Combustion Optimization – First Step in Reduction of Mercury Emissions

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Why Combustion Optimization?

- Can improve “native” mercury reduction on fly ash
- Can reduce sorbent consumption
- Relatively low cost
- Combustion Optimization has proven record of:
  - Decreasing NO_x and CO emissions
  - Improving heat rate
  - Reduces peak FEGT and slagging
  - Extending periods between outages

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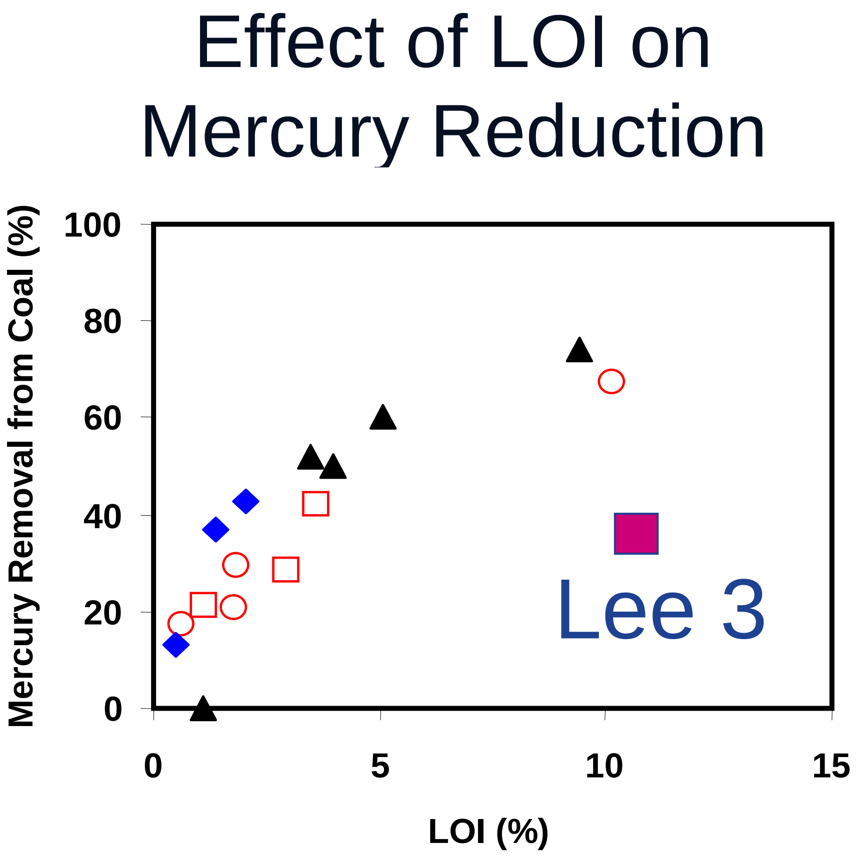
Why Combustion Optimization improves mercury reduction?

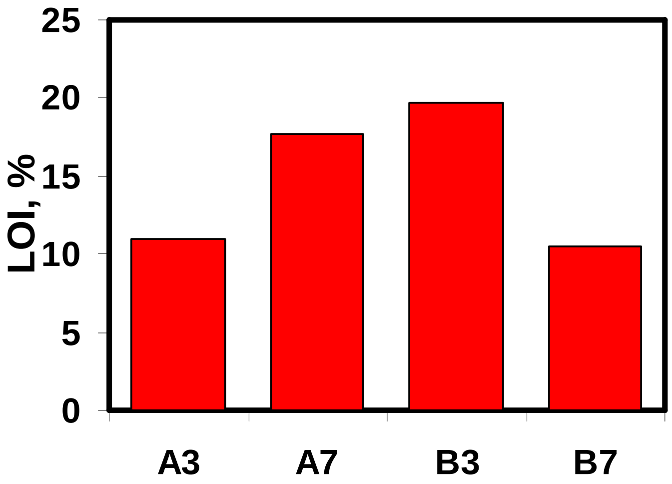


- LOI increase is often difficult without increase in CO emissions
- Fly ash capacity for mercury is not fully utilized because of non-uniform distribution of high carbon ash

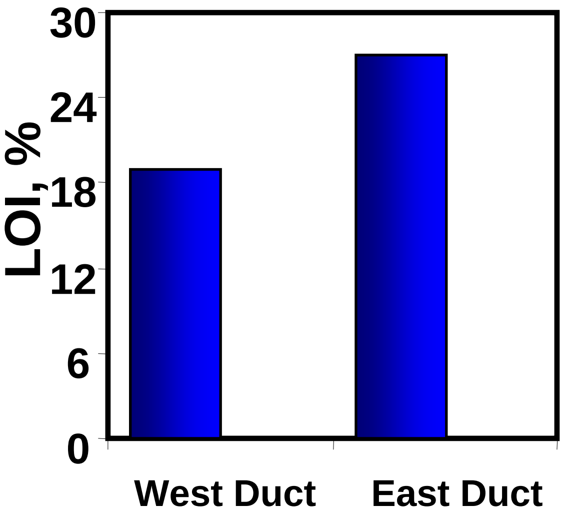
LOI distribution at ESP inlet

Uniform distribution is important as with any sorbent

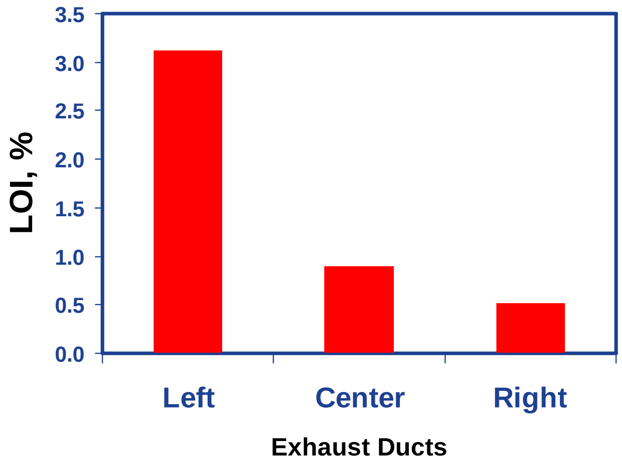
Lee Station



Green Station

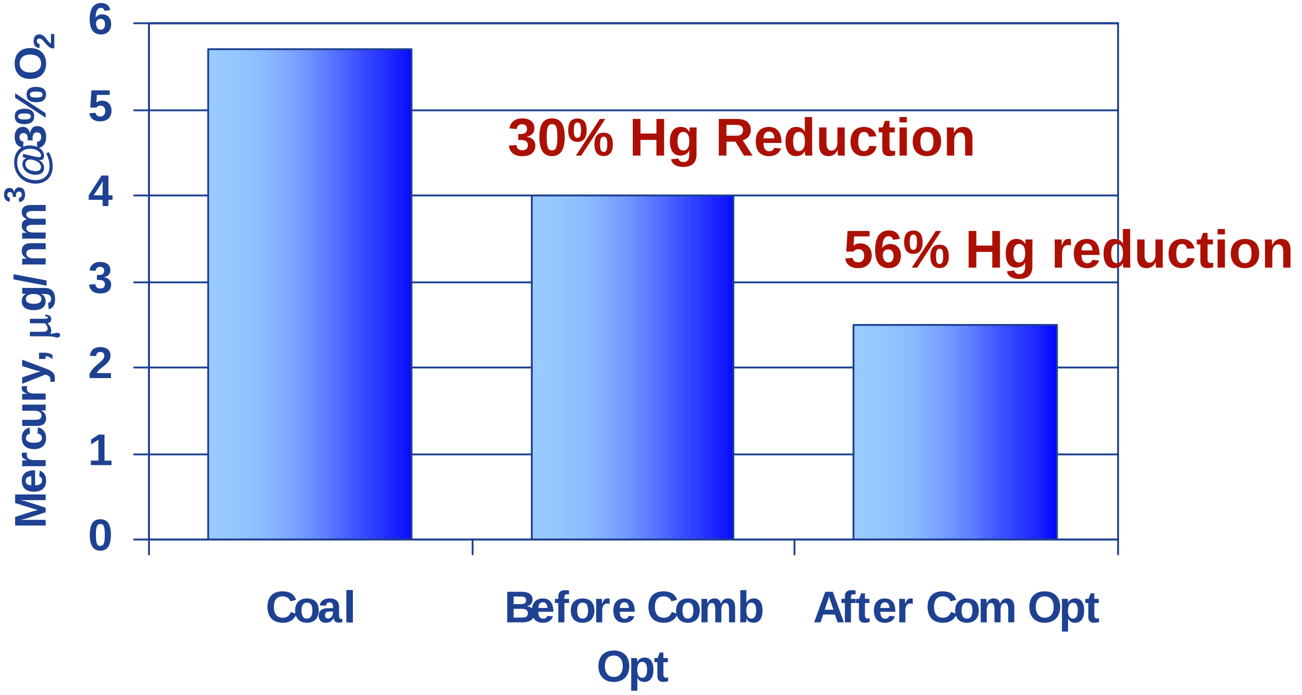


Holcomb Station



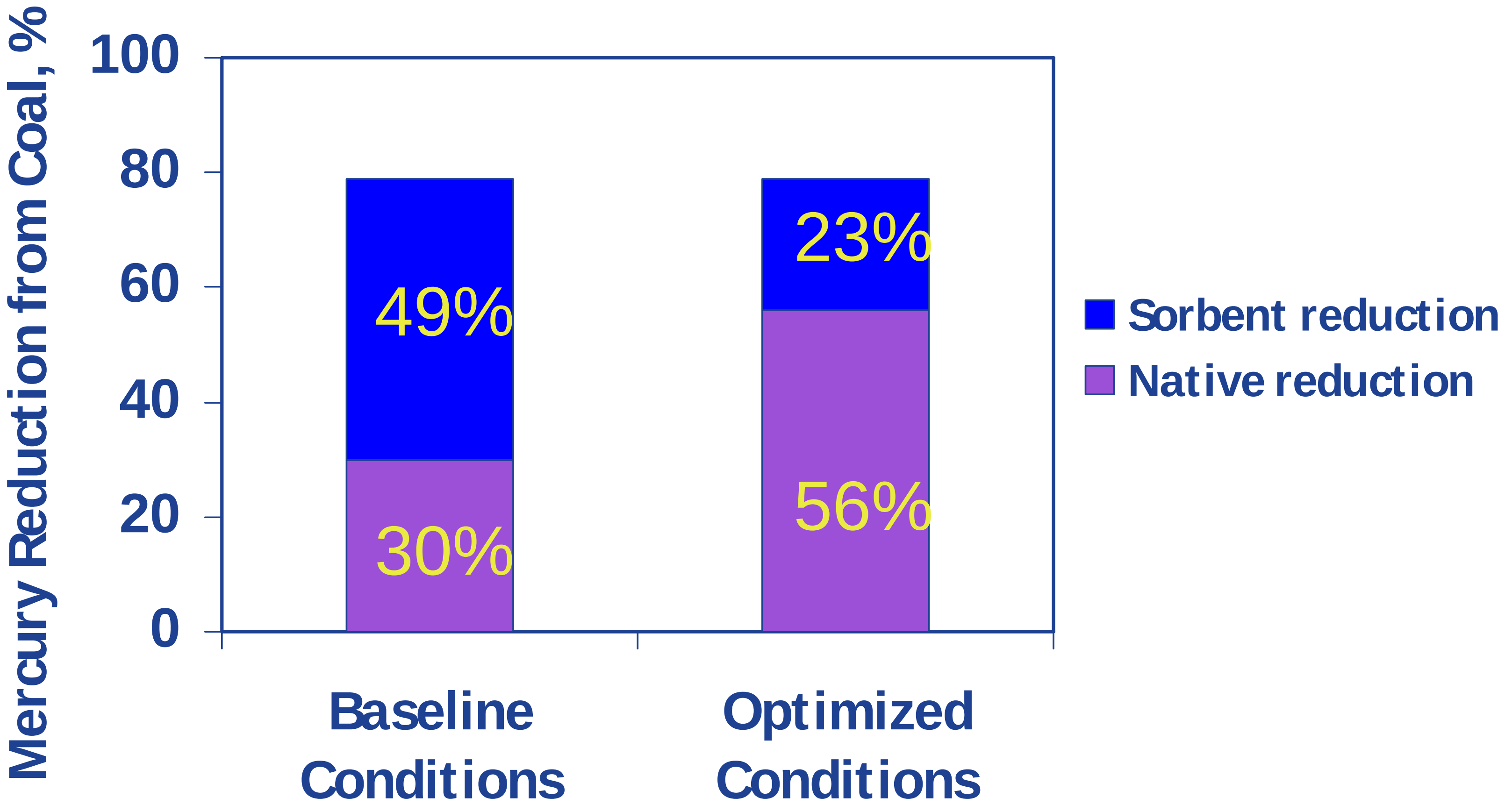
Combustion optimization makes LOI distribution more uniform as a result of coal and air flow balance

Combustion optimization – bituminous coal



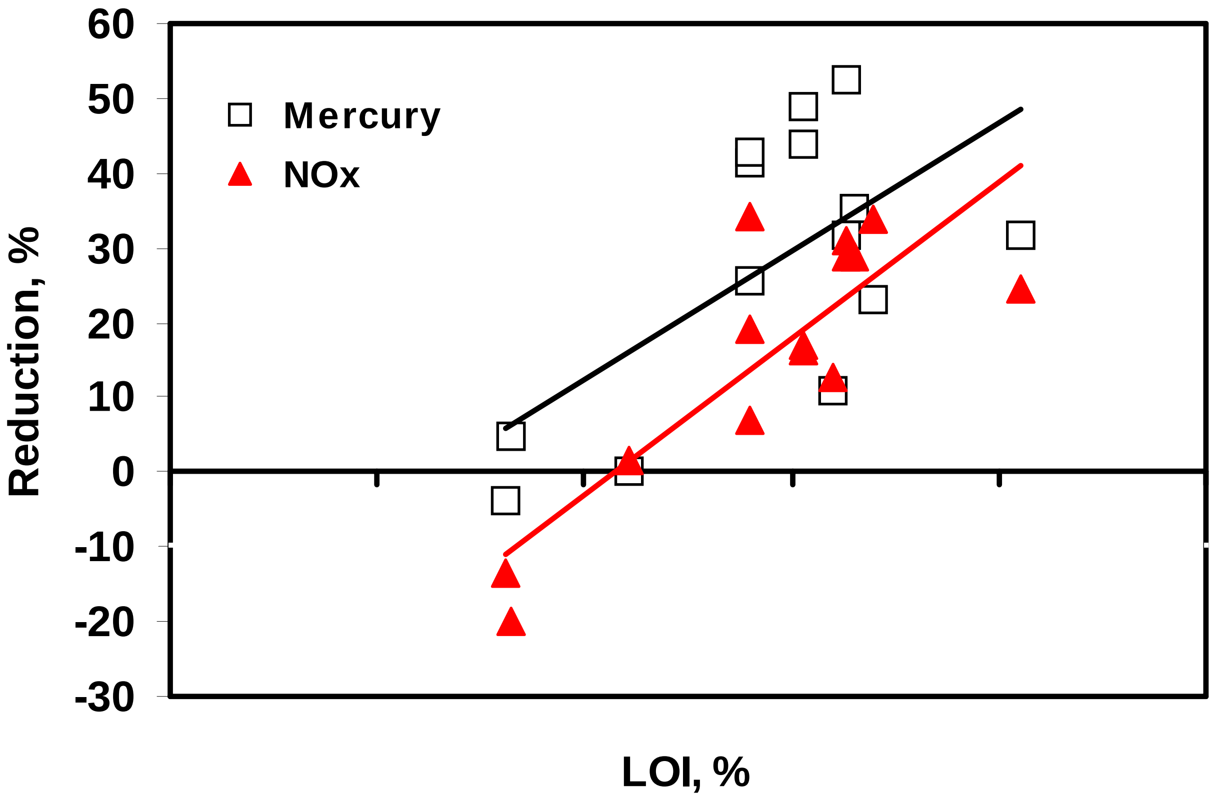
- 38% improvement in comparison with pre Combustion Optimization mercury reduction
- NO_x reduced by 18%

Reduction in sorbent injection rate



Sorbent injection rate reduced from 12 lb/MMACF to 7 lb/MMACF

Combustion Optimization – low-rank coal



- “Native” mercury capture on fly ash improved from ~20% to ~40%
- Additional ~20-30% NO_x reduction

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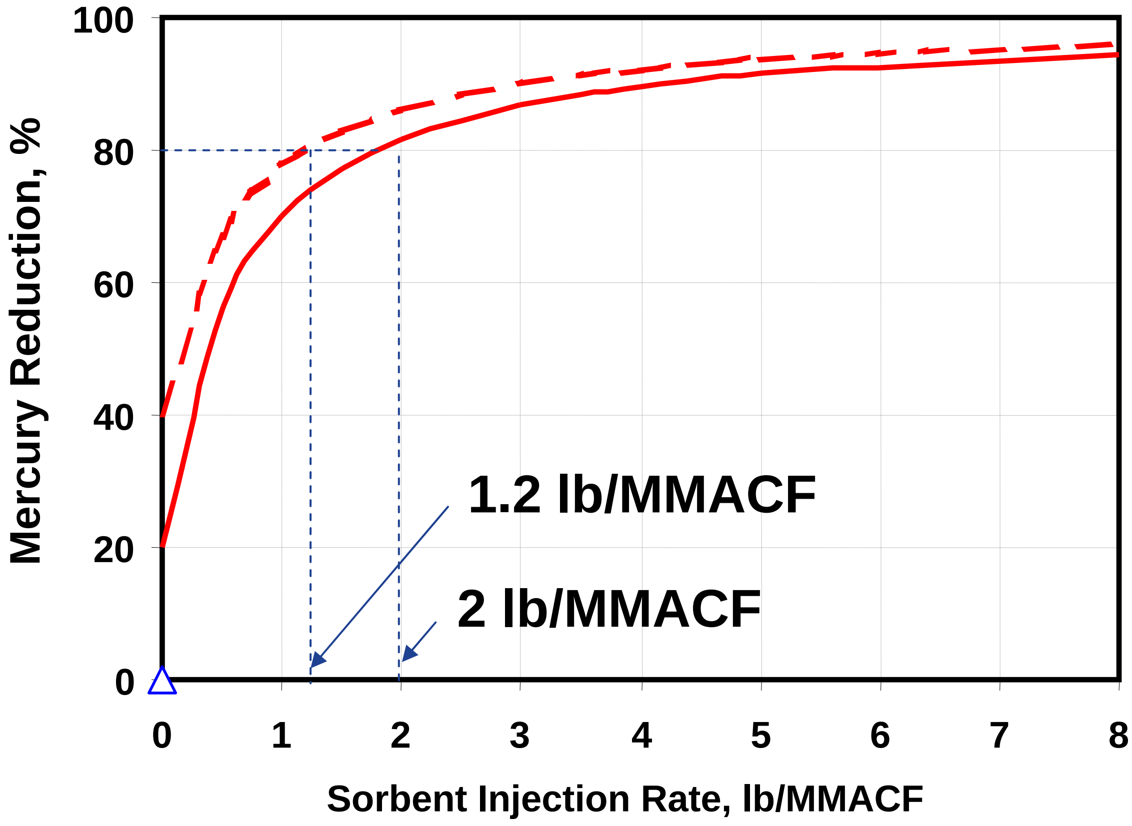
Integration of sorbent injection with combustion optimization

Target – 80% overall mercury reduction



Up to 40% reduction in sorbent injection rate

Factors to consider

- Combustion optimization for mercury control is more effective when combustion staging is present (SOFA, reburn, CCOFA)
- May require coal automatic balancing to achieve optimum combustion conditions
- May require CO/O_2 sensors to maintain optimum combustion conditions
- May affect fly ash sales

Economics

- Capital cost: $50k - $1M depending on hardware
  - Coal flow control
  - CO/O_2 sensors
  - Automatic controls
- May be additional cost due to LOI increase
- Reduction in sorbent injection rate
- Is more cost effective than sorbent injection alone if additional NO_x reduction is required