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# CASE STUDY : chroma S

# SULFUR COMPOUNDS ANALYSIS (H2S and $CS_2$, 0/300ppm) FOR EMISSION APPLICATION IN A PAPER MILL

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 submitted 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 process, factories must control continuously their efficiency with adequate analytical methods. Recently a paper mill asked **CHROMATOTEC** to measure the emission of sulphur compounds and to validate their bio filter washing systems.

**Challenge:**

- Continuous monitoring of: $H_2S$, $SO_2$ and $CS_2$
- Concentration range: 1 to 1000mg/$m^3$ (1 to about 300 ppm)
- one analyser upstream and one downstream the system
- Sample containing 90% of water vapour.

# Solution:

## chroma S analyser

- **chromaS** analyser
- **Supervisor**
- **HYDROXYCHROM** (zero air and UHP hydrogen generator)
- **NITROXYCHROM** (UHP nitrogen generator)
- **airmoPUMP** : sampling pump


***Chroma S analyser***

It is a complete and automated system able to **monitor continuous** sulfur compounds **($H_2S$, $CS_2$, COS, $SO_2$, Et-SH…)** from **1 ppb to 300 ppm** depending on configuration.

The instruments can be equipped with an internal calibration (**airmoCAL**).

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

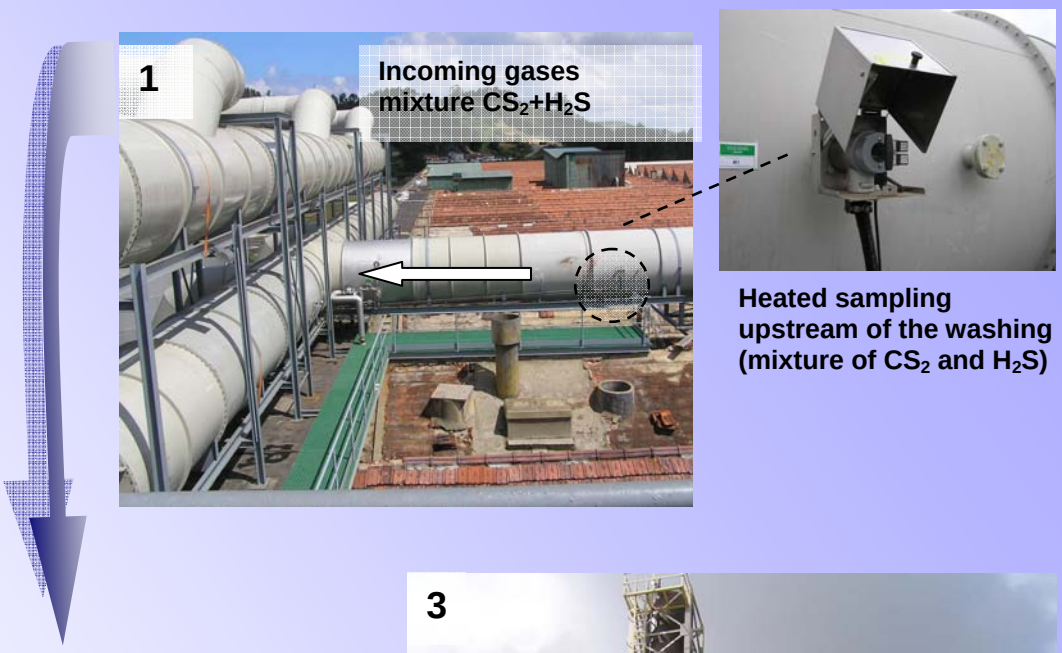
The data are timed, dated and stored under **ASCII and Peak Viewer format**. The software **Peak Viewer** enables to visualize chromatograms and to restate them.

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 analysis of sulfurs in situ.**

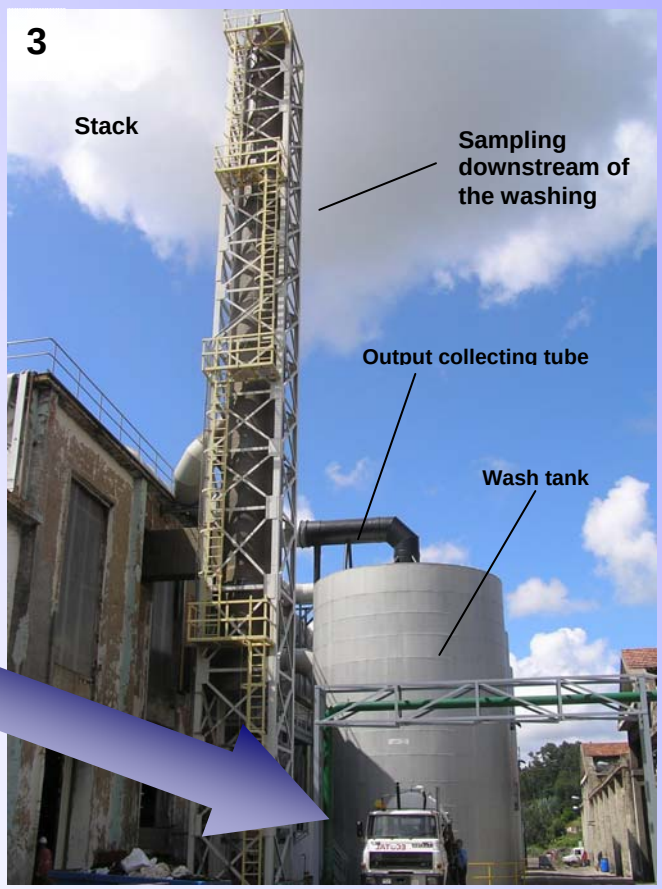
# On site set up :

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



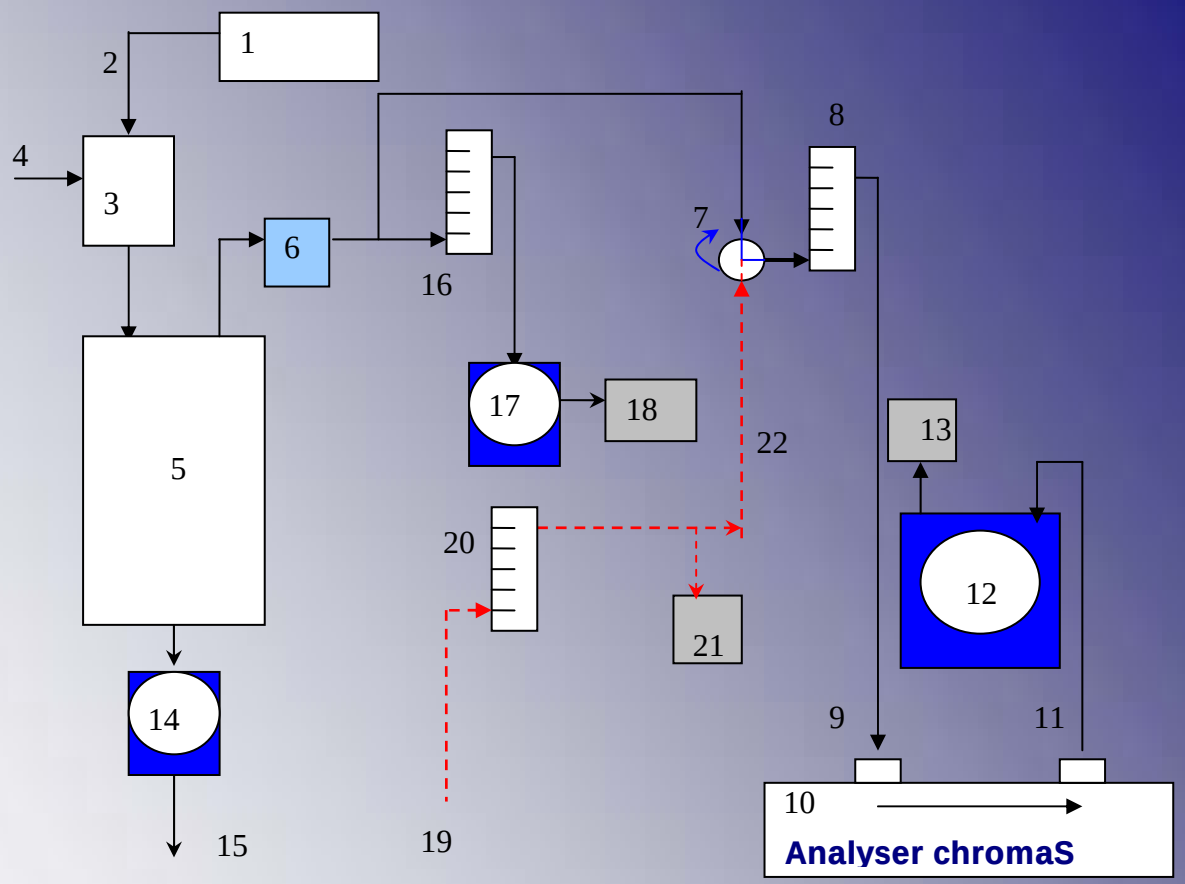


2) The collected gas mixture is brought to the base of the wash tank (see §3). Some water is vaporized to make gases precipitate into a solution at the bottom of the bath holder where sulfur bacteria are cultivated. Sulfur bacteria will digest sulfur substances and reject $SO_4^{2-}$ in solution.



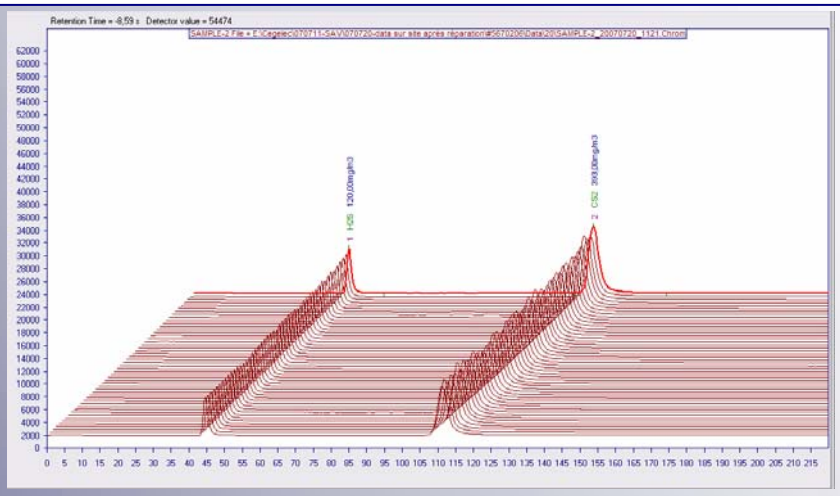

**3) Sampling downstream**: washed gases are taken from the top of the bath, and then injected by ventilators in a stack. The probe of the second analyser is on top of the stack. This system is designed to reduce by 90 % $H_2S$ and $CS_2$ emissions in the atmosphere.

# Diagram of the sampling line:



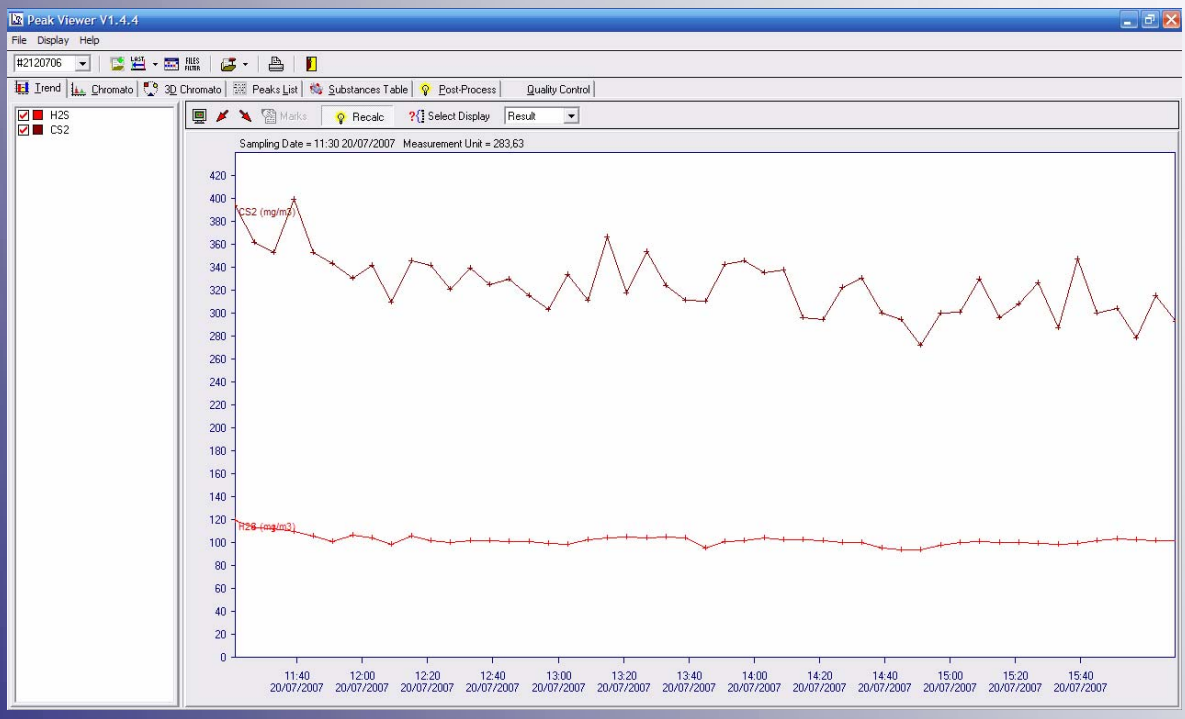

1) Sampling probe
2) Heated sampling line (180°C)
3) Heated dilutor
4) Dry air input
5) Condensation vessel
6) Dessicator and particle filters
7) Commutation valves 2 streams (sample / calibration)
8) Rota meter (sample flow analyzed)
9) Sample input of the analyzer
10) Analyser chromaS
11) Analyzer Output Vacuum
12) Sampling pump (80 ml / min)
13) Event and active coal-based filter for release
14) Peristaltic pumps (inhalation of the condensate)
15) Event and active coal-based filter for release
16) Rota meter (sampling flow)
17) Sampling pump (en L/min)
18) Event and active coal-based filter for release
19) Calibration systems (standard gas bottles)
20) Rotameter (calibration gas flow)
21) Event and active coal-based filter for rejection outside
22) Calibration circuit

# Results :



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

Follow-up of concentration of $CS_2$ and $H_2S$ during 5 hours (Function Trend/Results of software Peak Viewer).



# Conclusion:

**The chroma S has several advantages:**

- **fully automated**
- **data transfer to a data logger**
- **stability and repeatability (areas and retention times)**
- **analysis of sulfur compounds (H2S, CS2, COS,SO2, Mercaptans, Sulfides …)**
- …

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

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