Raw Material Testing for MACT and Safety Data Sheets

Susan Miller

Brick Industry Association

John Sanders

National Brick Research Center

What we will cover

- Why do you need the information?
  - MACT Compliance
  - Safety Data Sheets
- How can we help you get the information?

MACT Compliance

- Understand where you are now- mercury, metals
- Determine type of control device
- In conjunction with a stack test
- Possible approach to REPLACE stack testing

Safety Data Sheets

- Required by OSHA and Global Harmonization Standard
- Generic SDSs available, but site-specific has many advantages
- Sometimes used for reporting emissions (e.g., Toxic Release Inventory)

Generic SDS- from BIA's Brick SDS

3. COMPOSITION/INFORMATION ON INGREDIENTS

NOTE: Compounds listed below, other than aluminum silicates and quartz, should only be reported if known to be present, found by a test to be present, OR if used as an addition to a raw material. If you do not have such data, delete the other compounds.

Ingredient	CAS Number	% Weight
Aluminum Silicates	Various	50 – 85
Quartz	14808-60-7	Varies
Chromium compounds	Various	0 – 3
Manganese compounds	Various	0 – 3
Iron Compounds as granular body additives	Various	0 – 3
Calcium compounds	Various	0 – 3

SDS- Raw Material or End Product?

- Clay -> Raw material -> thing that is processed
- Brick -> End Product -> not processed
- Calculations for Toxic Release Inventory->
  - Clay and other raw materials!
  - SDS are not your first choice!

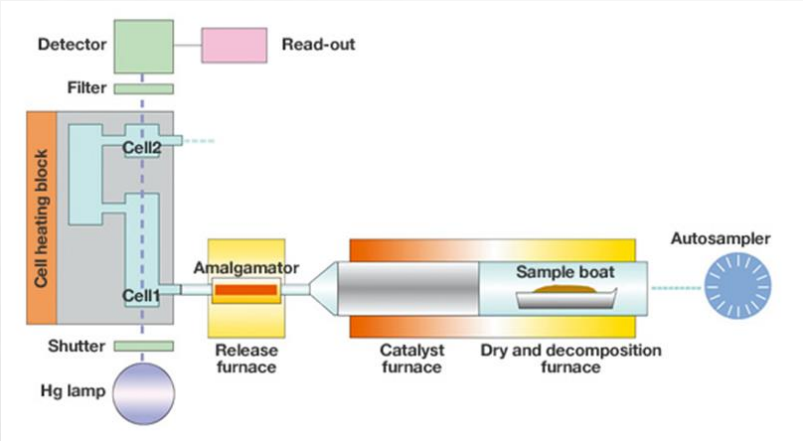
Metals Mass Balance

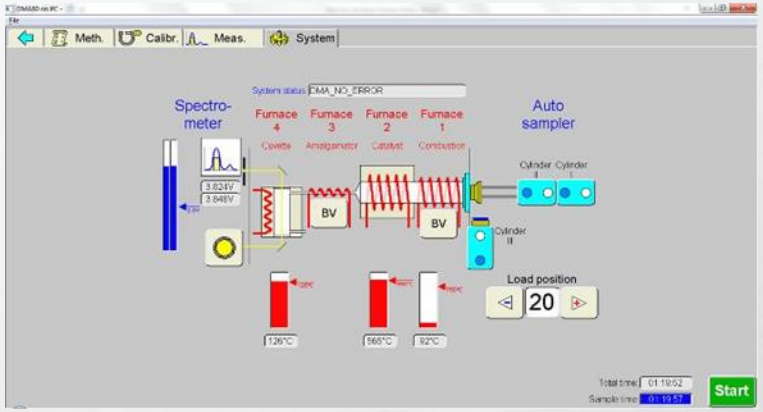
- Calculate emission by difference from the metals content of dry and fired samples.
- Mercury – EPA 7473
- Other HAP metals (As, Be, Cd, Co, Cr, Mn, Ni, Pb, Sb and Se) – EPA 3050/6010
- We have been performing mass balance estimates of emissions for F, Cl and S for over 10 years.
  - We can achieve very high levels of correlation with stack testing data, but we have found that the degree of correlation varies from plant to plant.

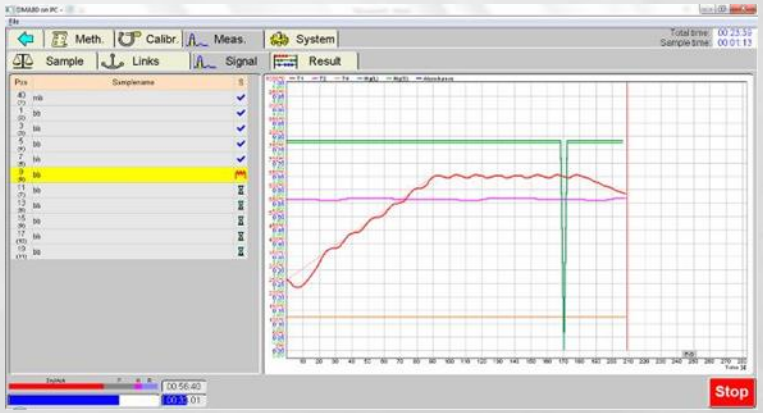
Milestone DMA-80 Mercury Analyzer

- EPA 7473 - Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectroscopy.
- Tri-Cell Unit to allow measurement from 0.015 ng to 1300 ng of mercury.
- Can be used for solids, liquids or gases (with sorbent traps).

Mercury Measurements







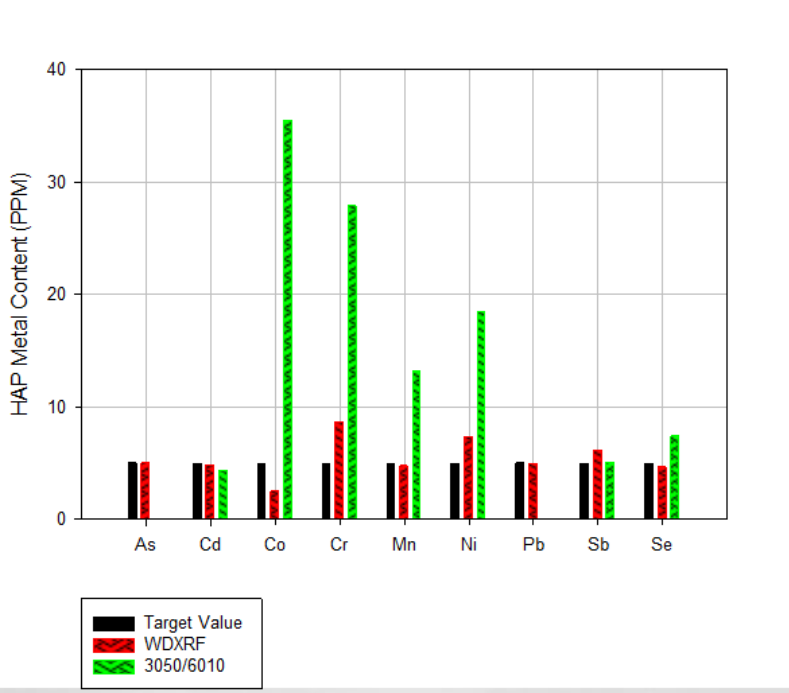
Metals Mass Balance Comparison

Test Method	Sample Preparation	Quantification	Comments	Potential Problems
EPA 3050 B/6010 C	3050 B – Acid Digestion of Sediments, Sludges and Soils	6010 C – Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES)	Sample is dissolved in a combination of nitric acid, hydrogen peroxide and hydrochloric acid. The extracted metals are then analyzed by ICP-AES.	If the acid treatments don't dissolve the metal, then it will not be measured. This is especially a problem for fired samples.
NBRC WDXRF	Sample crushed to homogenized and then pressed	Wave Length Dispersive X-Ray Fluorescence (WDXRF)	The sample is crushed to homogenize and then pressed into a disk for analysis. The metals are analyzed directly in the sample by WDXRF	The sample matrix causes minor variation in the background and peak height that shows up at low level measurements. It is not possible to measure Be with this method

Metals Mass Balance Alternative

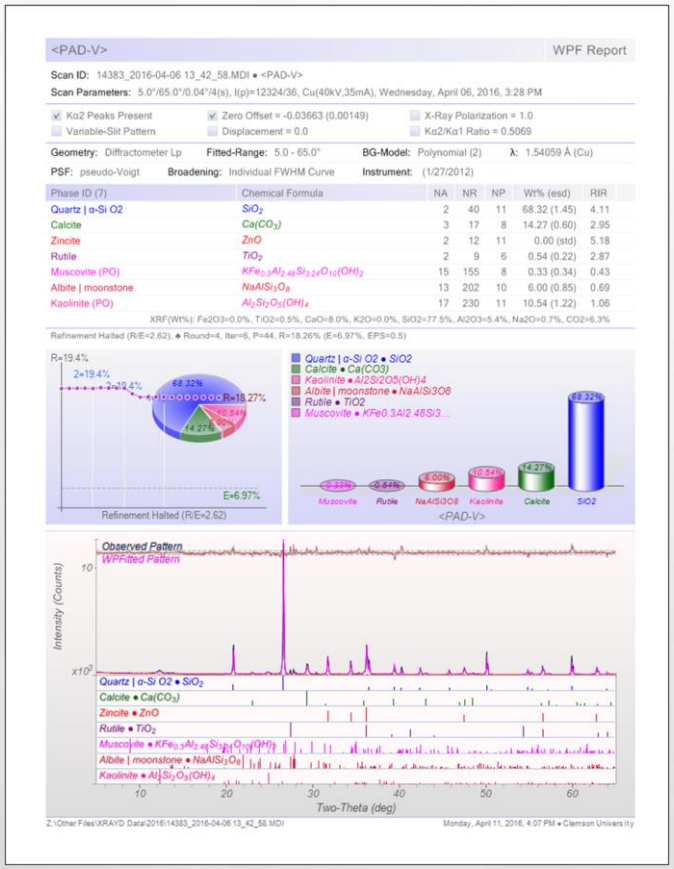
- Direct analysis of samples without acid digestion or heating.
- Samples are ground to homogenize and pressed into pellets for analysis.
- This technique has very little dilution so lower detection limits can be achieved.
- We developed a special calibration technique for As, Cd, Co, Cr, Mn, Ni, Pb, Sb and Se using a series of synthetic standards.
- Be can’t be measured with XRF.

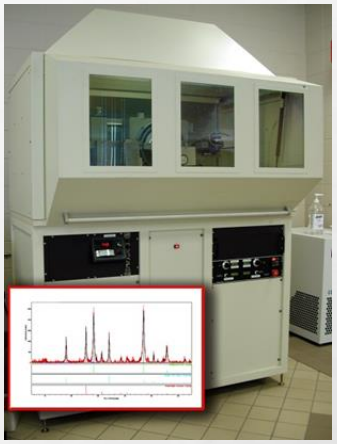
Comparison of NBRC and EPA methods



- We compared both methods against a synthetic standard (5 ppm).
- The XRF method was more accurate, and has lower detection limits for all of the metals.
- The main limitation of the XRF method is the inability to measure Be.

SDS Data - Mineralogy





- Minerals are identified by matching patterns from ICDD Database.
- The content of each mineral is estimated by a whole pattern fitting technique

SDS Data – Chemical Analysis

- Quantitative results for the most 11 common elements (fused disk).
- Semi-Quantitative results for any element from Na to U (Uniquant – Pressed Disk)
- Quantitative results for HAP metals (Pressed Disk – ppm levels)

For more information . . . .

Susan J Miller
Vice President, Environment, Health & Safety
Brick Industry Association
311 South Academy Street
Cary, North Carolina 27511
smiller@bia.org
919 380-2191

John Sanders
Director
The National Brick Research Center
Clemson University
100 Clemson Research Blvd
Anderson, SC 29625
jpsand@clemson.edu
864-656-0604