THE UN ENVIRONMENT
COAL PARTNERSHIP

BEST PRACTICE OPTIONS
AND PROJECTS IN
EMERGING ECONOMIES

LESLEY SLOSS
COP2, GENEVA, NOVEMBER 2018
MERCURY BEHAVIOUR IS COMPLEX

Hg speciation changes from pure Hg⁰ vapour at the furnace exit to changing mixtures of Hg⁰, Hg²⁺ and Hg-P as the flue gas moves through the APCDs depending on the levels of Cl, Br and unburnt carbon, whether a SCR is present and many other cleaning conditions.
MERCURY REDUCTION OPTIONS IN THE BAT/BEP GUIDANCE

Pre-combustion Hg reduction options for coal
  • select
  • blend
  • wash

Co-benefit – use systems you already have in place
  • particulate (dust) control systems
  • flue gas desulfurization technologies
  • oxidation

Hg-specific control technologies
  • Activated carbon injection (ACI)
  • Other advanced technologies
An easy chart which allows the user to work through BAT/BEP (best available technology/best environmental practice) to choose an option which will work best at a specific plant.
PREDICTING EMISSIONS AND CONTROL OPTIONS: THE IPOG

**Mercury iPOG**

- **Stack Hg Emissions**: $6.66 \times 10^{-3} \pm 1.00 \times 10^{-3}$ lb/h
  - $1.53 \pm 0.23$ lb/10^{12} Btu

- **Stack Hg Speciation**
  - $Hg^{2+}$ (%): $25 \pm 3.75$
  - $Hg^0$ (%): $75 \pm 11.25$

- **Hg Removal**
  - $\eta_{Hg, Overall}$ (%): $82.2 \pm 12.3$

**Mercury Mass Flow**

- $3.75 \times 10^{-2}$ lb/h

- $1.50 \times 10^{-3} \pm 2.25 \times 10^{-4}$ lb/h
  - $\eta_{Hg, Furnace}$ (%): $4 \pm 0.6$

- $2.70 \times 10^{-3} \pm 4.05 \times 10^{-4}$ lb/h
  - $\eta_{Hg, ESPc}$ (%): $7.5 \pm 1.13$

- $2.66 \times 10^{-2} \pm 4.00 \times 10^{-3}$ lb/h
  - $\eta_{Hg, WFGD}$ (%): $80 \pm 12$

**SCCR $X_{Hg}$ (%)**: $75 \pm 11.25$

**Hg$^{2+}$ (%)**: $85 \pm 12.75$

Screenshot of iPOG system
### Cost Comparison of Control Options

**Table 4  Relative cost of Hg removal for various techniques**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Capital cost</th>
<th>Incremental O&amp;M cost</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing plant efficiency</td>
<td>moderate</td>
<td>low</td>
<td>Not a significant effect on mercury emissions but good for multi-pollutant emission plant output</td>
</tr>
<tr>
<td>Coal washing/treatment</td>
<td>High</td>
<td>moderate</td>
<td>Washing is less expensive than chemical treatment. Coal specific results</td>
</tr>
<tr>
<td>Coal blending</td>
<td>Very low</td>
<td>Very low</td>
<td>Will depend on coal availability. May require refurbishment of pulverisers</td>
</tr>
<tr>
<td>Coal additives</td>
<td>Very low</td>
<td>low</td>
<td>Can be sprayed on to coal or into boiler. Proprietary, so cost varies with supplier. May be issues with corrosive impacts on plant</td>
</tr>
<tr>
<td>Upgrading flue gas controls (ESP, FF, FGD)</td>
<td>variable</td>
<td>low</td>
<td>The cost of upgrading on modifying existing pollution control devices will vary on a case by case basis but could improve performance of the plant in more than just mercury control and is a one-off cost</td>
</tr>
<tr>
<td>Activated carbon injection</td>
<td>Low</td>
<td>low</td>
<td>Maintenance of new sorbent injection facility now required. High costs for waste management for some sorbents. However, newer sorbents are low cost and do not cost disposal issues</td>
</tr>
<tr>
<td>Multi-pollutant systems</td>
<td>New, therefore variable</td>
<td>variable</td>
<td>New systems are emerging into the market and need to be considered on a case by case basis</td>
</tr>
<tr>
<td>Emission Control Device</td>
<td>Primary Pollutant Controlled</td>
<td>Co-benefit Reductions</td>
<td>Installation Times* (design to completion)</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Fabric Filter (full or polishing)</td>
<td>Particulate Matter/Non Hg Metals</td>
<td>Mercury (with or without ACI), Acid Gases, with DSI</td>
<td>12 to 24 months</td>
</tr>
<tr>
<td>ESP Upgrade</td>
<td>Particulate Matter/Non Hg Metals</td>
<td>Mercury – with ACI, Acid Gases, with DSI</td>
<td>6 to 24 months</td>
</tr>
<tr>
<td>Dry Sorbent Injection (DSI)</td>
<td>Acid Gases</td>
<td>SO₂, SO₃, SeO₂</td>
<td>9 to 12 months</td>
</tr>
<tr>
<td>Dry Scrubber</td>
<td>Acid Gases</td>
<td>SO₂, SO₃, SeO₂, Hg</td>
<td>24 to 36 months</td>
</tr>
<tr>
<td>Scrubber Upgrades</td>
<td>Acid Gases</td>
<td>SO₂, SeO₂, Hg</td>
<td>12 to 36 months</td>
</tr>
<tr>
<td>Activated Carbon Injection (ACI)</td>
<td>Hg</td>
<td>-</td>
<td>12 to 18 months</td>
</tr>
</tbody>
</table>
• Do I need to install controls?
• … really?
• How soon?
• Who is paying for it?
• Which is the best system for my coal?
• Will it actually work on my plant?
• How do I make an informed choice?
• Where do I make my purchase?
COAL PARTNERSHIP
PROJECTS AND OUTREACH
Mercury control from coal combustion
COMPLETED INVENTORY AND DEMONSTRATION PROJECTS

- China
- Russia
- India
- South Africa
- Thailand
- Vietnam
- Indonesia
WEBINAR

THE MINAMATA CONVENTION: WHAT DOES IT MEAN FOR COAL?

25th October 2017  Lesley Sloss

ABOUT THIS WEBINAR

This timely webinar will review the implications of the Minamata Convention on Mercury on coal. COP1, the 1st Conference of the Parties, of the convention was held in Geneva at the end of September. Tune in to get a full update on the final text of the Minamata Convention on Mercury and a discussion on the potential consequences for emerging economies who have a significant dependence on coal.

UNEP (the United Nations Environment Programme) first raised the issue of mercury as the most important, unregulated, pollutant in the global environment in the mid 2000s and, in response, Dr Lesley Sloss has produced reports and run workshops and conferences for the CCC for more than 20 years. Lesley’s areas of expertise include emissions and
The Coal Partnership will be:

- giving a plenary at the conference
- acting on the organising committee to select papers, exhibitors and sponsors
- running a one-day “training course” on mercury monitoring and control
TRAINING COURSE

- Requested by Servicio Geologico Colombiano (Geological Survey of Colombia)
- 2 day course on mercury monitoring and control
- Site visit to Paipa
- Running iPOG simulation on real plant data
MEC14 VIETNAM

- Support from Vietnamese Environment Administration

- Expect >80 delegates from 25 countries

- Oct/Nov 2019

- All papers freely available after the event
CALL FOR ABSTRACTS!
CCT2019 IN HOUSTON, TEXAS
3 – 7 JUNE 2019
COAL PARTNERSHIP CONTINUES TO GROW AND EVOLVE
POTENTIAL FUTURE WORK

• Assistance to national implementation plans

• Further inventory work and demonstration projects

• Continued outreach at international events

• Updating the BAT/BEP and the iPOG – creating an easier user interface