

Compliance Testing for Mercury – Measurement Methods and Considerations

**NCASI Boiler MACT
Implementation Workshop**

October 2, 2013

Lee Carlson, NCASI

Topics Covered

- Factors affecting test method selection
- Mercury emissions measurement methods
- Method capabilities
- Method implementation issues

**Everything you need to
know about compliance
testing under CISWI and
boiler MACT for mercury**

EPA Method 30B

Important Considerations for a Mercury Emissions Test Program

- Selection of:
 - Appropriate test method
 - Testing company and analytical laboratory

What Factors Affect the Selection of a Test Method?

- What emission standard do you have to meet?
Boiler MACT standards for mercury emissions for sources firing solid fuels

5.7 lb/10¹² Btu – Existing Sources

0.80 lb/10¹² Btu – New Sources

CISWI standard for energy recovery units, new and existing sources

0.0022 mg/dscm

(1.3 lb/10¹² Btu) biomass F-factor

What Factors Affect the Selection of a Test Method?

(Continued)

- Can quantifiable results be obtained at the applicable standard?
- Are the results available on-site?

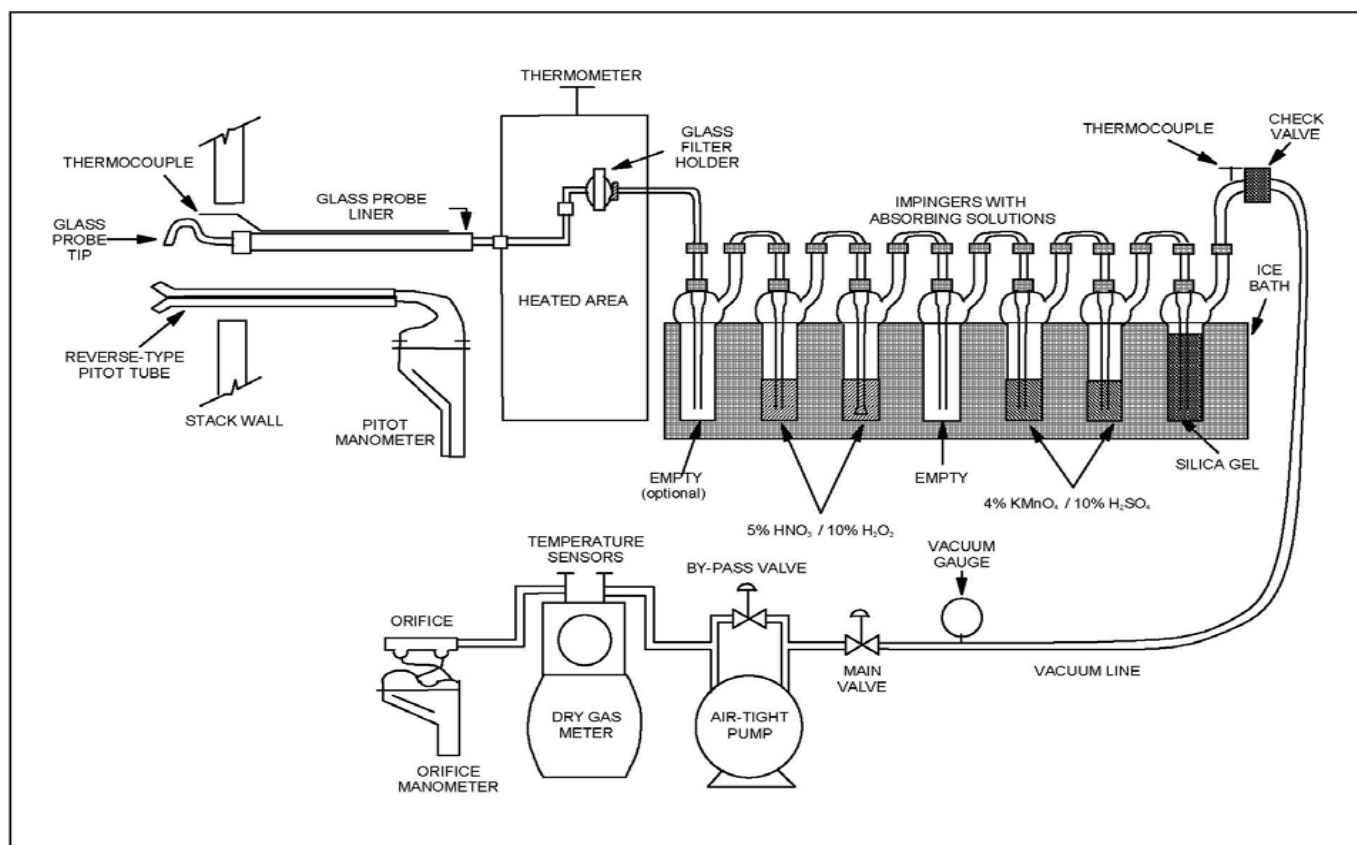
Three Manual Methods Approved Under CISWI and Boiler MACT for Mercury Emissions Measurement

- 1. EPA Method 29**
- 2. ASTM D6784-02** (Commonly known as the Ontario-Hydro Method, or OHM)
- 3. EPA Method 30B**

EPA Method 29 and OHM

- Isokinetic sampling
- Based on EPA Method 5 Train
 - *OHM allows Method 17 in-stack filter*
- Hg captured on filter and in multiple impingers
- Multiple samples analyzed separately
- Both methods speciate Hg into particulate bound, oxidized, and elemental fractions
- Method 29 capable of measuring multiple metal emissions

EPA Method 29 Train Schematic (Ontario-Hydro Similar)

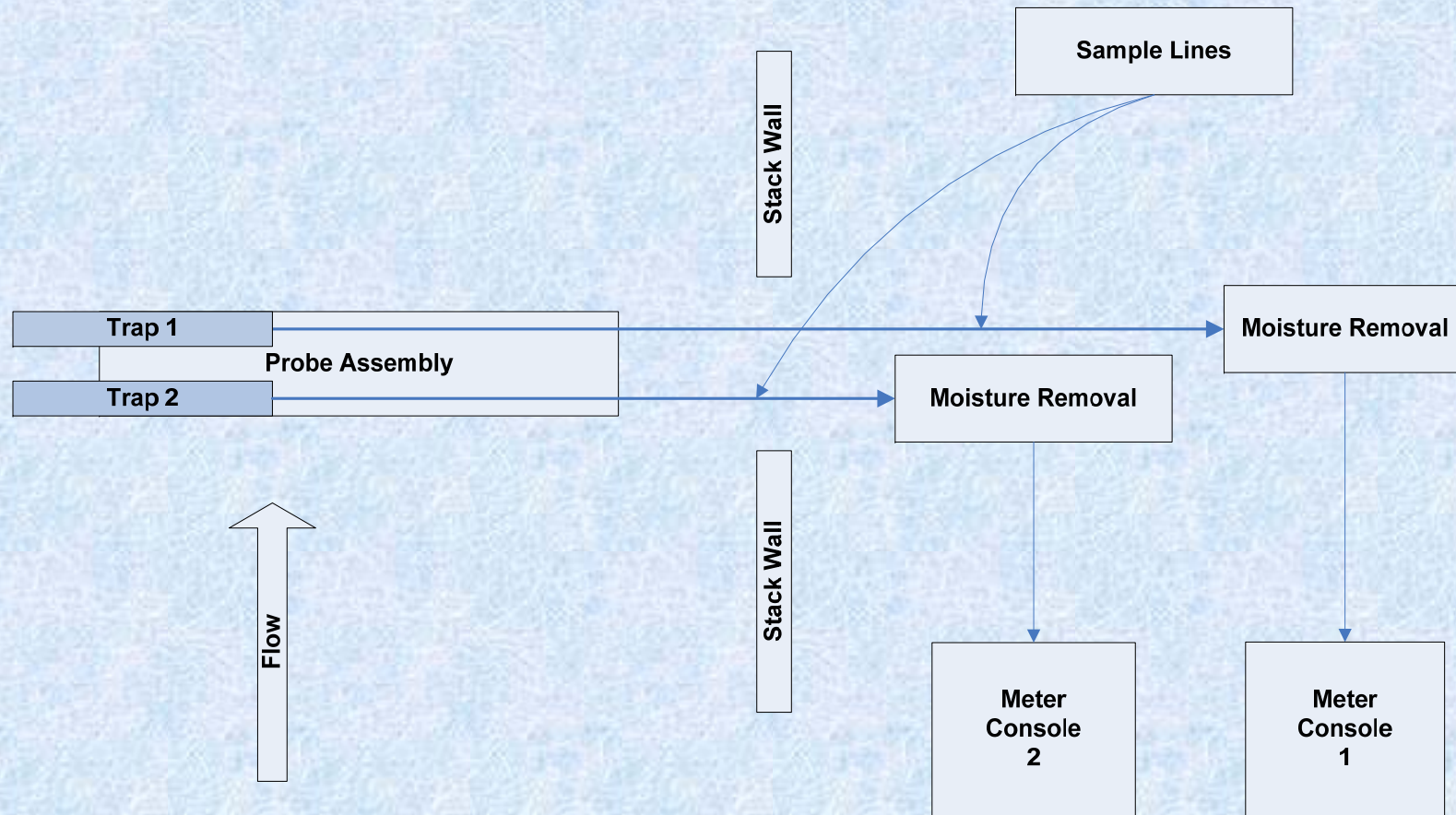


EPA METHOD 29
MULTI-METALS SAMPLING TRAIN

EPA Method 30B

- Non-isokinetic measurement of vapor phase mercury
- Continuous, constant rate sample extraction using paired trains
- Mercury collected on activated carbon in sorbent tube
- Analysis by thermal decomposition or wet chemical methods
- Onsite thermal decomposition analysis provides near real time Hg data – *no shipping of samples*

Method 30B Sample Train Schematic



NCASI Experience with Method Capabilities versus Boiler MACT Limits

Method	¹ Minimum Quantifiable Hg Emissions (lb/10 ¹² Btu)	Boiler MACT Limits for Hg (lb/10 ¹² Btu)
Method 29 (3-hour run)	0.34	5.7 (existing) 0.80 (new)
OHM (3-hour run)	0.33	
Method 30B ² (1-hour run)	0.06	

¹Minimum quantifiable Hg emissions for Method 29 and OHM based on NCASI's study at a biomass fired boiler and a minimum 3.0 cubic meter sample volume

²Based on minimum quantifiable mass of 8 ng, sample volume of 0.12 dscm, average operating conditions of source, and biomass combustion

Method Implementation Issues

Common Problems with EPA Method 29 and OHM

- Any isokinetic method problem
 - Port size, sampling location, isokinetics, port changes, leaks
- Train preparation and recovery
 - Particularly adequate rinsing of any residue
- Labor intensive and tedious
- High detection limits
- High blanks and train contamination

Common Problems with EPA Method 29 and OHM

(Continued)

- Filter media and absorbing solution quality affect background levels
- Sample packaging and shipping – gas evolution from permanganate – hazardous materials
- On coal fired sources – Potential for conversion of vapor phase oxidized Hg to elemental Hg within the sample train
 - Not as pronounced with OHM
- High implementation costs/long test periods

Common Problems with EPA Method 30B

- Inability to meet performance criteria
 - Spiking levels, paired train agreement, and breakthrough can be most challenging
- Re-analysis of samples not possible if thermal decomposition used

Recommendations

- Evaluate laboratory capabilities relative to expected Hg emissions
- If source is a low emitter for Hg, Method 30B will avoid positive bias issues associated with Method Reporting Limits for Method 29 and Ontario-Hydro
- Consider lower implementation costs of Method 30B, and availability of test results in near real time

Recommendations

(Continued)

- If testing for TSM and mercury – test for mercury separately to avoid potential for manganese contamination of TSM samples

**Everything you need to
know about compliance
testing under CISWI and
boiler MACT for mercury**

EPA Method 30B

Questions?

Lee Carlson
NCASI Southern Regional Center
(352) 331-1745
Lcarlson@src-ncasi.org