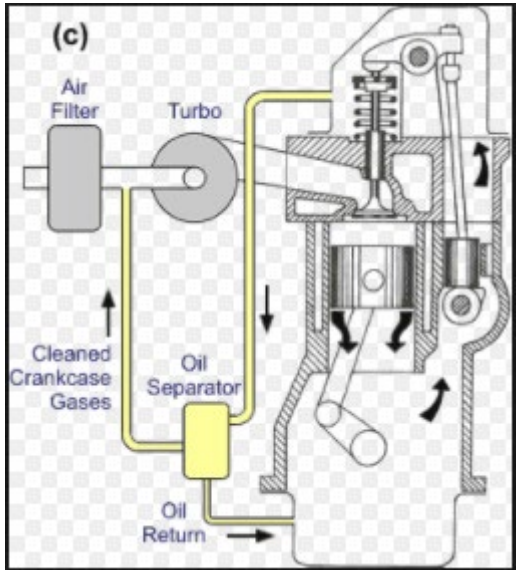
High Temperature ELPI+™



- Same operating principle as ELPI+™
- Charger+Impactor moved to external heating unit, max 180 °C
- Allows hot aerosol size and charge distribution measurement in real-time
- Heater maintains temperature and avoids condensation, NO residence time to heat up the sample

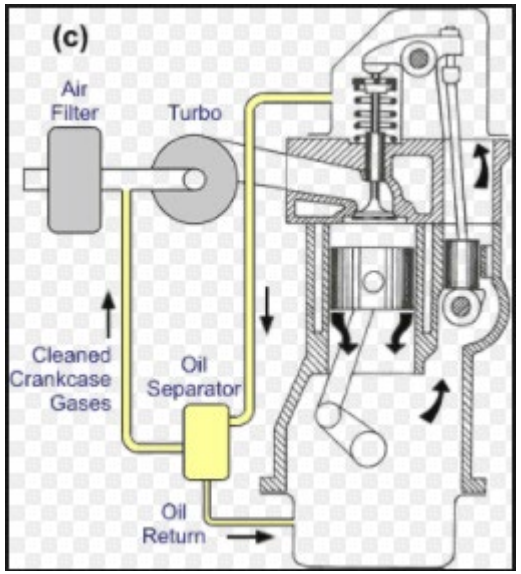
What is Blowby (crancase) emission?

- Most combustion gas in an engine exits the cylinder through a valve and then out the exhaust pipe
- A portion of the gas escapes through a gap between the piston wall and the piston ring, this is called blow-by
- Blow-by gases enter the crankcase chamber and exit through a breather tube – typically to engine intake
- There is oil mist (oil droplets) in blow-by gas
- To avoid excess oil loss there is a usually a filter / impactor / cyclone in the breather tube



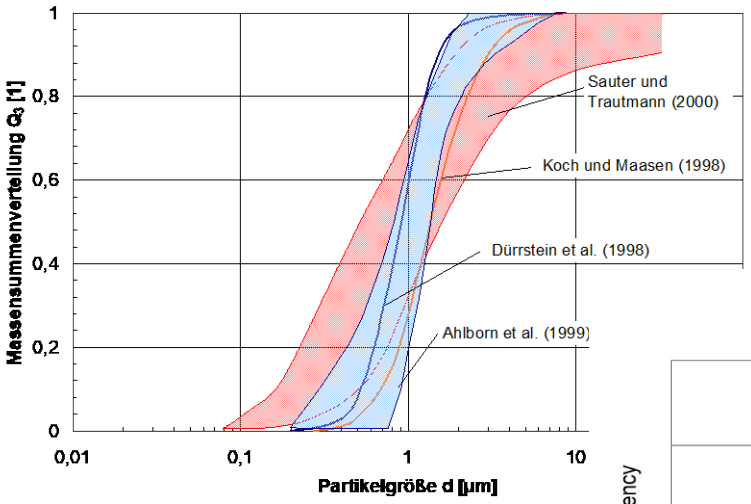
Why is it measured ?

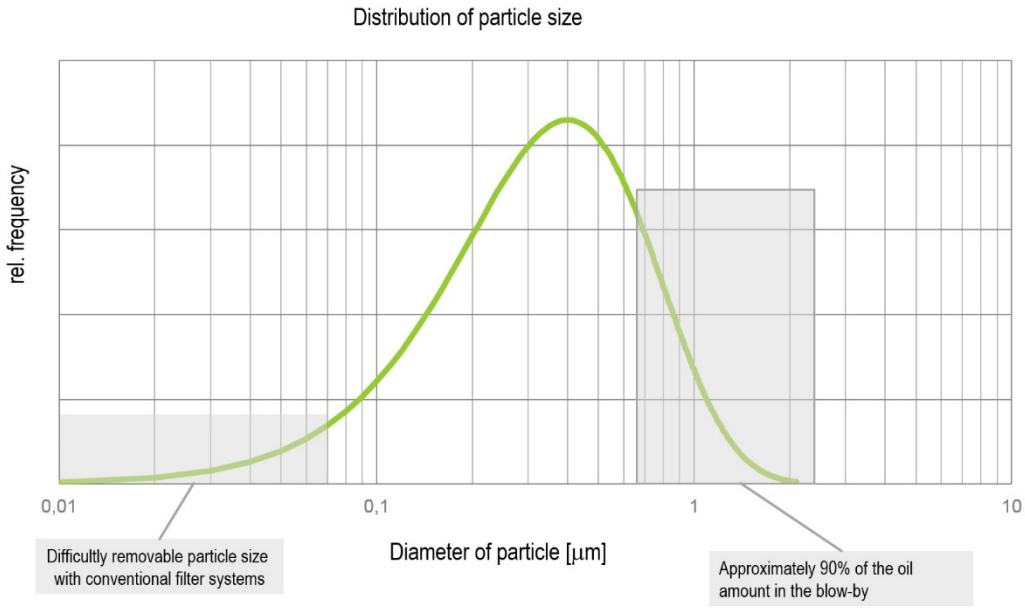
- There is usually some oil separator in the breather tube – filter, impactor or cyclone
- Particle size is measured upstream and downstream of the separator to study and optimize its efficiency
- Customers are engine manufacturers (esp. HD) and filter manufacturers



Crancase emission – particle size

- Crancase oil droplets are relatively large (mass around 1 um) but there are lot of small particles as well including soot and ash that escapes the cylinder





Other crancase particle properties

- Oil droplets, wide particle size range
- High concentration (milligrams / m^3)
- High temperature (100°C)
- Slightly elevated pressure
- Need to measure pre- and post oil separator

→ Selection of ELPI+ configuration

→ HT-ELPI+ and Heated DI-1000

Why and what kind of ELPI+?

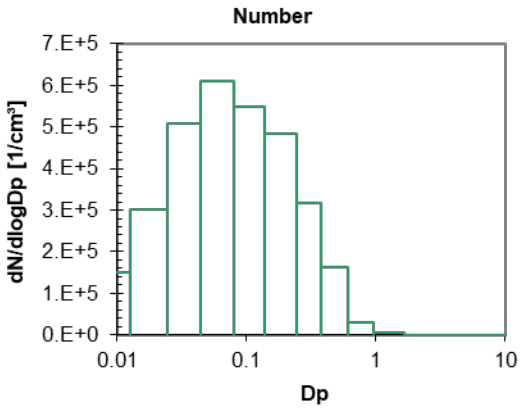
- Wide size range of ELPI covers both nano range where filtration efficiency information is important and micron range where mass emission (oil consumption) is important.
- ELPI+ can be heated so sampling is done at crankcase conditions

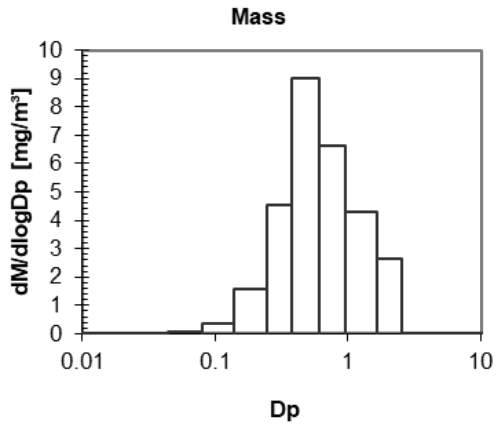
- HT-ELPI+ is the ideal instrument for this application

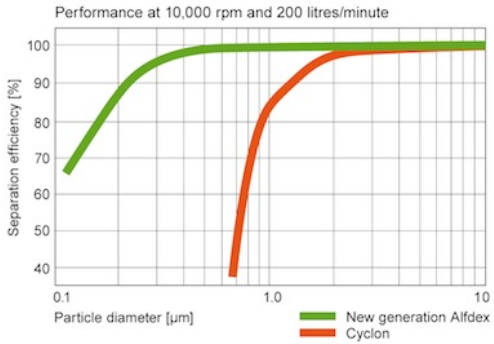
- Could be high concentration, one heated ejector diluter might be needed
- Sintered plates recommended

Existing data, articles and other information from Dekati

- Customer references
  - AGCO, Parker Hannfin, Caterpillar, Donaldson, …
- Information about standards
  - Dekati is a member of ISO/TC22/SC34 WG 11:Filtration performance of closed crankcase ventilation systems
- Example data:







Basic configuration for Blow-By emission measurement

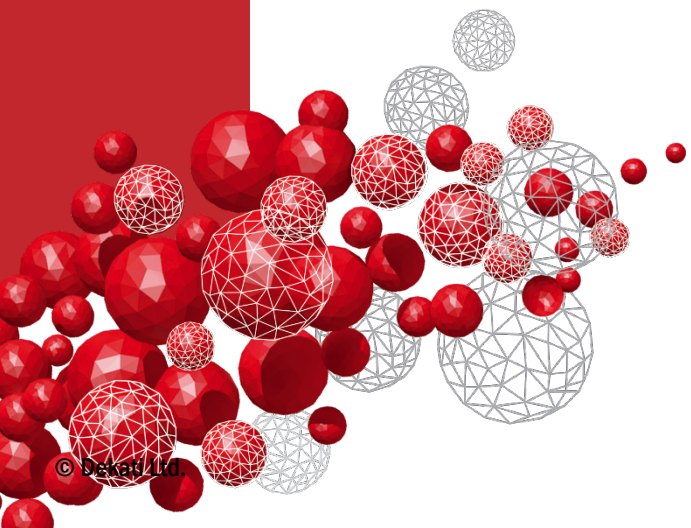
- HT-ELPI+
- Heated DI-1000
- Sintered collection plates

OR

- (HR)-ELPI+, Sintered plates
- DI-2000 + DI-2003

Thank you!

-Questions and discussion



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