

Crankcase Ventilation In-line Measurement of Oil Aerosols

Measurement Hardware for Blow-By Oil Separation

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Adaptive Instruments:



Content

- **Absolute Filter GMS141 (for Gravimetric Analysis)**
- **Photometer PAP 610 / 612 (for Optical Measurement)**

State of the Art of Benchmarking Oil Mist Separators

Laboratory

- Gravimetric Measurement
- Fractional Efficiency Measurement

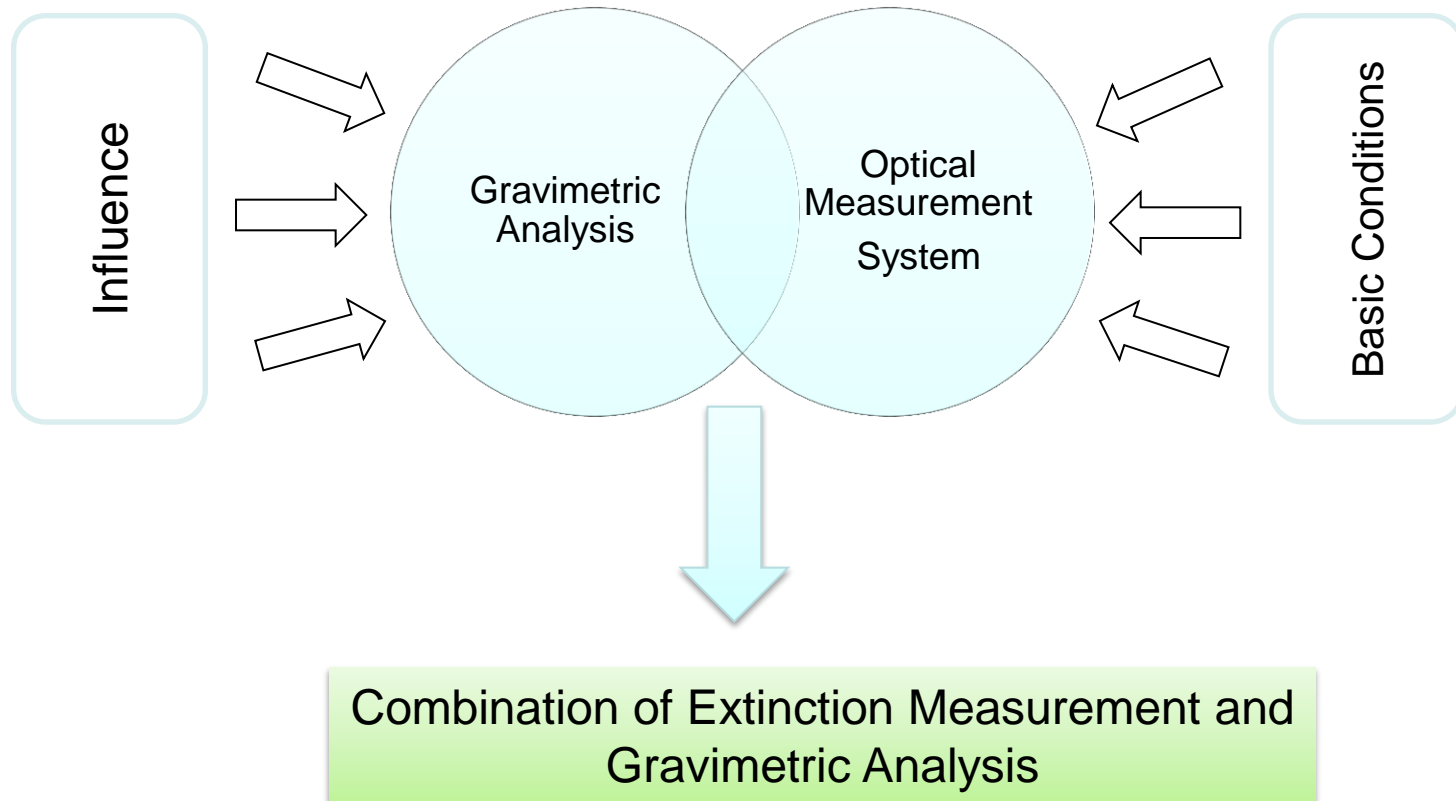
Engine

- Gravimetric Measurement
- Accompanying Measures in Laboratory

Disadvantages

- Low Time Resolution
- Expensive Cost to Value Ratio
- Possibility of Particle Changes during Storing
- High Filtration Efficiency -> Long Period of Measurement Time -> High Operational Expense

 **Advancement / Improvement**



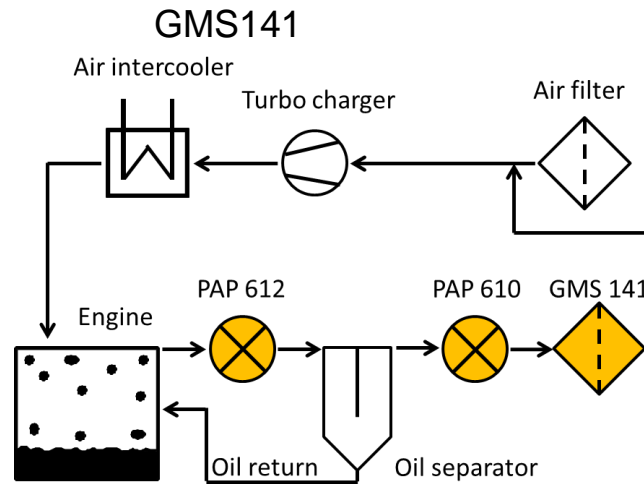
 **measurement equipment**

Product Development

Test Stand

Gravimetric

Optical



● GMS141 (Gravimetric Measurement System)

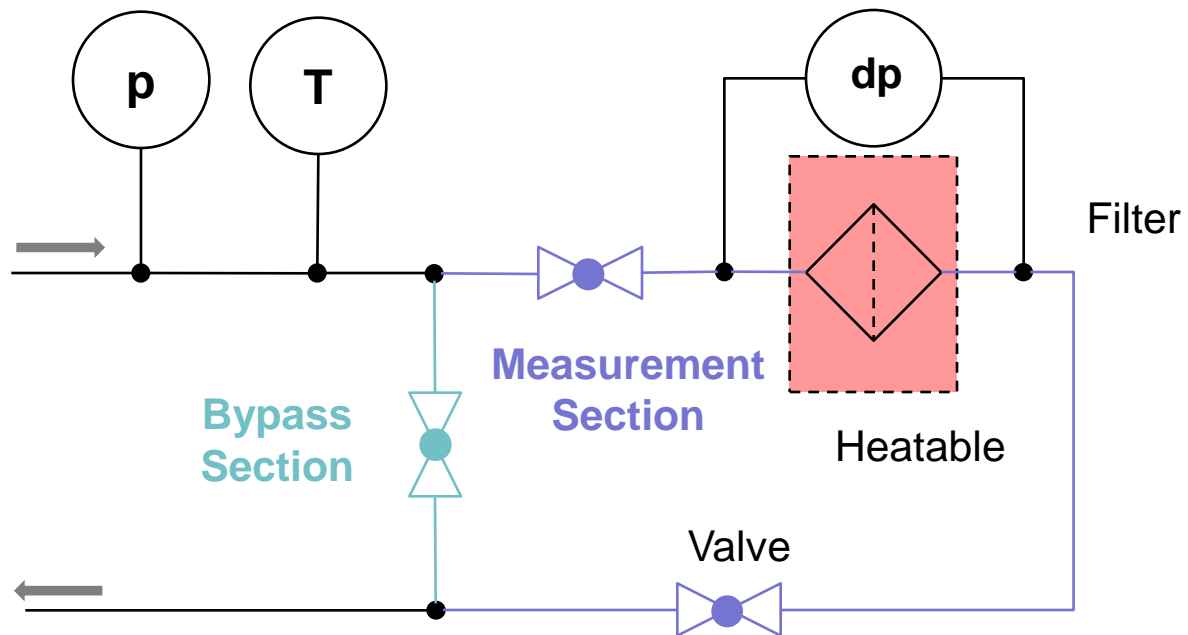


- 2 Types of Test Filter useable
 - Filter Cartridge
 - Blank Filter (d=110mm)
- heatable Test Filter Box
- Two independent Sections: Bypass / Measuring
- Differential Pressure Measurement Test Filter
- Temperature, pressure and volume flow Measurement of blow-by
- Manually or automatic operated Valve Controlling
- Automatic: Controlling by Time / Differential Pressure
- Device Control with SPS by Web Browser



● GMS 141

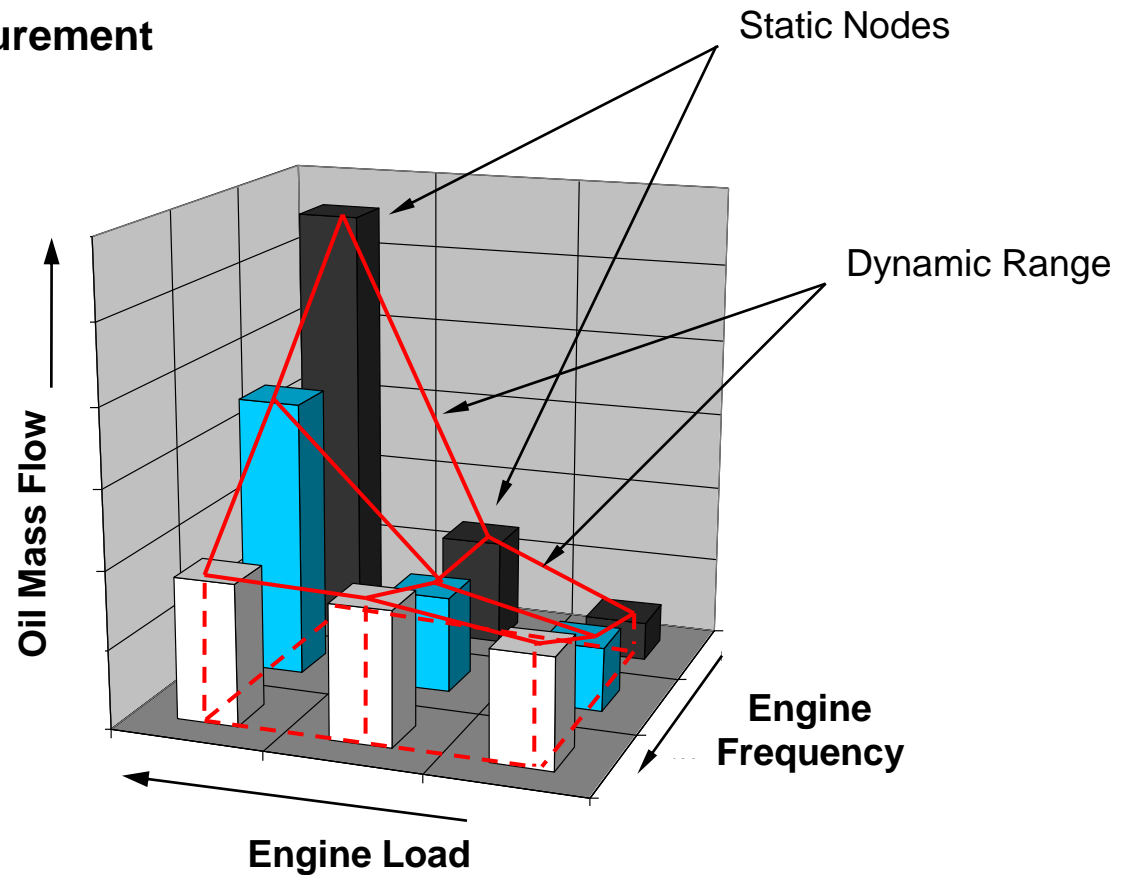
● Process Diagram





● GMS 141

● Example Measurement



● PAF 610 (Process Aerosol Photometer)

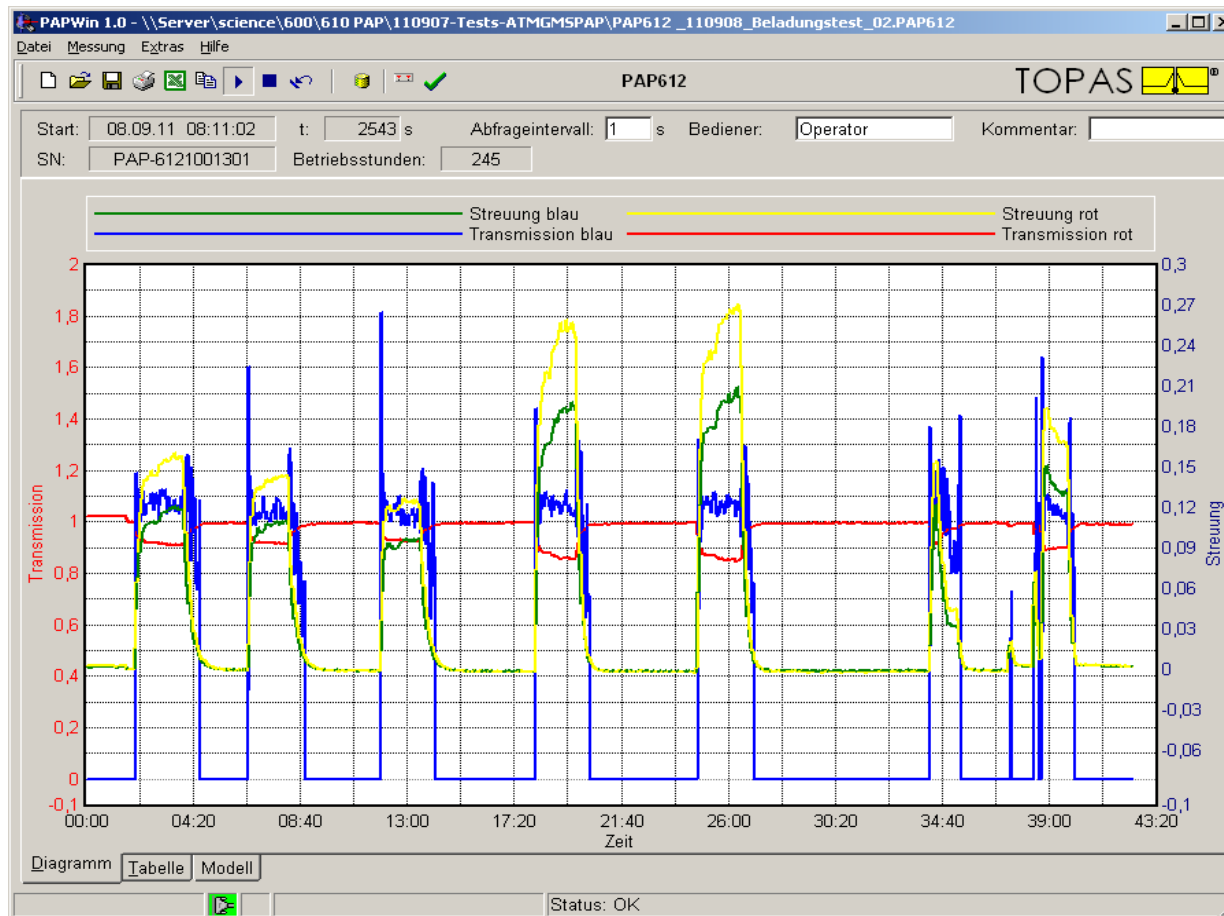


Specifications

Measurement Range of Concentration	Approx. 0.1 ... 3 g/m ³
Droplet Size Range	Approx. 0.1 ... 1.5 μm
Extinction length	300
Temperature	110°C (adjustable)
Wave Length	470 to 875 nm

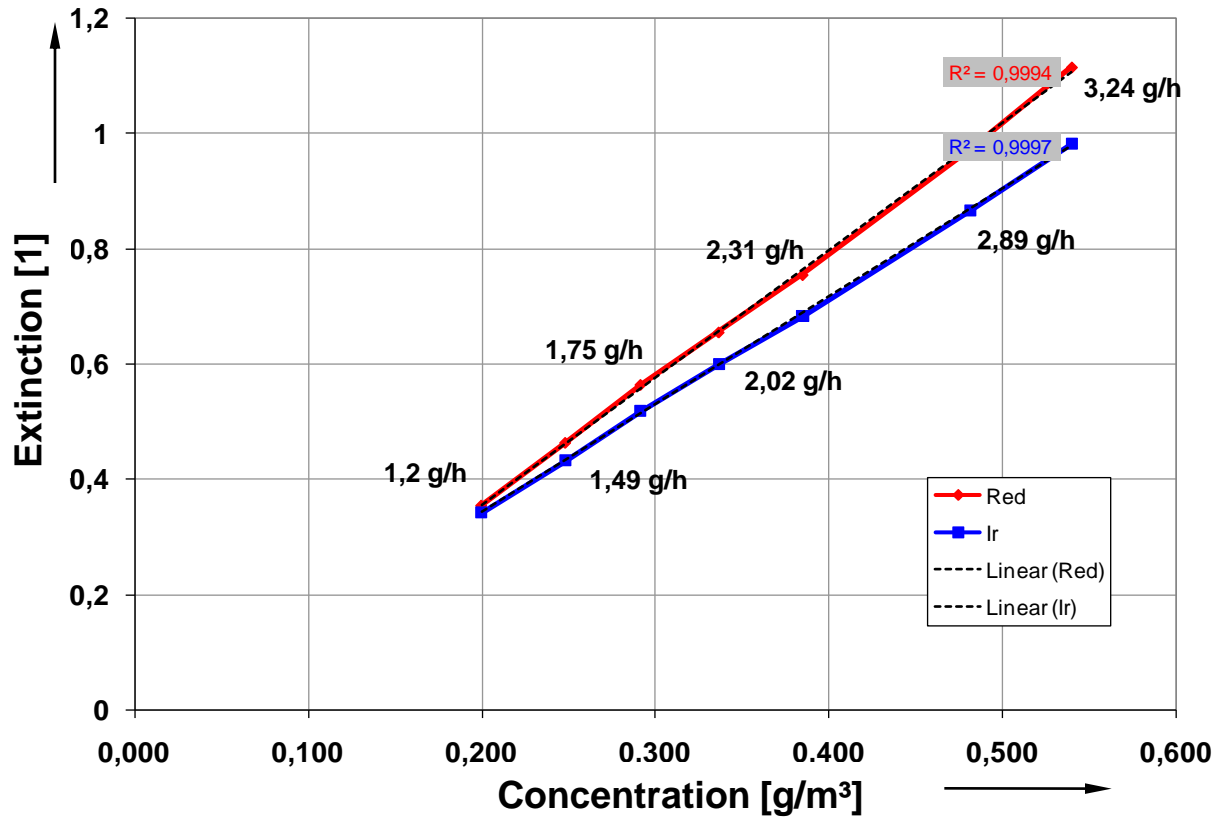
 **Photometer**

 **Software: PAPWin**

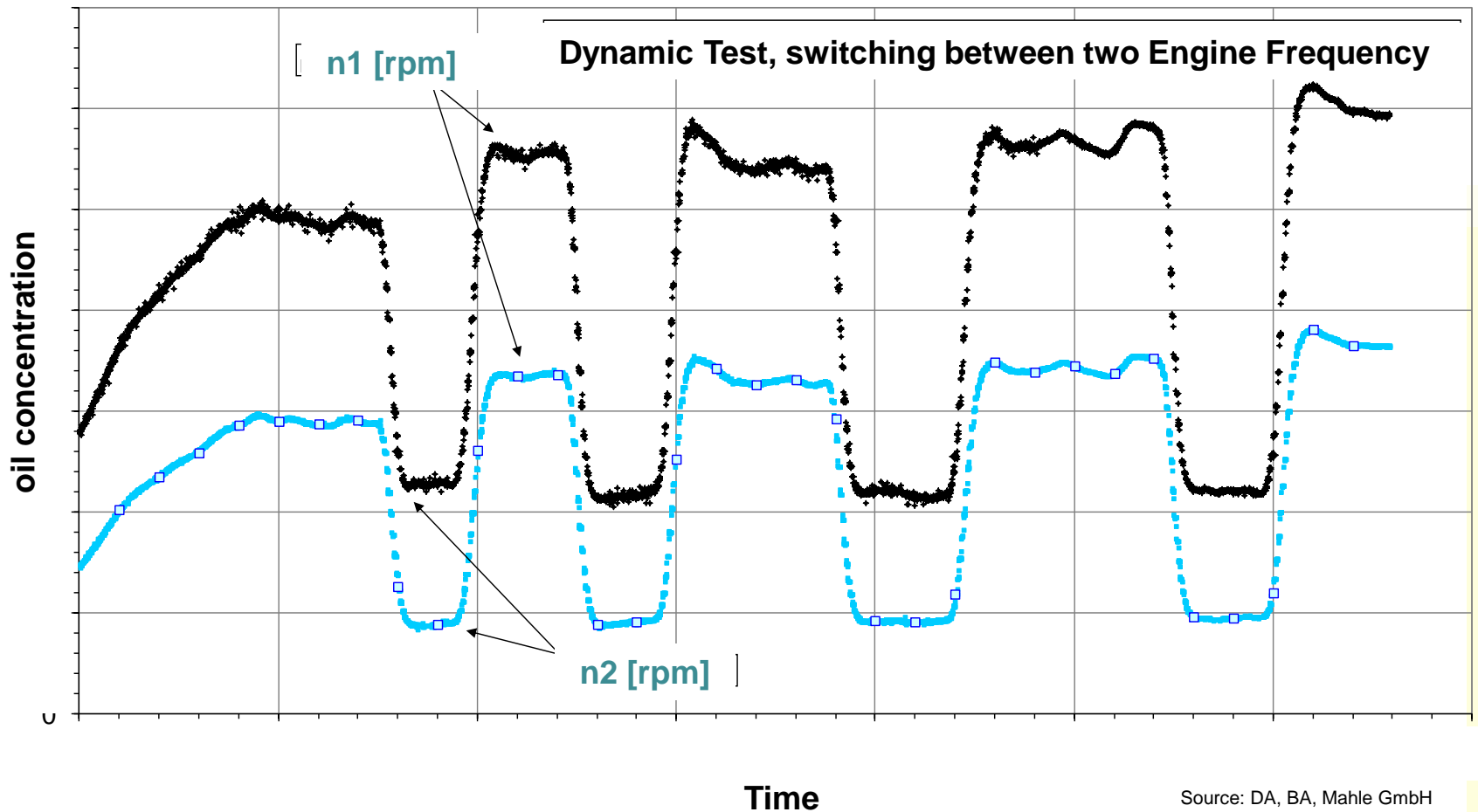


 **PAP 610**

 **Measurement Data (Photometer Signal) – adjustable Nozzle Pre-Pressure (gravimetric)**

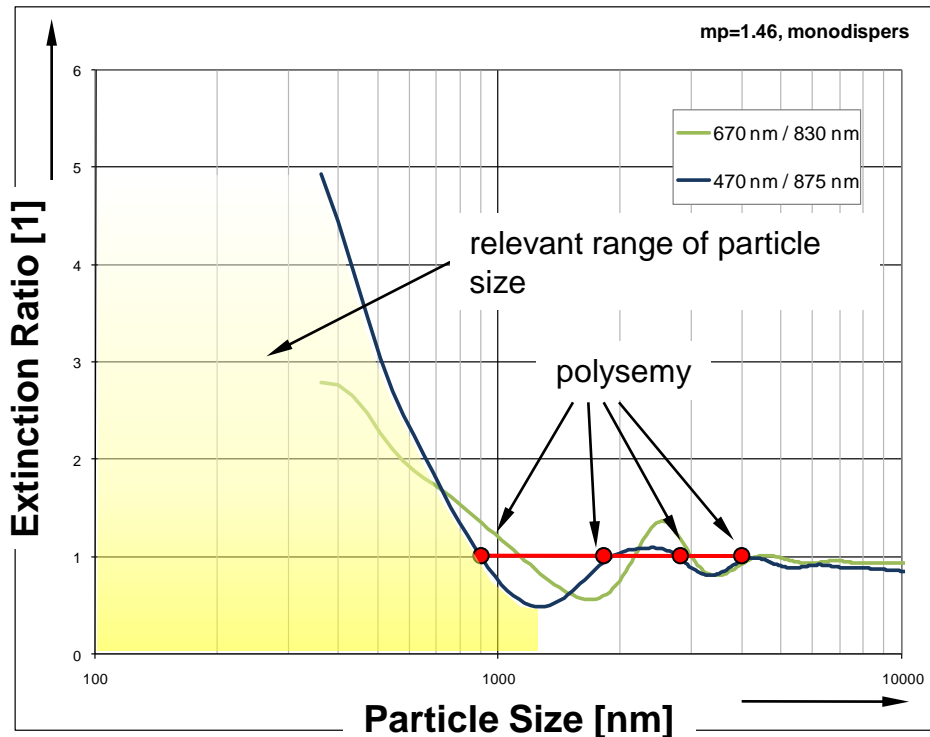


 Engine Measurement

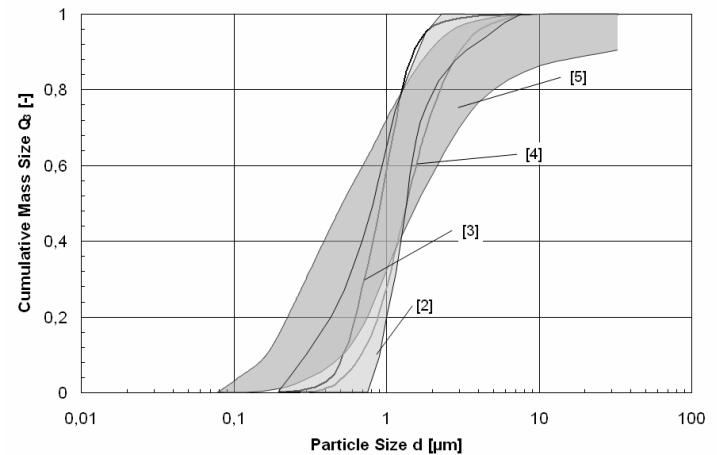


 PAPER 610

 Extinction Ratio of 4 Wave Length for Spherical Oil Particle (calculated)



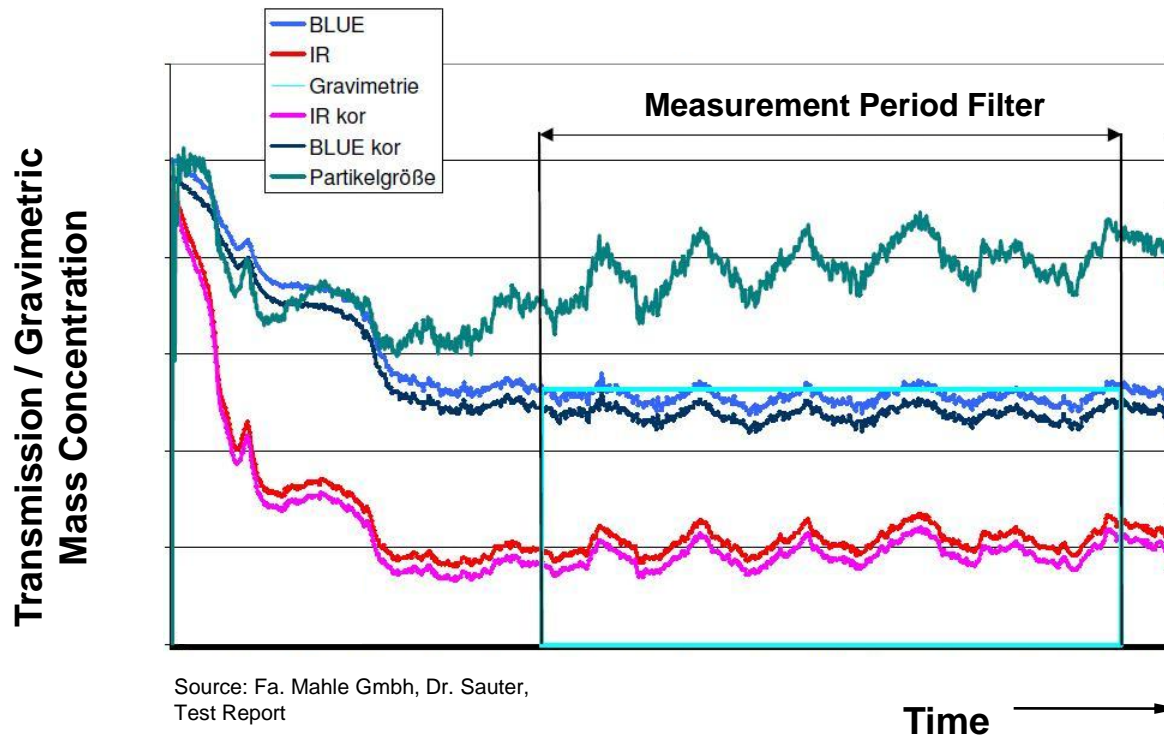
Droplet Size Distributions of Reciprocating Engines



source: Fa. Mahle GmbH, Dr. Sauter,
Aachener Motorenkolloquium

 **PAP 610**

 **Example Filter Measurement on Engine Test Stand**



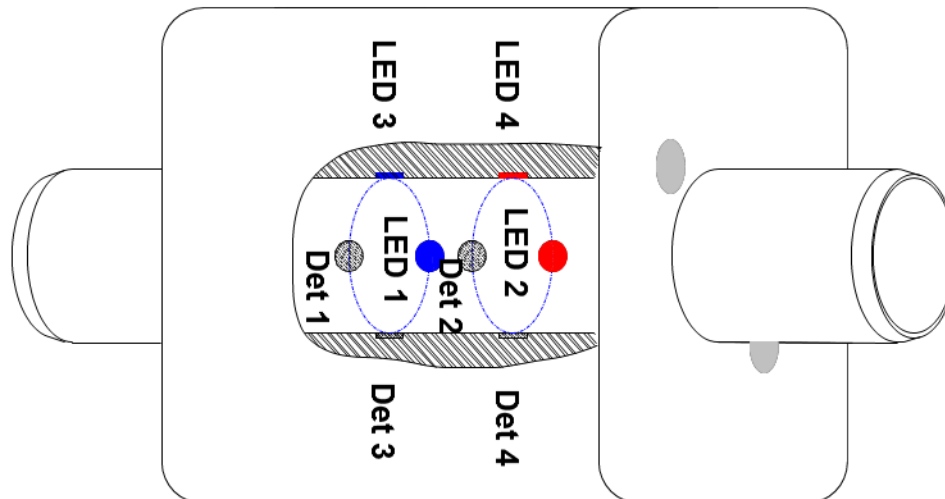
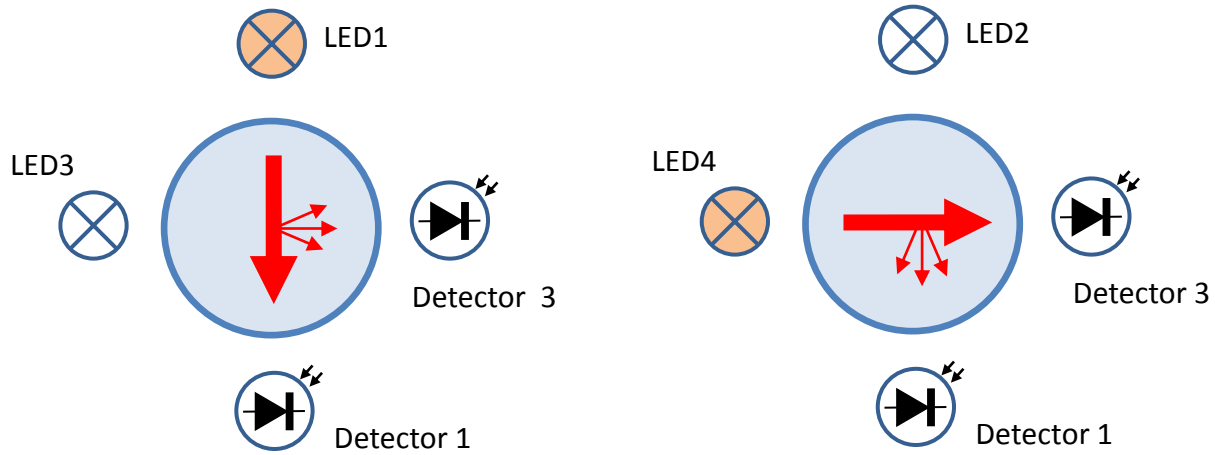
Source: Fa. Mahle GmbH, Dr. Sauter,
Test Report

● PAPER 612 (Process Aerosol Photometer)

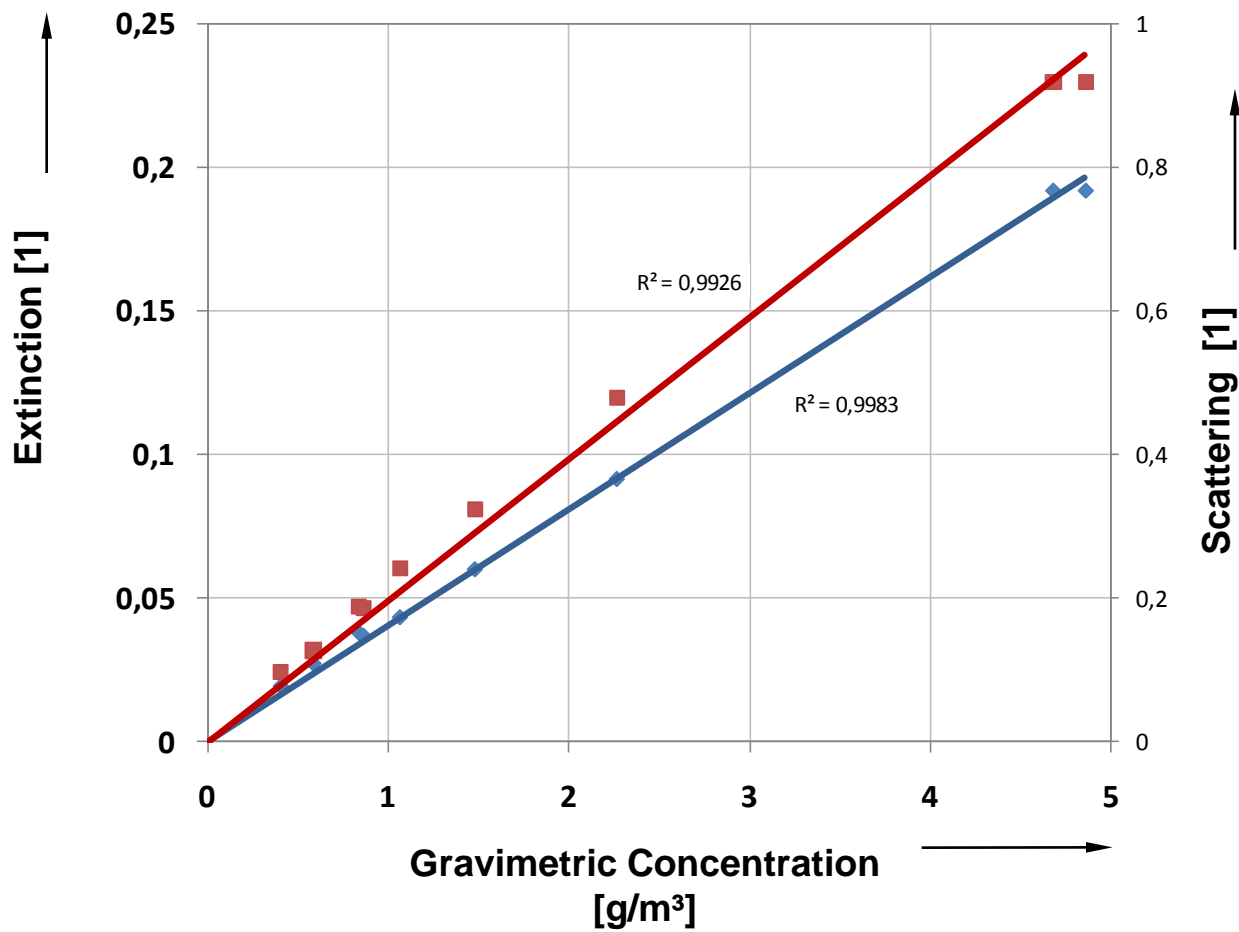


- Scattered Light Arrangement (Measurement Angle 90°)
- Extinction Measurement
- Wall Film Detection
- 2 Wave Length (estimate of Particle Size)
- Compact Dimensions

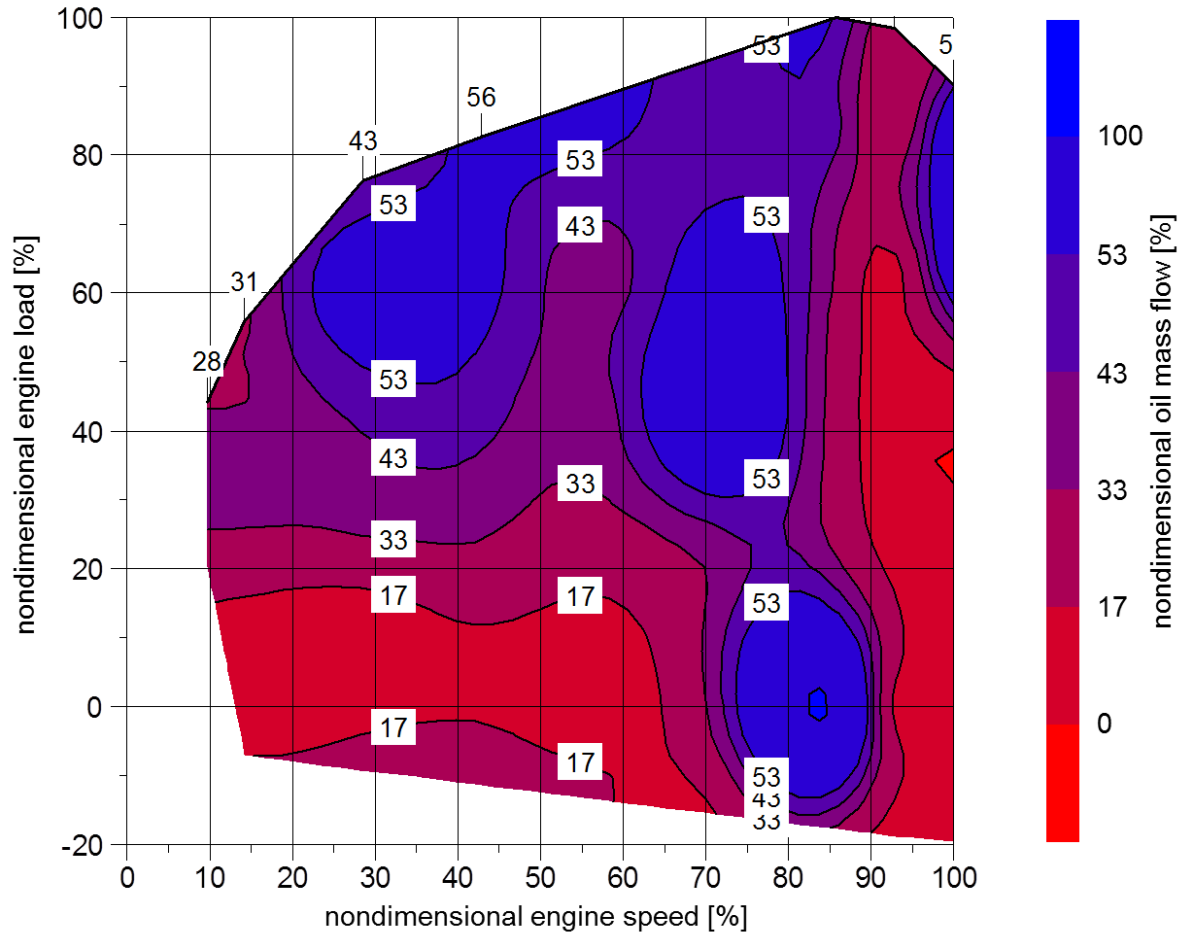
 **Assembly**



 **PAP 612**

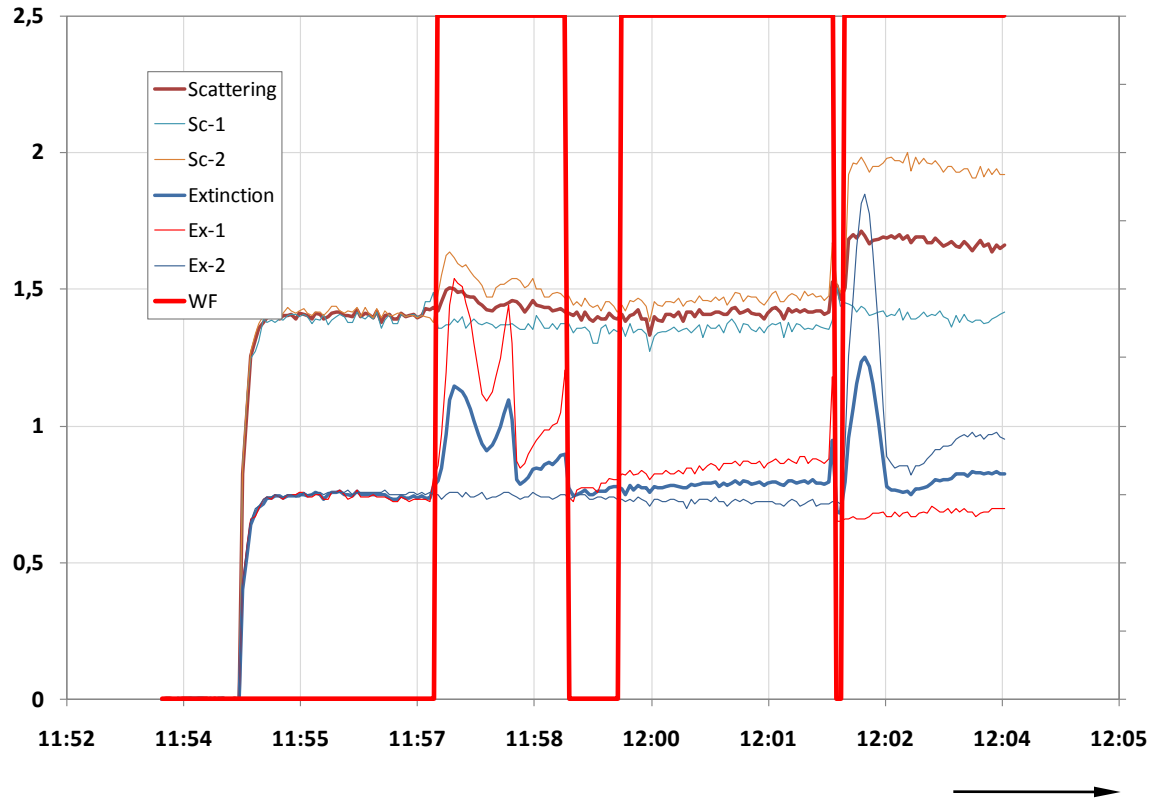
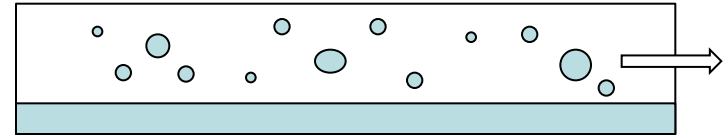


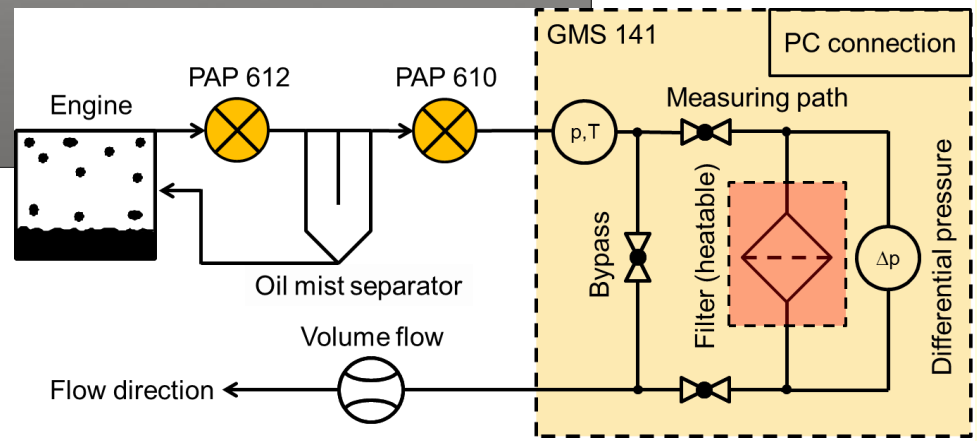
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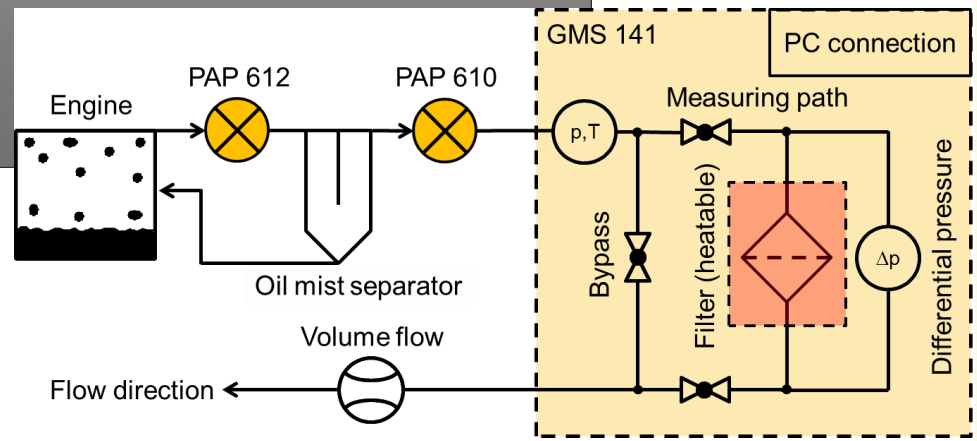




● PAP 612







Thank you for your attention