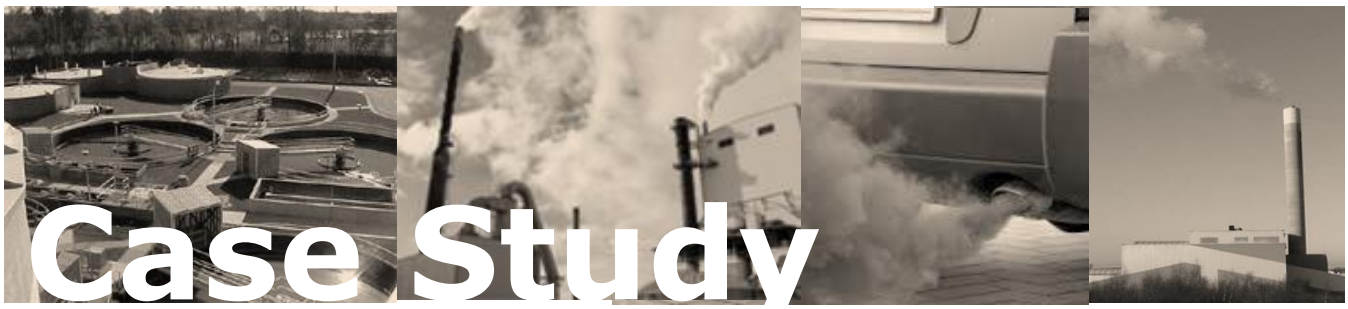



Emissions & CEM Applications

# $H_2S$ and $CS_2$ analysis at ppb & ppm levels from Emission Paper Mill Application

## Context & Challenges

Paper mills use large quantities of sulfur substances in particular in the process of cellulose burning (Kraft cooking). **$CS_2$** and **$H_2S$** emissions are a real problem for the environment (toxicity, odors…).

Nowadays, emissions are subject to regulations (**Directive n° 2001/81/EC** of European Parliament and Council October 23, 2001) and factories must respect these rules by installing filter or washing systems. To validate the operation of these processes, factories must continuously control their efficiency with adequate analytical methods.

Recently a paper mill asked **Chromatotec** to measure the emission of sulfur compounds and to validate their bio filter washing systems. Chromatotec proposes one chromaS ppm and one chromaS ppb.

**Challenge: before and after filters**

- Continuous monitoring of $H_2S$ and $CS_2$ at ppb or ppm level.
- 2 x Concentration range: 1 to 1000mg/$m^3$ (1 to about 300 ppm and 0 / 100 ppb).
- One analyzer upstream ppm and one downstream the system (ppb).
- **Sample containing 90% of water vapor.**

## Chromatotec® Solutions


### 2 x chroma S analyzers:

- **chromaS** analyzer ppm or ppb
- **Supervisor**
- **HYDROXYCHROM** (zero air and UHP hydrogen generator)
- **NITROXYCHROM** (UHP nitrogen generator)
- **airmoPUMP**: sampling pump

It is a complete and automated system able to **monitor in continuous** the sulfur compounds **($H_2S$, $CS_2$, COS, $SO_2$, Et-SH…)** at **ppb or ppm** levels depending on configuration. The instruments can be equipped with an internal calibration (**CALIB**) system.

The complete and intuitive software **VISTACHROM** enables to control the analyzers and to follow all the steps of the analysis.

The data are timed, dated and stored under **ASCII and Peak Viewer format**. The software **Peak Viewer** enables to visualize chromatograms and to restate them.

Data can be sent to a data logger thanks to a communication protocol such as **MODBUS, JBUS or BAYERN HESSEN PROTOCOL**.

**With all these qualities, chromaS is the best solution for the analysis of sulfur compounds in situ.**

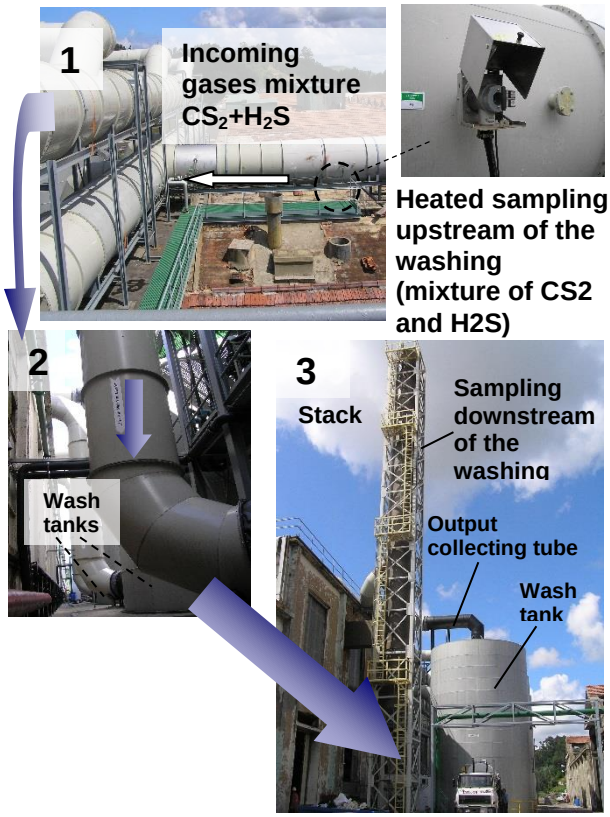
## Technical information and results

**On site set up:**

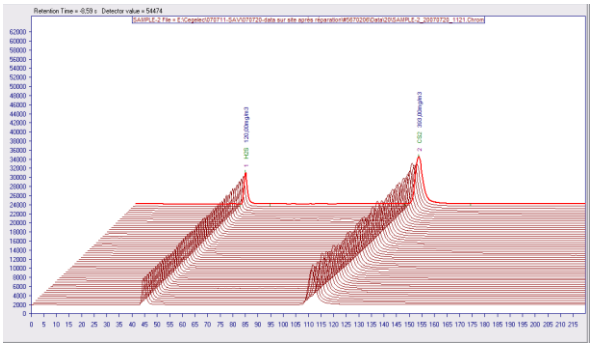
**1) Upstream sampling**: emission gases during the burning process ($H_2S$ and $CS_2$) are collected and brought to the wash tank.

2) The collected gas mixture is brought to the base of the wash tank (see §3). Some water is vaporized to make gases precipitate into a solution at the bottom of the bath holder where sulfur bacteria are cultivated. Sulfur bacteria will digest sulfur substances and reject $SO_4^{2-}$ in solution.

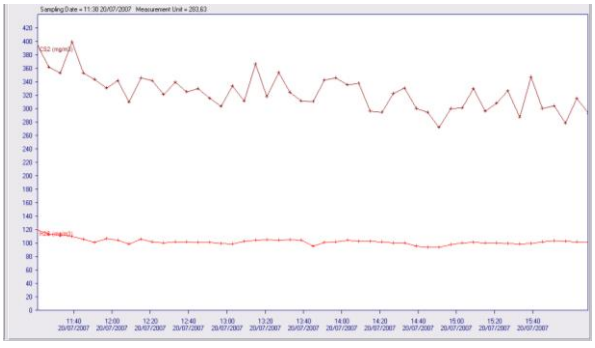
**3) Sampling downstream**: washed gases are taken from the top of the bath, and then injected by ventilators in a stack. The probe of the second analyzer is on top of the stack. This system is designed to reduce $H_2S$ by 90% and $CS_2$ emissions in the atmosphere.




**Upstream sampling**



3D view of chromatograms obtained on the sampling upstream of the washing system (function 3D of software of data processing Peak



Follow-up of concentration of CS2 and H2S during 5 hours (Function Trend/Results of software Peak Viewer.

## Conclusion:

The chromaS has several advantages:

- Fully automated
- Data transfer to a data logger and remote control
- Stability and repeatability (areas and retention times)
- Analysis of sulfur compounds: $H_2S$ and $CS_2$, but also COS, $SO_2$, Mercaptans, Sulfides …
- Used for filter calculation efficiency
- ppm analysis for upstream sampling (using a dilution sampling system)
- ppb analysis for downstream sampling (no dilution)

Thanks to those features, the chromaS is the adequate solution to measure sulfur compounds for emission application.