ECN

Energy research Centre of the Netherlands

Wet Sampling Analyzers

What's going on?

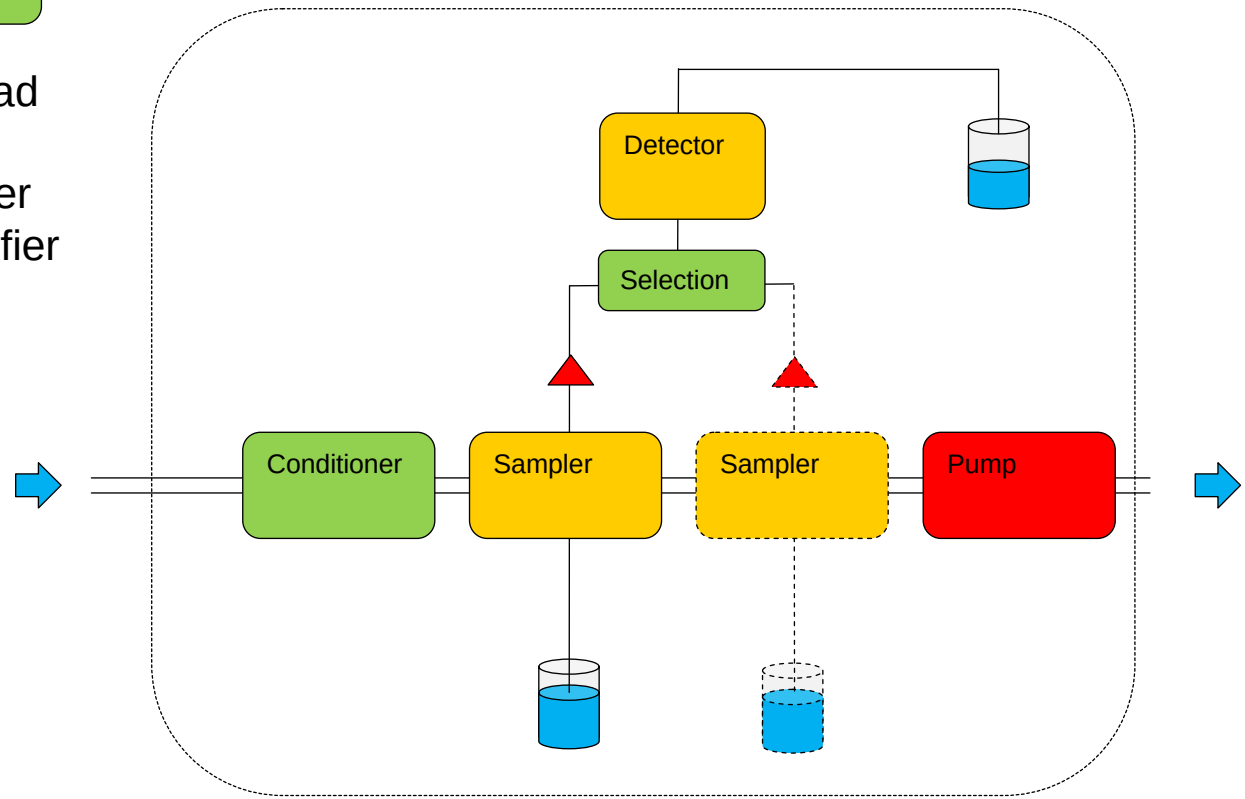
Wetted Systems

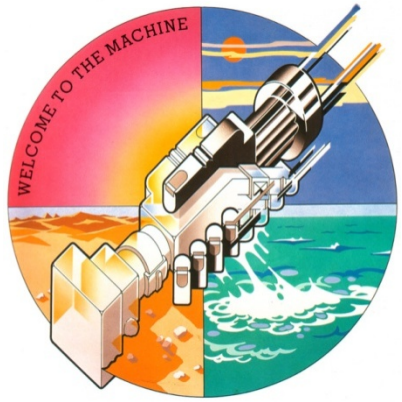
- Introduction
- Overview
- Examples
- Potency
- Calibration Issues

General set up

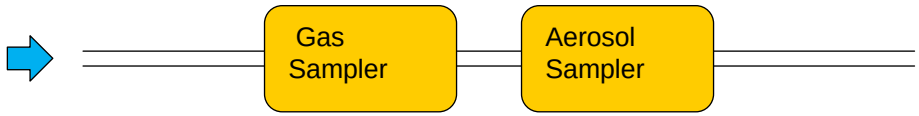
Conditioner

-PM head
-Filter
-Denuder
-Humidifier





Samplers



Gas Aerosol Separation based on difference in diffusion coefficient (m^2/sec vs mm^2/sec)

Gas samplers use wetted walls (high diffusion velocity – all gas molecules hit the wall and the water soluble gases dissolve, particles remain uneffected)
-Annular Rotating Denuder
-Paralel Plate Denuder
-Membrane Sampler
-Glas Spiral

Aerosol samplers use flushed impaction surfaces
Submicron particles are too small,usually particles are prior to impaction grown by condensation (steam injection or cooling)

- PILS, SJAC, SEAS (Steam Injection)
- VACES (cooling)

Overview

Company	Instrument	Gas	PM
Quma	Lopap	HONO, HNO_3	
Aero-Laser	AL	HCHO, H_2O_2	
Mechatronics	AiRRmonia	NH_3	
URG	AIM	HCl, HNO_3, NH_3, SO_2	Cl, NO_3, SO_4, Na, NH_4, K, Mg, Ca
Applikon	MARGA	HCl, HNO_3, NH_3, SO_2	Cl, NO_3, SO_4, Na, NH_4, K, Mg, Ca
Metrohm / BMI	Pils		Sampler
OEI	SEAS		Sampler
-	VACES		Sampler

MARGA – Monitor for AeRosols and GAses

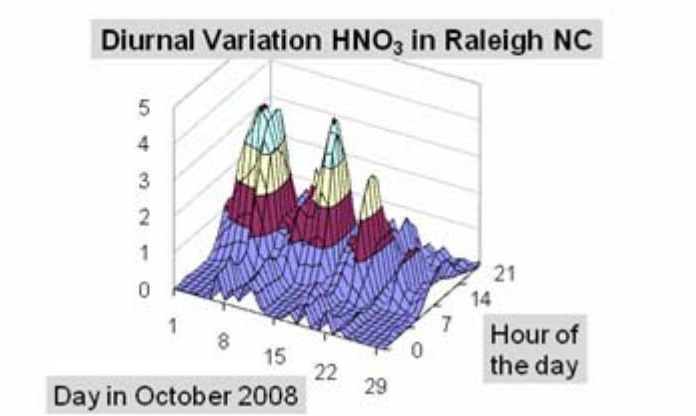
applikon® ANALYTICAL

Metrohm Ion analysis

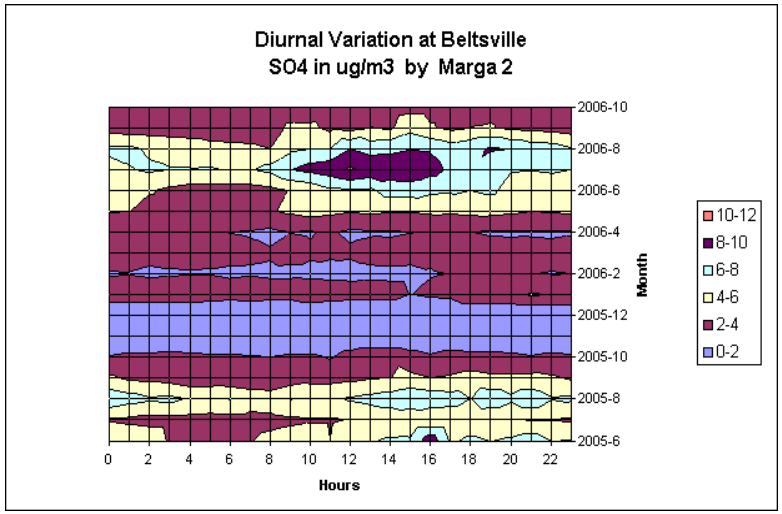
City of Seoul

Results

Diurnal trend over a month



Seasonal trend throughout the year



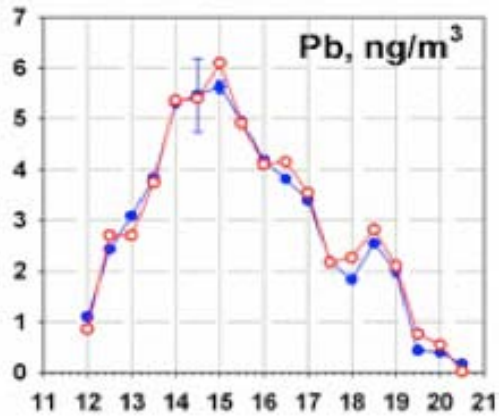
Interesting poster by Gerald Spindler in the hall

SEAS

S E A S
Semicontinuous Elements in Aerosol Sampler
ONDOV ENTERPRISES, INC.

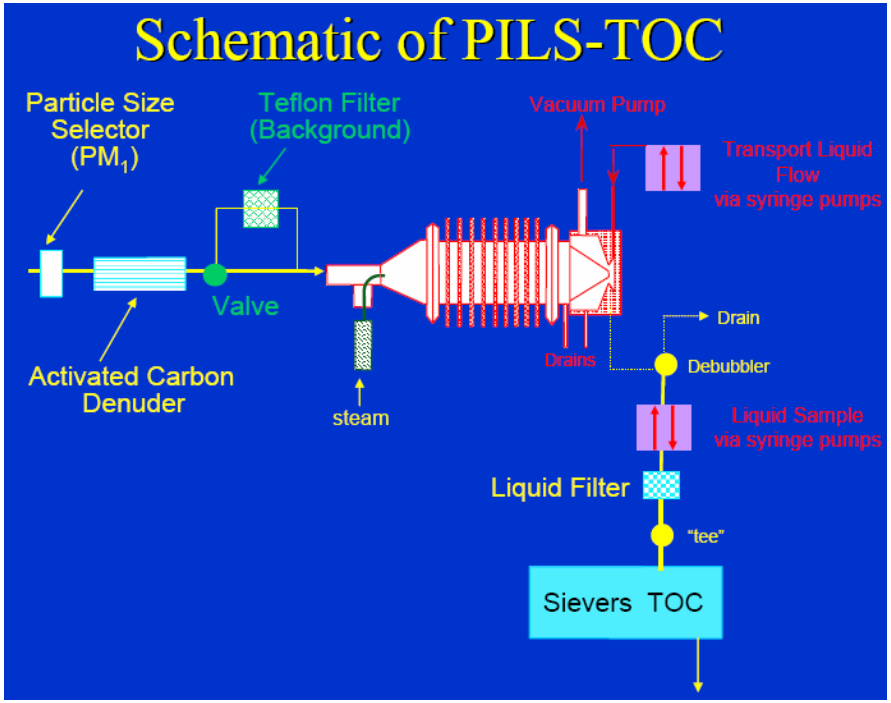
Ondov offers Semicontinuous Elements in Aerosol Sampler (SEAS) and related products for sale or for lease.

The company offers a full service for Source Apportionment assessment studies and chemical mass balance.



PILS

Particle Into Liquid Sampler

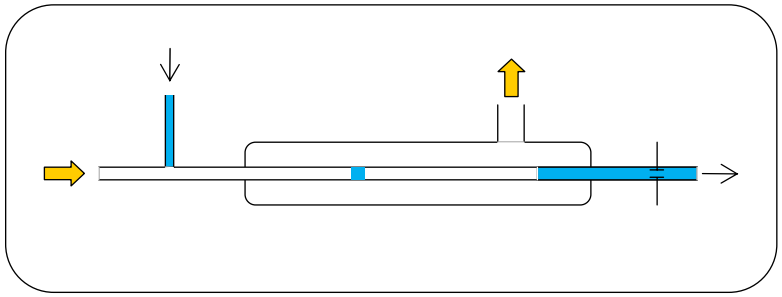


User Application with TOC analyzer

bmi

Other components

In development at ECN



Membrane sampler with electrochemical detection

Measurement of by PM induced peroxide as a proxy for anti oxidant depletion

Potency

- Air Quality in urban area's is mainly about the impact on human health (unlike remote background locations)
- Transfer mainly takes place through the wetted lung tissue. Gases by absorption and aerosols by impaction

The analogy with the wet sampling techniques is remarkable. The sampling principle is comparable. Using a lung surfactant liquid as absorption solution may reveal new highly relevant monitoring applications if it comes to the relationship with health.

Calibration

Not regulated trace gases

Ambient Air Quality monitors (like the wetted) are usually poorly calibrated on accuracy in measuring range.

Due to the low atmospheric concentrations, calibration by certified gas bottles require a multi step dilution system with increasing risk on contamination and wall losses. Most trace gases are however not available from bottles. NPL is doing a good job on the organics.

Permeation devices usually produce gases in lower concentration ranges, but require frequent weighing and suffer from the same risks.

Calibration

Aerosol components are even harder to calibrate the instrument with, if not impossible. Mainly caused by the divers PM matrix, size distribution issues and the poor reproducibility of existing aerosol generators.

Even if it becomes possible, we face another problem: Artifacts caused by retention or evaporation from filters are dealt with by convention. Meaning, what ends up on the filter is parameter to be presented. Artifacts are by definition to be neglected. *(EU Standard 14907)*

This also makes it extremely difficult to calibrate. The artifact needs to be reproduced by the monitors.

Calibration

- Wet sampling instruments normally use well traceable standard solutions for calibration
- The sampling systems for gases and aerosols are dealt with by efficiency measurements (slip).

Conclusions

- Not many wetted sampler instruments on the market
- Very usefull for assessment studies (diurnal variation, source apportionment)
- Potency for health related proxies
- Calibration problems for trace gases and PM components in general

The AirMonTech project may consider issuing guidelines for development of future on-site calibration methodologies

Thank you