

Reinhold Environmental Ltd.



***2007 APC Round Table & Expo
Presentation***

***July 8-10, 2007
Chattanooga, TN
Hosted by TVA***

PLANT TOUR: THE INDIGO AGGLOMERATOR

**14th APC Round Table and Expo
Chattanooga Convention Center
July 8-10, 2007**



Highlights

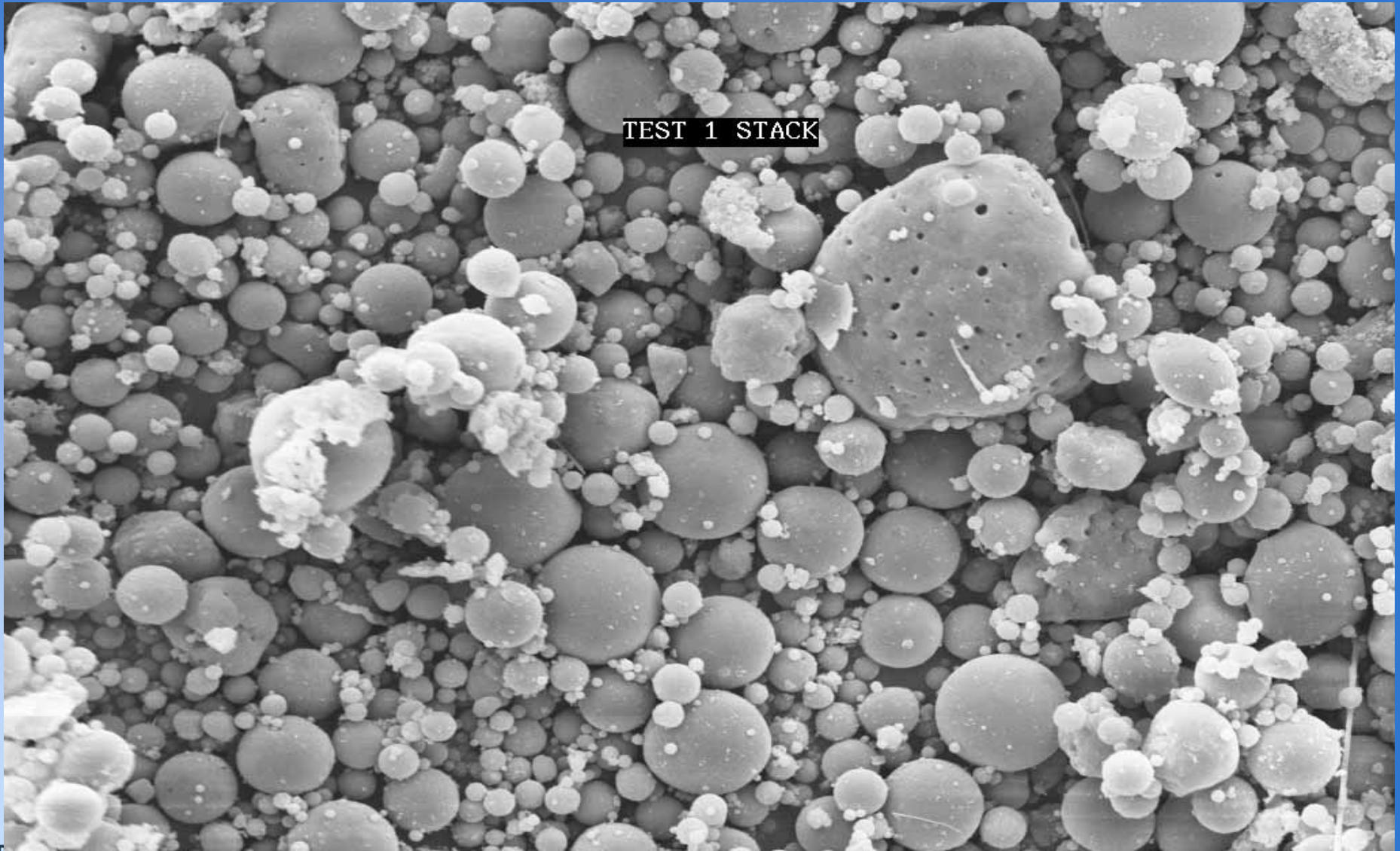
- **Introduction to Indigo Agglomerator**
- **TVA Widows Creek Unit #8**
- **Project highlights**
- **Test results**
- **Summary**



Introduction to the Indigo Agglomerator Technology



Fly Ash Photomicrograph



TEST 1 STACK

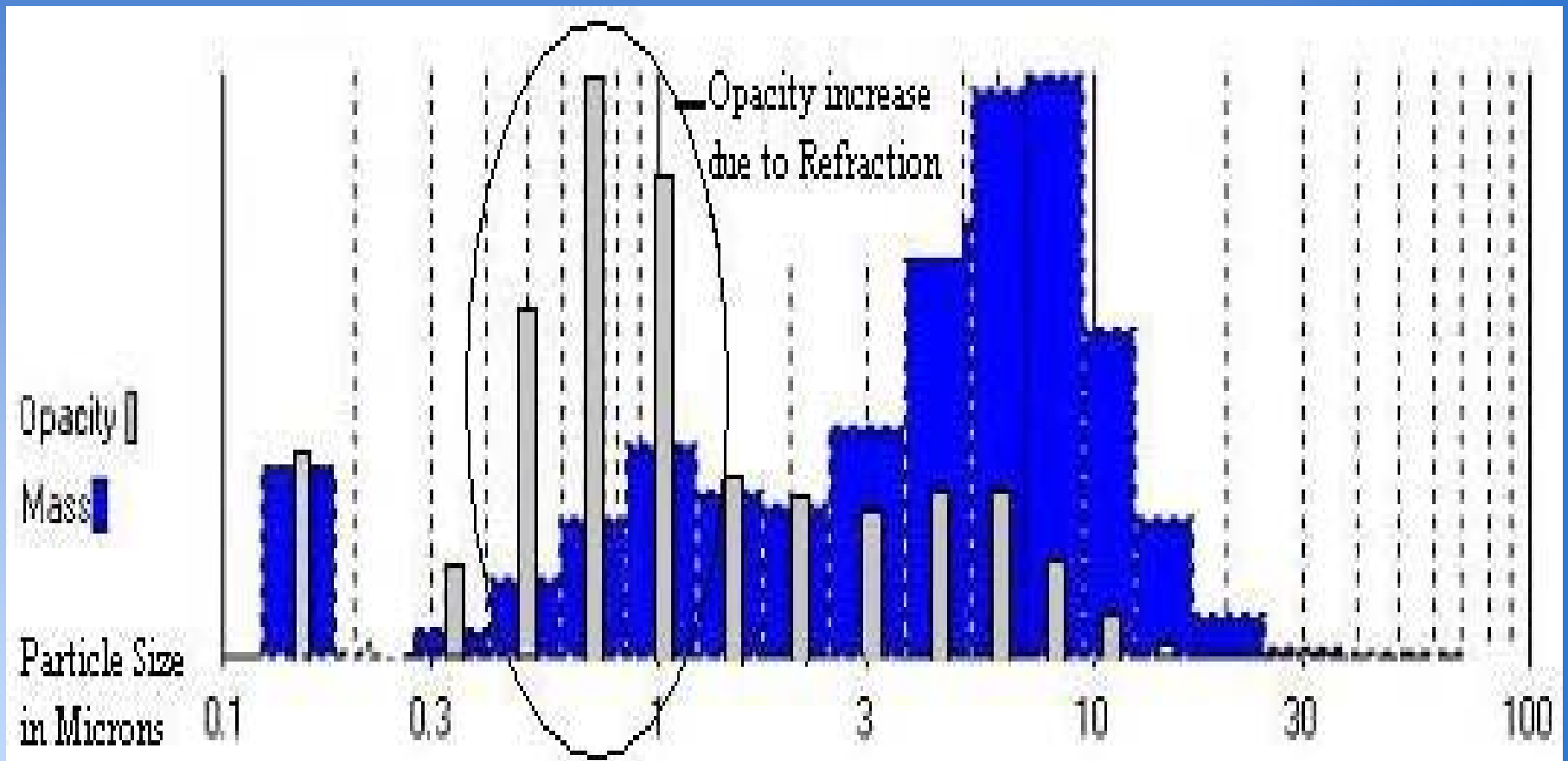
SIGMA

EHT=20.00 kV
10µm

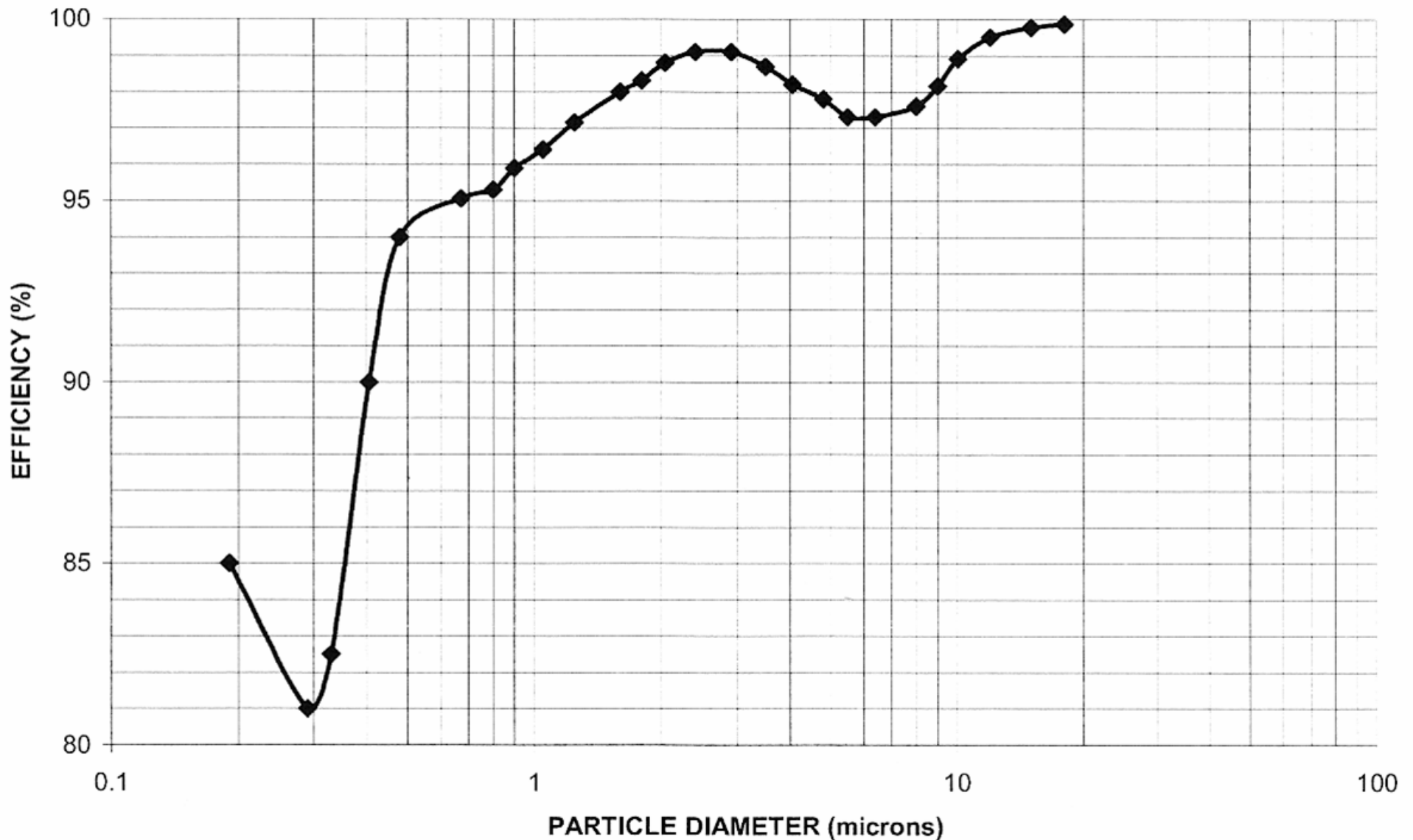
WD= 11 mm

Detector= SE1
Photo No.=5720

Typical Mass And Opacity Versus Particle Size At ESP Outlet



Measured Efficiency (EPRI)



The Indigo Agglomerator

- Installed in the ducts ahead of an ESP
- Treats the particles prior to entering the ESP
- Operates at normal duct flue gas velocity
- Uses a unique combination of bi-polar electrostatic and fluidic forces to bring the particles together.
- Once together Van der Waal forces keep the particles together. They do NOT come apart.

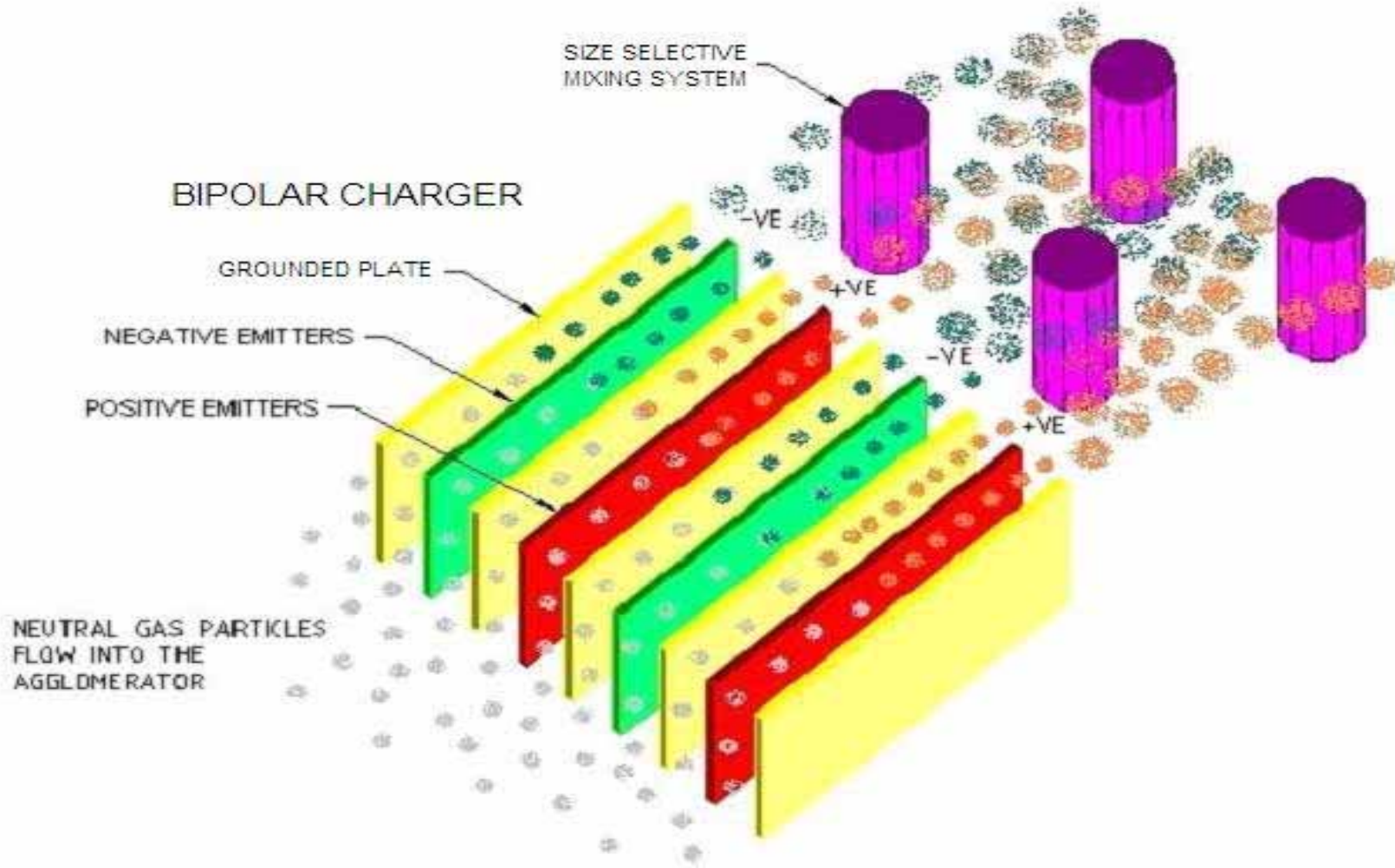


How Does the Indigo Agglomerator Work?

- **The Bi-Polar Charger charges half the dust positively and the other half negatively**
- **Fine negative particles are selectively mixed with the large positive particles and large negative particles with fine positive particles**
- **When a fine particle comes close to an oppositely charged large particle, it is attracted to and attaches to the large particle**



THE INDIGO AGGLOMERATOR



TVA

Widows Creek

Unit #8



TVA Widows Creek Unit # 8

- **500 MW**
- **CE tangentially fired dual furnace boiler**
- **1,550,000 ACFM @ 300 °F**
- **Medium sulfur eastern bituminous coals**



APC Equipment

- **SCR for NO_x**
- **Wet limestone scrubber for SO₂ (2004)**
- **Original ESPs ahead of scrubbers were eliminated to make room for refurbishment of older scrubbers**
- **New scrubbers supposed to control particulate matter in venturi stage**
- **Flue gas reheat to ~ 180 °F – dry stack**



Opacity Problems

- **January 2004 start up of new scrubbers**
- **Opacity issues due to**
 - **SO₃ emissions**
 - **Particulate emissions**
 - **Neither controlled effectively by scrubbers**



SO₃ Emissions

- Inject hydrated lime
- Additional particulate to scrubbers
- Higher utilization with finer grind
- Lower opacity due to SO₃ removal
- Somewhat offset due to more particulate



Particulate Emissions

- **Scrubber modifications to enhance particulate removal efficiency**
- **Added pressure loss for higher particulate collection efficiency**
- **Limited fan capacity limited ability to increase particulate removal**



Agglomerator Solutions

- **Agglomerate finer particles**
- **Enhance scrubber efficiency on particulate removal**
- **Reduce fine particle penetration through scrubbers that contribute significantly to high opacity**
- **Potential to increase lime utilization due to fluidic mixing in Agglomerator**



TVA Alternatives

- **New dry ESP with long duct runs to where ESP could be installed. No room in existing configuration of back end pollution control equipment.**
- **New wet ESPs with exotic materials and additional water treatment requirements**
- **AN INDIGO AGGLOMERATOR IS THE COST EFFECTIVE SOLUTION**



TVA Widows Creek Unit #8 Agglomerator Project



Project Scope

- One Agglomerator on 1 of 4 gas paths
- D path
- 125 MW equivalent
- 550,000 acfm
- Equipment only supply
- Duct modification required
- TVA's construction alliance partner did installation



Project Schedule

- October 2006 award of contract
- Scheduled outage March 31
- Outage moved forward to March 10
- 21 day outage
- Installed in 3 pieces
 - Expansion transition
 - Agglomerator charging section
 - Agglomerator mixing section















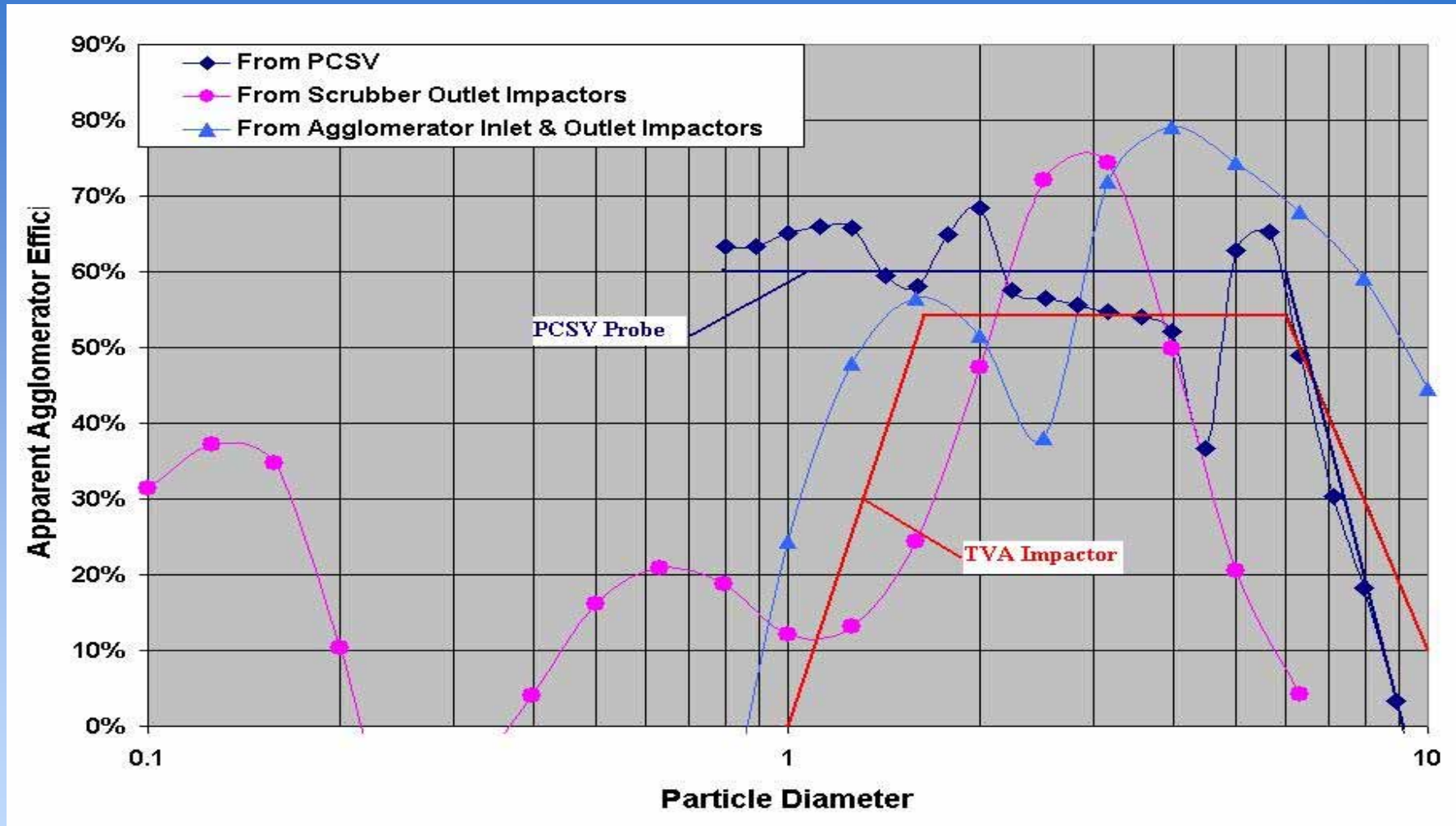




Test Results

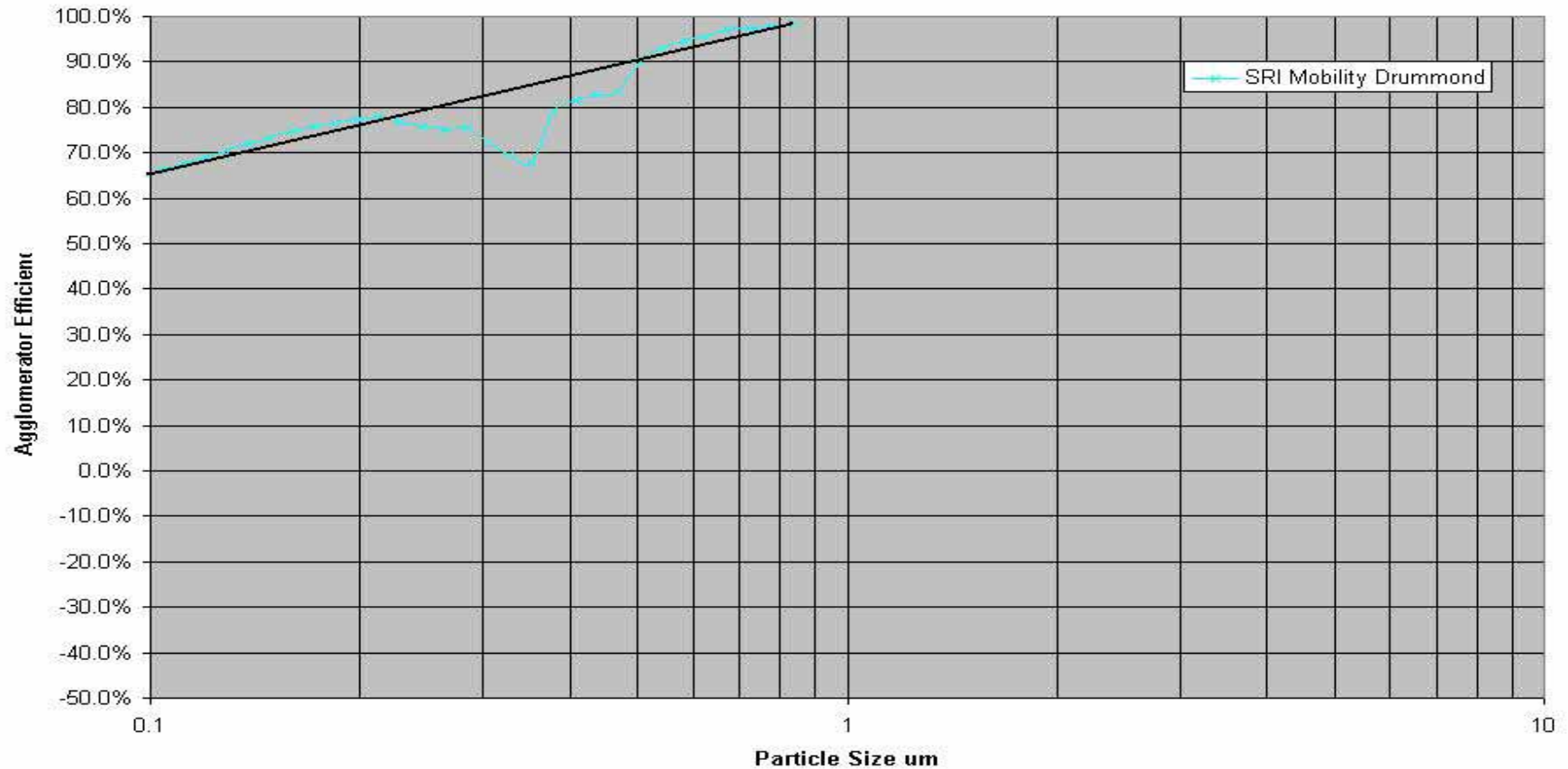


Widows Creek Test Results

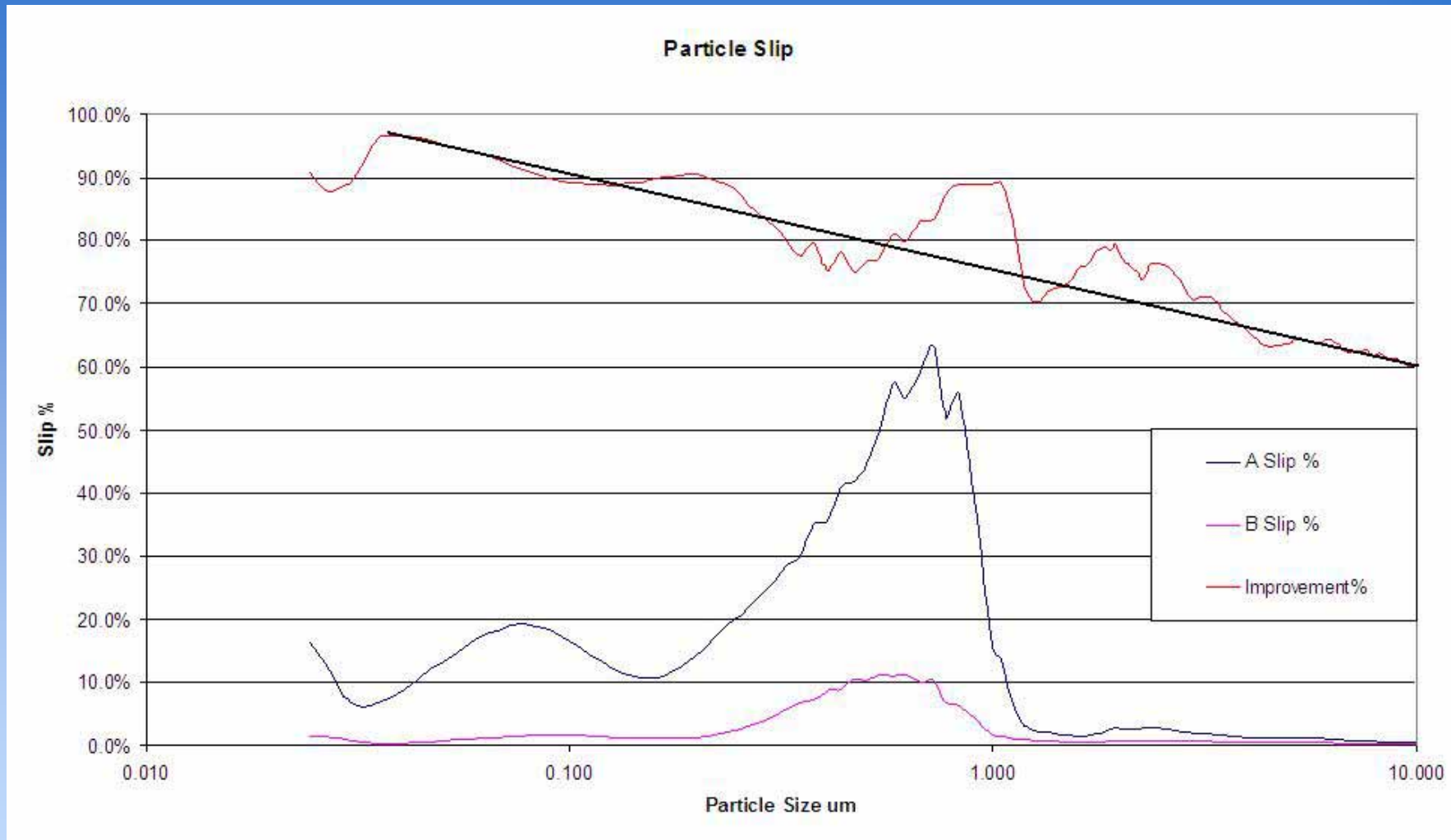


Plant Watson Test Results

Plant Watson Agglomerator Efficiency Tests



Dust Emission vs Particle Size



Hammond Electrode Frame



Watson vs WC

- Coal
- Lime injection
- Agglomerator design differences
- Test methodology



Thank You!

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