



Compact °Catalytic Stripper

POWER & INPUT

24 VDC power supply
100-240 VAC 50/60 Hz 50 W

SPECIFICATION

- 0.4 L/min (STP) nominal flow rate
- 370 °C operation temperature
- Oxidation efficiency: 99.9 % for tetracontane
- (PMP)
- Optimized for minimal solid particle loss
- Outlet temperature: Ambient + 25 °C
- Alarm output for remote status monitoring

APPLICATIONS

- Vehicle emissions
- Marine emissions
- Smoke measurements: e-cigarette, tobacco
- Toxicological assessments
- Aircraft turbine measurements
- Black carbon (BC) measurements

FEATURES & BENEFITS

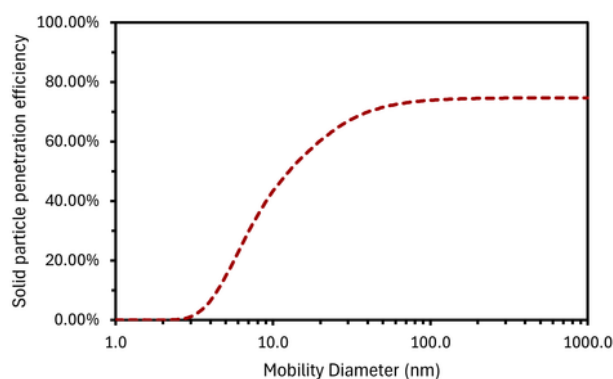
- Robust measurement of solid material without re-nucleation artefacts
- High hydrocarbon oxidation efficiency
- Portable and easy-to-use
- No consumable parts
- Annual (PMP) compliance upon request
- All devices are CE marked and RoHS compliant

The **Compact °Catalytic Stripper** (CCS004) is a heated catalytic element used to remove the semi-volatile fraction of an aerosol. Aerosols from fossil fuel combustion contain solid particles and semi-volatile materials. Their characterization helps assess health impacts, combustion technologies, and emission control devices.

Back view



Typical solid particle penetration curve



Illustration



TO ORDER

CCS

H x W x D (mm)	Weight (kg)	Inlet
138 x 300 x 138	4,5 kg	1/4"





°Catalytic Stripper

POWER & INPUT

100-240 VAC 50/60 Hz 210 W

USB interface - Modbus communication

SPECIFICATION

- 0 - 10 L/min (STP) nominal flow rate
- 350 °C operation temperature
- Oxidation efficiency: 99.99% for Tetracontane (PMP), optimized for minimal solid particle loss at 50 nm and 1 mg/m³ mass.
- Outlet temperature: Ambient + 25 °C

APPLICATIONS

- Vehicle Emissions
- Marine Emissions
- Smoke measurements: E-cigarette, Tobacco
- Toxicological Assessment
- Aircraft turbine measurement
- Black carbon (BC) measurement

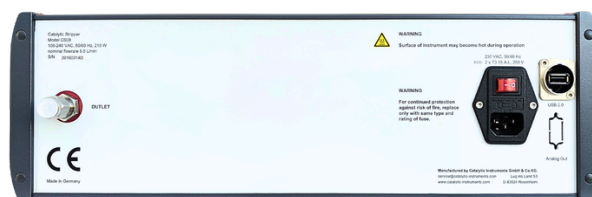
FEATURES & BENEFITS

- Robust measurement of solid material without re-nucleation artefacts, ideal for multiple CPC configurations
- High hydrocarbon oxidation efficiency
- Portable and easy-to-use
- No consumable parts
- Remote data logging via USB
- Annual (PMP) compliance based on requests

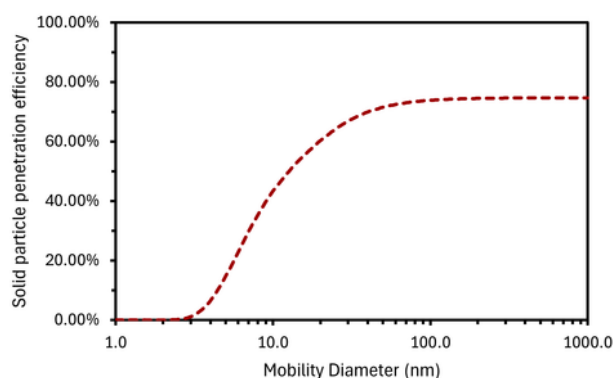
All devices are CE marked and ROHs compliant

The °Catalytic Stripper (CS) is a heated catalytic element used to remove the semi-volatile fraction of an aerosol. Aerosols from fossil fuel combustion contain solid particles and semi-volatile materials. Their characterization helps assess health impacts, combustion technologies, and emission control devices.

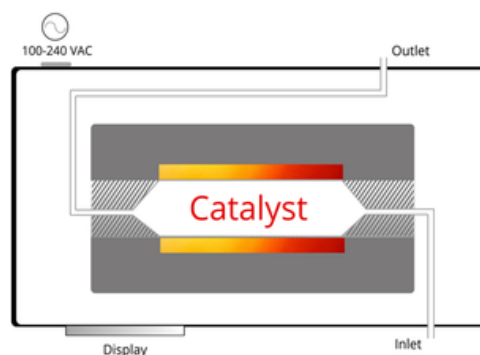
Back view



Typical solid particle penetration curve



Illustration



TO ORDER

CS10 | CS08

H x W x D (mm)

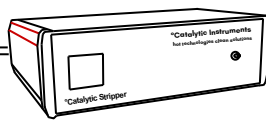
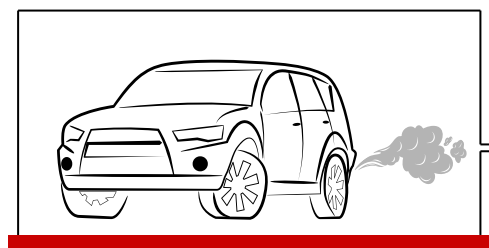
145 x 444 x 245

Weight (kg)

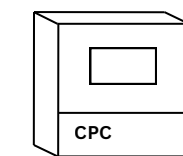
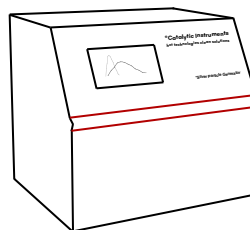
7.6



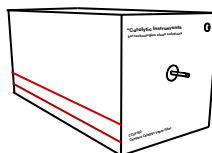
Elevate your Aerosol Measurement Precision with °Catalytic Instruments



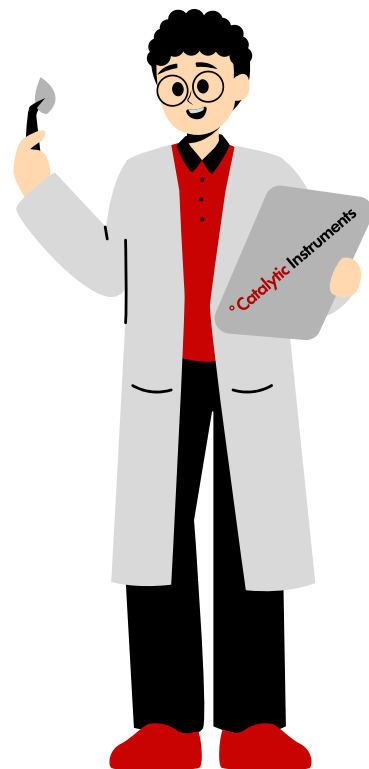
✓ Remove the volatiles



✓ Remove the butanol



✓ Improve your research
✓ Compliance

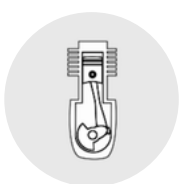


Applications of °Catalytic Stripper

Biomass
Coal
Flame
Combustor



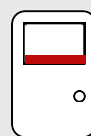
Natural Gas
Diesel
Petrol



High Altitude
Urban
On-road
Background



Particle Detector



Remove **semi-volatile** material
allowing solid particle
measurement



Contact us

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Measurement Precision with us!
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Elevate your aerosol measurement precision with °Catalytic Instruments

Biomass
Coal
Flame
Combustor



Natural Gas
Diesel
Petrol



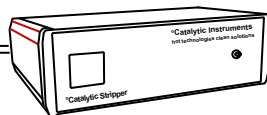
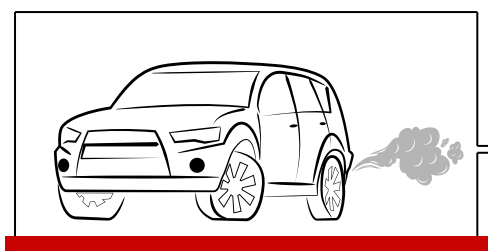
High Altitude
Urban
On-road
Background



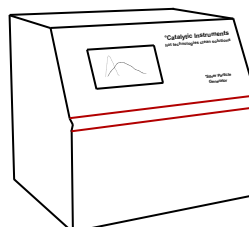
Particle Detector

Remove **semi-volatile** material
allowing solid particle measurement

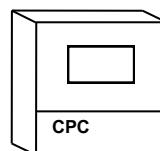
Ensure **compliance** with current
vehicle emission **regulations**



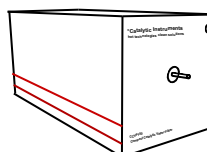
✓ Remove the volatiles



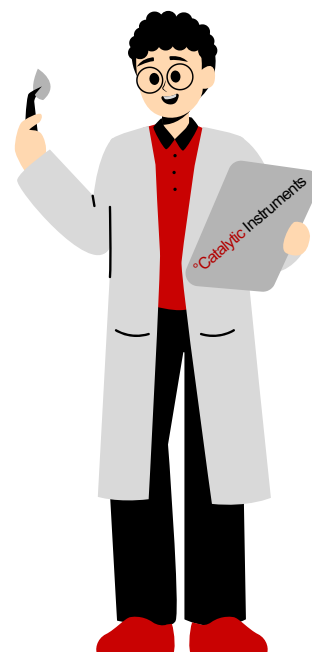
✓ Calibrate the CPC



✓ Remove the butanol



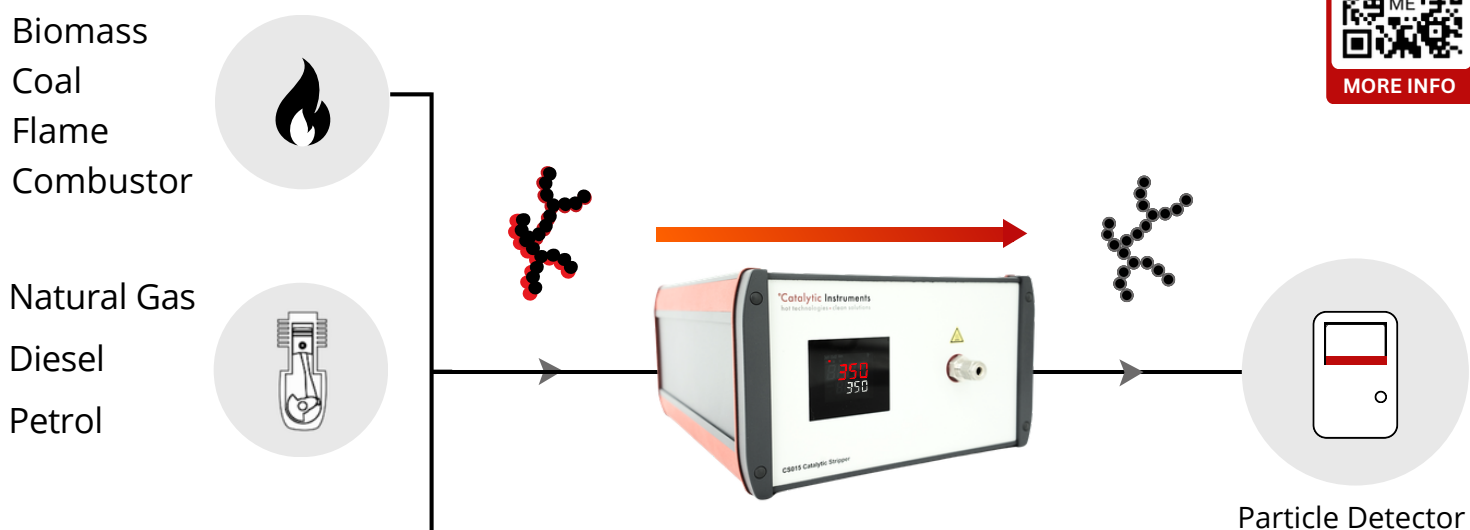
✓ Improve your research
✓ Compliance



Contact us

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°Catalytic Stripper



Remove **semi-volatile material
allowing solid particle
measurement**

The **°Catalytic Stripper** (CS) is a heated catalytic element used to remove the semi-volatile fraction of an aerosol. Aerosols from fossil fuel combustion contain solid particles and semi-volatile materials. Their characterization helps assess health impacts, combustion technologies, and emission control devices.

APPLICATIONS

Vehicle Emissions
Marine Emissions
Toxicological Assessment
Aircraft turbine measurement
Black carbon (BC) measurement
Smoke measurements: E-cigarette, Tobacco

FEATURES & BENEFITS

Robust measurement of solid material without re-nucleation artefacts, ideal for multiple CPC configurations
High hydrocarbon oxidation efficiency
Portable and easy-to-use
No consumable parts
Remote data logging via USB
Annual (PMP) compliance based on requests

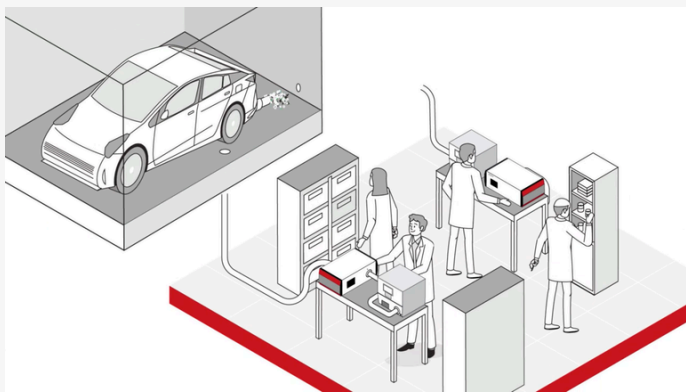
Introduction

The °Catalytic Stripper (CS) operates on a principle similar to that of an evaporation tube or thermal denuder, which are commonly used in aerosol measurement. Both devices involve heating an aerosol inlet to a specific temperature to separate volatile materials by converting them to the vapor phase. However, the key difference with the CS is its catalytically active design. Unlike an evaporation tube, which merely allows volatile materials to condense on inner surfaces or re-condense into aerosol form, the CS uses a heated catalyst to chemically convert hydrocarbons and other non-solid materials into non-reactive gaseous species. This ensures that the aerosol exiting the CS consists solely of the solid fraction of the original sample.

All of these measurements and more with our **PMP compliant* **CS** technology!**

Applications

Vehicle Emissions



In the automotive industry, the CS is employed to measure non-volatile particle emissions from internal combustion engines. It is vital for meeting stringent regulations, such as those in Europe, which

require measurements of particles smaller than 23 nm and, in the future, below 10 nm. The precision of the CS supports the development of cleaner vehicle technologies. The precision of the CS supports the development of cleaner vehicle technologies.

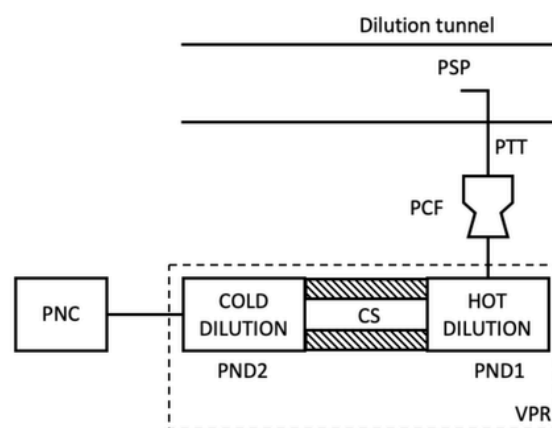


Figure 4: Schematic of the dilution tunnel measurement system in the updated PMP protocol

Acronym	Definition	Acronym	Definition
PSP	Particle Sampling Probe	VPR	Volatile Particle Remover
PTT	Particle Transfer Tube	PNC	Particle Number Counter
PCF	Particle pre-classifier	CS	Catalytic Stripper
PND	Particle Number Diluter	PND2	Particle Number Diluter 2

The CS is often integrated with systems like the TSI Engine Exhaust Particle Measurement system (EEPS) and Cambustion Differential Mobility Spectrometer (DMS500), offering detailed analysis of emissions. By surpassing the limitations of traditional thermal denuders, it ensures more reliable measurements, aiding the industry in designing more efficient and less polluting engines.

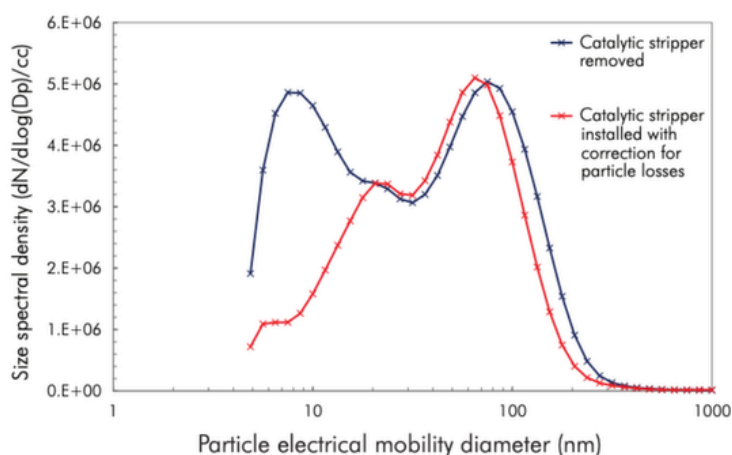


Figure 6: DMS500 with optional CS accessory showing the volatile fraction below 20nm, from GDI particles sampled upstream of turbocharger during WLTC

Ambient Air Measurement

The CS is utilized to study black carbon (BC) particles, which are by-products of incomplete combustion from fossil fuels and biomass. These particles play a critical role in air quality degradation, global climate change, and health impacts. By separating volatile and non-volatile aerosol fractions, the CS enables accurate real-time analysis of aerosol mixing states and properties such as the Mass Absorption Coefficient (MAC).

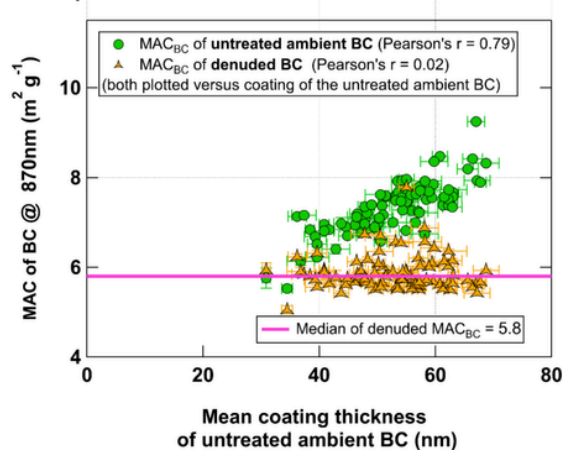
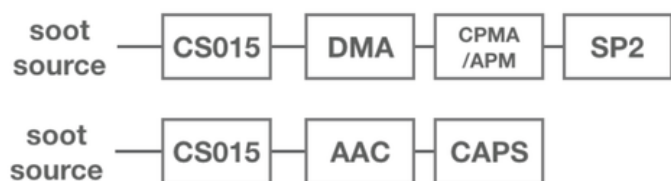


Figure 1: MAC_{BC} of ambient and CS "denuded" samples against the mean coating thickness of ambient rBC

Additionally, the CS significantly enhances the calibration of instruments like the SP2 and CAPS by providing a stream of pure solid aerosol, minimizing uncertainties and allowing for detailed investigations into aerosol optical and hygroscopic properties, essential for understanding their climate and health effects.

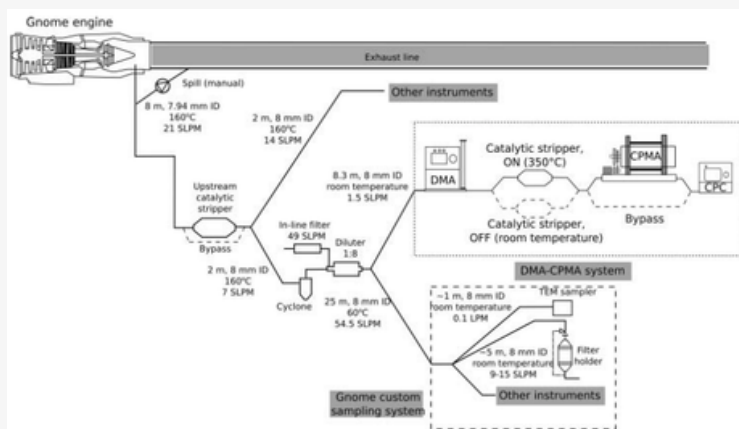


Operating the CS in front of a Centrifugal Particle Mass Analyser (Cambustion; CPMA) or Aerosol Particle Mass Analyser (Kanomax; APM) will ensure that mass selection is of only the solid fraction.

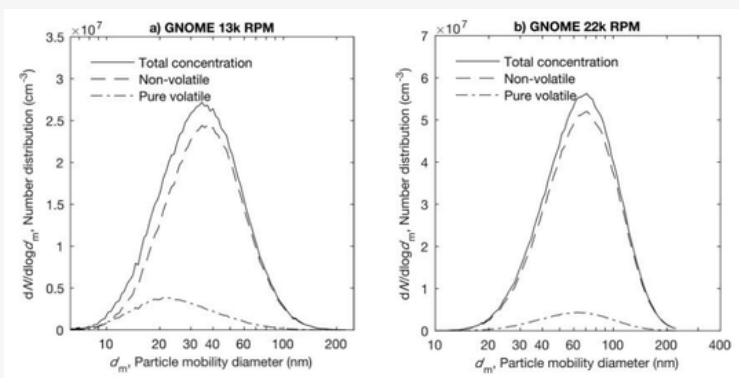
Thus, alternate scans between CS and non-CS will result in a derivation of the particle coating/mixing state.

Aircraft Emissions

Aircraft particulate emissions, particularly during landing and takeoff cycles, are regulated by the International Civil Aviation Organization (ICAO). The CS removes volatile fractions, allowing for precise measurement of black carbon and other solid particles emitted by aircraft engines. These insights help correlate parameters like effective density and particle size to regulatory standards.

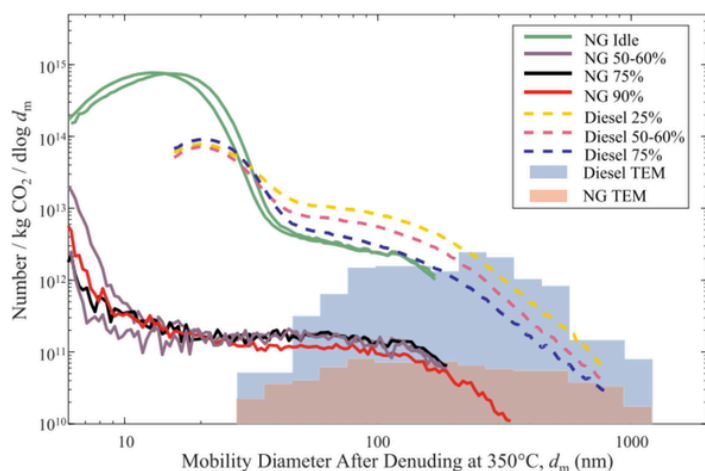


Studies using the CS have advanced the understanding of emissions from helicopter gas turbines and commercial aircraft, aiding the development of cleaner propulsion technologies. It also ensures compliance with ICAO limits while supporting research in aviation sustainability.

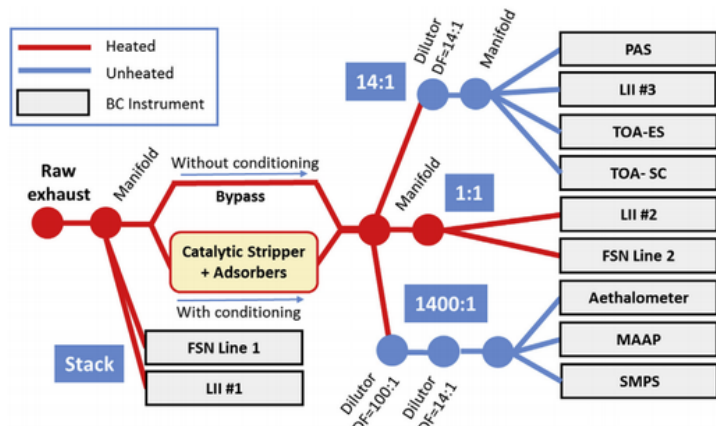


Marine Emissions

The maritime sector is a significant source of greenhouse gas emissions. The CS is used to analyze non-volatile particulate emissions from marine engines, including those running on liquefied natural gas (LNG) and heavy fuel oils. This precise measurement is crucial for meeting International Maritime Organization (IMO) standards.



Recent studies demonstrated that the CS effectively characterizes black carbon emissions from marine engines, regardless of load or fuel type. These findings support the development of alternative fuels and technologies, promoting cleaner and more sustainable maritime operations as Jiang et al. (2018) performed used with a small marine engine:



A key finding of this research was that the relative BC measured values were mostly independent of load and fuel.

Filtration Efficiency Measurement

Filtration efficiency studies benefit from the CS by ensuring a stream of solid aerosol, eliminating variability caused by volatile fractions or environmental conditions. This precision supports the evaluation and improvement of filter designs, such as diesel particulate filters or respiratory protection devices.

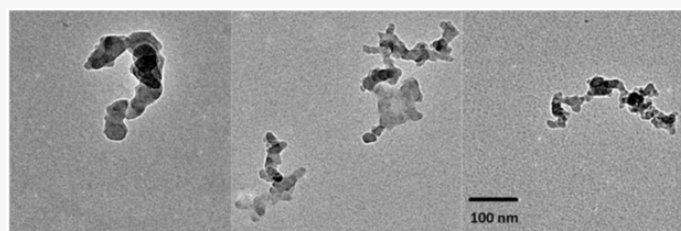


Figure 12: miniCAST soot particles, taken from Mamakos et al., 2013

With increased focus on filtration following the COVID-19 pandemic, the CS has become essential for developing effective protective equipment and improving industrial filtration technologies.

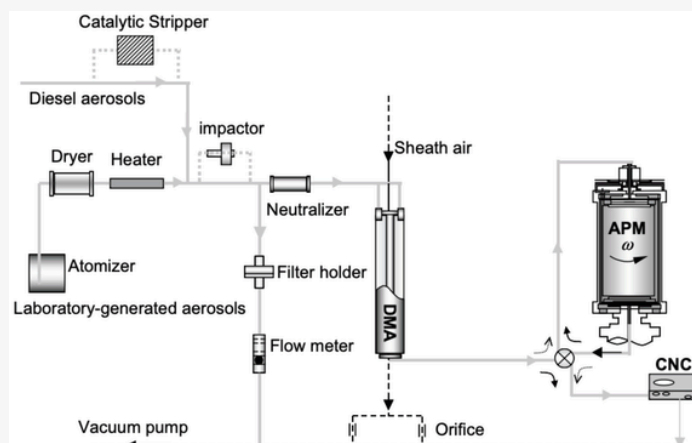


Figure 13: Taken from K. Park et al., 2003

Improving Calibration

The CS is crucial for calibrating aerosol measurement instruments, such as SP2, CAPS, and MAAP. By removing volatile organic compounds, the CS ensures a pure black carbon source, reducing uncertainties and enhancing the accuracy of calibration. This capability is particularly important for research requiring high precision. The CS

provides a consistent standard for calibrations, enabling researchers to obtain more reliable data when analyzing aerosols in various settings.

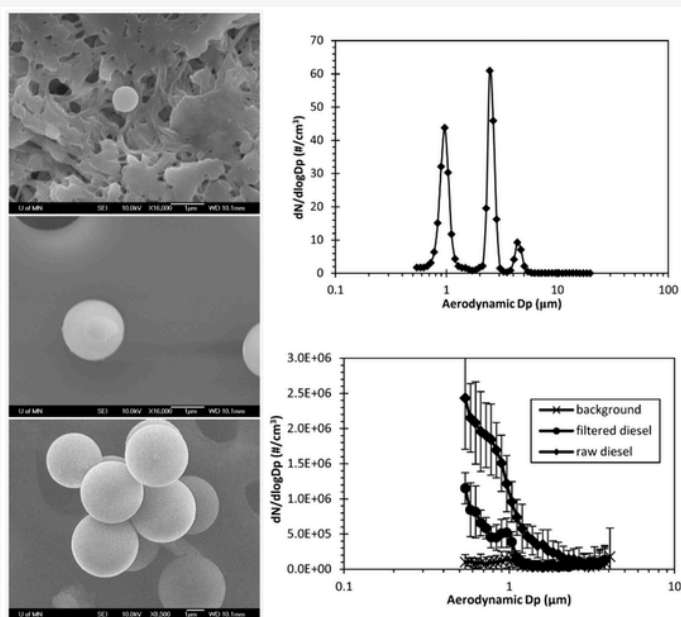
Tobacco, E-Cigarette (Smoke Measurement)

The CS is employed to characterize particles in smoke generated by tobacco, e-cigarettes, and marijuana. It measures particle volatility, density, and concentration in each puff, aiding in the comparison of emissions across products.

These studies are vital for understanding health impacts, regulatory compliance, and product improvement. The CS enables researchers to identify harmful components and explore ways to mitigate them.

Measuring Solid Particles in Liquids

In combination with nebulizers, the CS facilitates the measurement of solid particles in liquids, such as contaminants in diesel fuel. By eliminating volatile droplets, it ensures precise analysis of particle size distributions and contaminant levels.



This application is valuable for assessing fuel quality, studying black carbon in environmental samples (like ice cores

or rainwater), and investigating combustion-related contamination. The CS's ability to isolate solid fractions makes it indispensable for liquid particle analysis.

Operation principle

Illustration

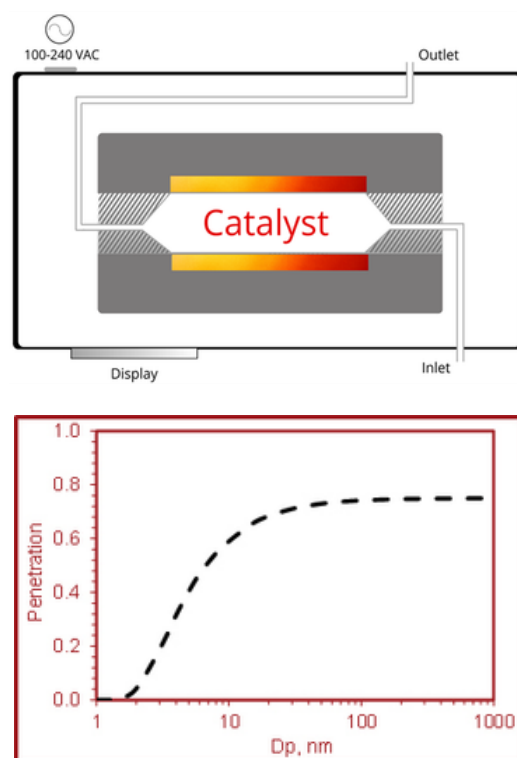


Figure 5: Typical Solid particle penetration curve

Specifications

CS Model	CS015	CS02	CS03	CS08	CS10
Inlet flowrate	1.5 L/min	2L/min	3L/min	8L/min	10L/min
Net Weight (Kg)	7	7	8.5	8.5	8.5
Dimensions (DxWxH) cm	31x24x14	31x24x14	44x25x15	44x25x15	44x25x15
Oxidation efficiency	> 99% of Propane (g)				
Solid particle loss	< 40% at 100 nm				
Operation gas temperature	350°C				
Outlet gas temperature	Ambient + 25°C				
Sampling pressure	Atmospheric pressure				
Power	100V-240V AC, 50/60 Hz, 210 W max, 40 W nominal				

References

space for references

Catalytic Instruments®
hot technologies · clean solutions

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