



***GEOENERGY***

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A.H. LUNDBERG ASSOCIATES, INC.



**Wet ESPs for Solid and Condensable Particulate  
presented to  
McIlvaine Hot Topics Web Seminar  
April 26, 2012  
by  
Steven A. Jaasund, P.E.  
Geoenergy Division of A. H. Lundberg Associates**

# Wet ESP History

- The first ESP was a wet unit by Frederick G. Cottrell in 1907
- Many wet ESPs applied since then for acid mist collection
- Increased applicability since CAA in 1970
- New emphasis on air toxics motivates further development

# Inherent Advantages of Wet Precipitation

- Condensables are already formed
- Particulate resistivity is irrelevant
- No temperature limitation
- No particulate re-entrainment
- Sneak-by can be eliminated
- Smaller gas volume



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# Typical Applications

- Sulfuric acid mist collection in non-ferrous smelting
- Wood dryers in panelboard and pellet manufacturing
- Incinerators of hazardous waste and sewerage sludge
- Industrial boilers down stream of wet scrubbers



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# Wet ESP Performance

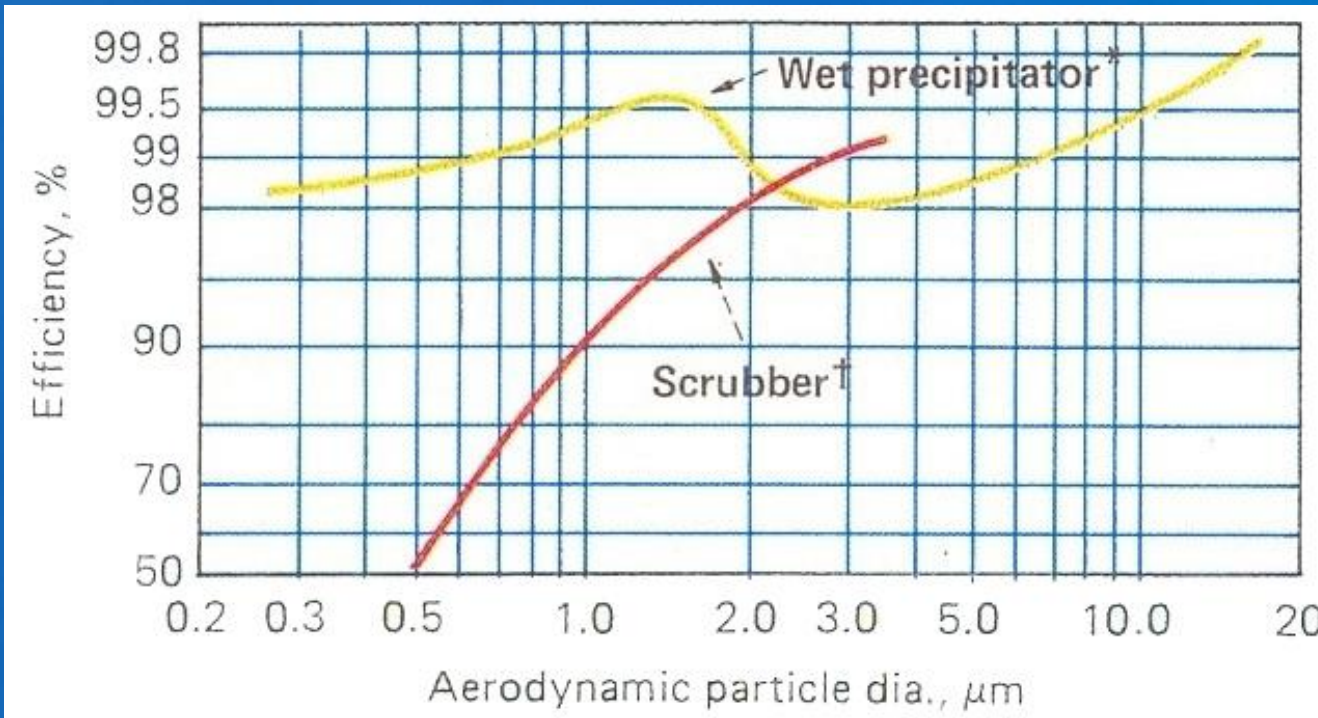


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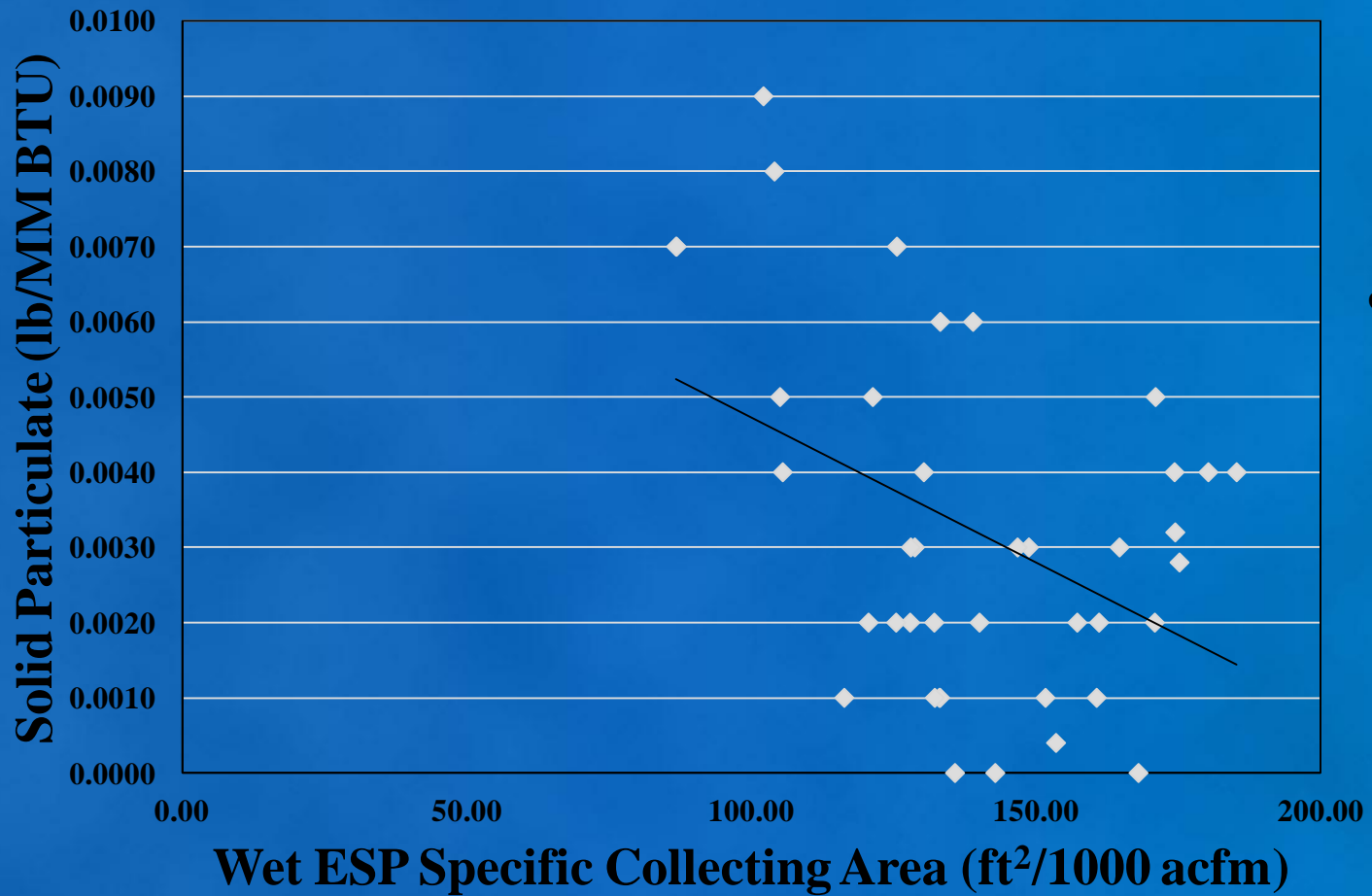
# Effect of Particle Size



Size has a strong influence on the performance of a wet precipitator in collecting fine particles

Wet electrostatic precipitators capture fine particles more efficiently than the highest-energy wet scrubbers

# Performance Tests 2009 -2011 (Biomass Boiler @ Northwest P&P Mill)



cc = -0.4271

# Winter 2012 Pilot Test Program

- Test Site – London, England
- Application - Municipal waste-to-energy boiler
- Test Set-up
  - ~1200 scfm (wet) raw gas from upstream of dry ESP
  - Pilot Equipment
    - Multiclone
    - Wet scrubber;  $\Delta P \sim 15$  inches w.c.
    - Wet ESP; SCA  $\sim 100$  to  $150 \text{ ft}^2/1000 \text{ acf}$
- Inlet gas stream profile
  - ~1200 mg/Nm<sup>3</sup> total particulate
  - ~100 ppm HCl
  - ~25 ppm SO<sub>2</sub>



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# Pilot Unit Installation

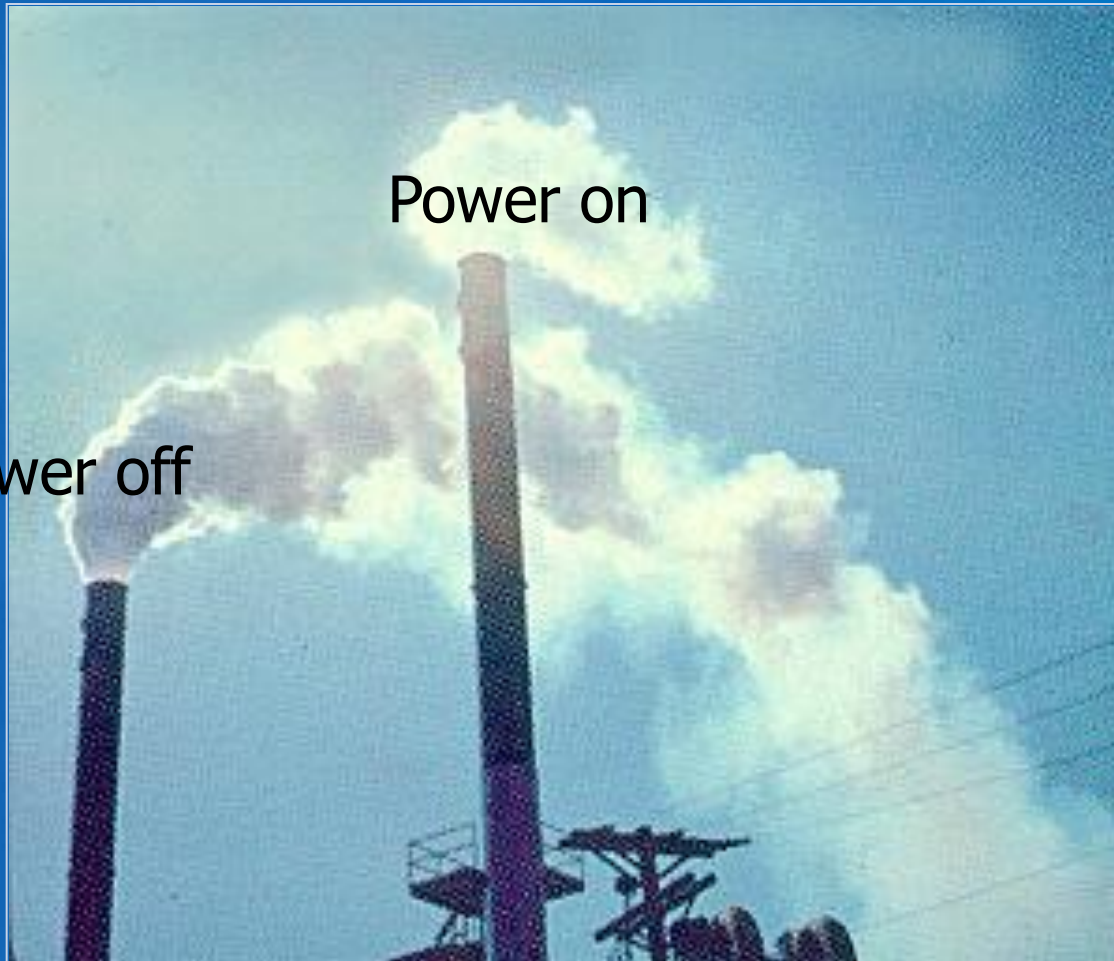


# Pilot Test Program Results

(All results corrected to 11% O<sub>2</sub>)

- Particulate Results (8 most representative tests)
  - Solid particulate 0 to 3 mg/Nm<sup>3</sup>; average 1.9  
(0 to 0.0013 gr/scfd; average 0.0008 gr/scfd)
- Heavy Metals >99% removal
- Mercury >90% Removal
- Acid Gases
  - HCl < 1.0 ppm
  - SO<sub>2</sub> < 2.0 ppm

# Wood Dryer



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# Wood Fired Boiler



Power Off



Power On



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