



Determination of **mercury** emissions with flue gases

US EPA method 30B
US EPA PS 12B
HJ 917-2017
CEN/TS 17286

INTRODUCTION

Mercury content is measured in flue gases to assess mercury emissions to the atmosphere from stationary sources: coal combustion, non-ferrous metallurgy, cement production, waste incineration, etc. Available standard methods for measuring Hg emissions vary in level of complexity and application conditions (continuous CEM and discrete trap sampling).

The sorbent trap method is the most cost-effective and accurate one for measuring mercury content in flue gases that involves sampling using paired sorbent traps with subsequent laboratory analysis. The United Nations Environment Programme considers the sorbent trap method to be one of the BAT/BEP (best available techniques/best environmental practices) for mercury emissions monitoring.

The proposed approach complies with US EPA Method 30B; US EPA PS 12B; HJ 917-2017; CEN/TS 17286.



MERCURY MEASUREMENT TOOLKIT

The so-called Mercury Measurement Toolkit provides rapid, reliable on-site data on total mercury and mercury speciation in flue gas as well as in coal, ash and other combustion products [1, 2, 3].

The Toolkit includes sampling system (heated probe and sampling console), sorbent traps, and analytical system.

Sorbent traps of various configurations are specifically designed for short- and long-term sampling, for total mercury and mercury speciation (determination of oxidized and elemental mercury separately), etc. The sorbent traps have at least two sections that should be tested separately: for the primary capture of gaseous mercury and for the mercury breakthrough. Sorbent traps can include an additional spiked section intended to confirm proper sampling and analysis.

Lumex Instruments offers a range of RA-915 series analyzer models based on Zeeman atomic absorption spectroscopy (ZAAS) for rapid selective mercury determination in any kind of solid and liquid samples in stationary and mobile laboratories. Lumex offers the following analyzers for measuring mercury emissions from stationary combustion sources: RA-915 Lab, RA-915F, or RA-915M combined with PYRO-915+ attachment. The latter is being used as the analytical part of the US EPA's Mercury Monitoring Toolkit, which facilitates rapid data collection on mercury in sorbent traps, coal, fly and bottom ash, gypsum, sludge, etc. at the sampling site [1, 2]. It also gives opportunity to analyze ambient air in real-time handheld mode.



MEASUREMENT METHOD

A known volume of flue gas is sampled through paired in-stack sorbent traps at a fixed flow rate. After the sampling, the traps are removed and the sorbent sections are analyzed for mercury content.

The sorbent from each section of the trap is placed and heated in the thermal decomposition chamber of the mercury analyzer. The mercury compounds are evaporated and dissociated forming elemental mercury. The gaseous products are transported into the analytical cell using ambient air as a carrier gas. Mercury atoms are then detected using ZAAS. This method does not involve intermediate preconcentration of mercury on a gold trap, thereby eliminating ensuing problems. Zeeman background correction provides the highest selectivity without interference from the sample matrix. Automatic closed-loop temperature control extends measurement range and ensures no data loss during analysis. This is critical for long-term monitoring of flue gas emissions.

Detection limit: 0.5 ng; Range: 0.5–50 000 ng

1. R. Forte, Jr., J.V. Ryan, T.P. Johnson, P.H. Kariher. The United States Environmental Protection Agency's Mercury Measurement Toolkit: An Introduction. Energy Fuels 2012, 26(8).

2. L. Sloss. Legislation, standards and methods for mercury emissions control. IEA Clean Coal Centre, 2012.

3. Mathebula, M.W., Panichev, N. & Mandiwana, K. Determination of mercury thermospecies in South African coals in the enhancement of mercury removal by pre-combustion technologies. Sci Rep 10, 2020, 19282. doi:10.1038/s41598-020-76453-z.

FEATURES & ADVANTAGES

- Compliant with US EPA Method 30B; PS 12B; HJ 917-2017; CEN/TS 17286
- Measurement of total Hg and speciation
- Mobile equipment is easy to use, maintain, and transport
- No special requirements for site preparation
- Wide dynamic measurement range: 0.5 to 50 000 ng mercury absolute
- Fast on-site analyses and results (2–10 minutes per sample)
- No compressed gases
- Lower capital expenditure comparing to that of CEM
- Low operating and maintenance costs
- Versatility: analyses of coal, ash, sludge, wastewater with the same analytical system



RA-915M mercury analyzer
with PYRO-915+ attachment



RA-915 Lab mercury analyzer



RA-915F mercury analyzer

