WET ELECTROSTATIC PRECIPITATORS
FOR GAS CLEANING IN SULFURIC ACID
PLANTS

PRESENTED AT:
IX MESA REDONDA DE PLANTAS
DE ÁCIDO SULFÚRICO
ANTOFAGASTA - CHILE
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BY
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ACID MIST PRECIPITATOR
APPLICATIONS

• Non Ferrous Smelters - Metallurgical Acid Plants
  - Copper
  - Zinc
  - Lead
  - Nickel
  - Molybdenum
  - Zirconium
  - Gold

• Spent Acid Recovery
• Power Boilers - Heavy Oil & Coal
WESP COLLECTS

- Sub-Micron Dust and Acid Mist
- Heavy Metals- As, Pb, Zn, Cd, Other Metals
- Condensed Hydrocarbons
- Tail Gas Cleaning - Visible Emissions

ADVANTAGES OF WET ELECTROSTATIC PRECIPITATOR

- High Efficiency Collection Of Submicron Particulate, Mist and Aerosols
- Low Pressure Loss
- Open Tubes - Not Easily Plugged
- WESPs Not Affected By Dust Resistivity
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WET ELECTROSTATIC PRECIPITATOR
DESIGN COMPARISON

• SHORTER TUBE LENGTH
  - Easier to maintain Ionizer alignment and easy to clean

• MECHANICALLY STRONGER
  - RIGID MAST ELECTRODES AND FRAMES do not swing and move to affect ESP performance

• ISOLATED INSULATORS
  - No stabilizing insulators at the bottom in gas stream

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PRECIPITATOR EFFICIENCY

• \( E=1-\exp[-(A/F)w] \)

• \( E=1-\exp[-(V_c \ V L/dc^2 \ d v)] \)
EFFICIENCY vs. POWER INPUT

Tubular Electrostatic Precipitator Performance at Corona Power Levels of (1) 200, (2) 400, and (3) 1000 watts per 1000 CFM.

COMPARISON OF COLLECTOR GEOMETRY

Precipitator Configurations:
- Plate
- Round Tube
- Square Tube
COMPARISON OF COLLECTOR SHAPE & COLLECTION AREA

ESP COLLECTOR SHAPE

RELATIVE SIZE
( FOR SAME % AND FLOW RATE )

1
1/2
5/8
3/4

Ionizer Construction

Corona
Grounded Plate
Ionizing Wire

Corona
Grounded Plate
Ionizing Points
MATERIAL OF CONSTRUCTION

• LEAD
  - Long History Of Use In Sulfuric Acid Service.
  - Poor Mechanical Properties.
  - Requires Expertise In Lead Burning.
  - Toxic Metal Exposure During Maintenance and Repair.
  - Corrosion From Acids With Chlorides And Fluorides.

• METAL ALLOYS
  - Electrically Conductive
  - Temperature Resistant.
  - Excellent Mechanical Properties.
  - Varied Corrosion Resistance.
  - High Cost.

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PRENW = %Cr + 3.3 x %Mo + 1.65 x %W + 16 x %N
MATERIAL OF CONSTRUCTION

- **THERMOPLASTICS**
  - Highly Corrosion Resistant.
  - Poor Mechanical Properties At Increased Temperature.
  - Not Electrically Conductive.
  - Subject To Carbonizing And Ignition To Electrical Shorting.
  - Requires Water/Acid Film To Ground WESP.
  - Grounding Problems.

- **CONDUCTIVE FIBERGLASS REINFORCED PLASTICS (CFRP)**
  - Highly Corrosion Resistant.
  - Good Mechanical Properties.
  - Electrically Conductive – Homogeneous
  - Does Not Require Water/Acid Film To Ground WESP.
  - Fire Retardant And Thermally Robust.
  - Cost Effective.

WET ESP CONFIGURATIONS

- WESP-STAND ALONE
- WESPs IN SERIES
- WESPs IN PARALLEL
- TWO PARALLEL TRAINS EACH TRAIN HAS TWO WESP IN SERIES
Coal Fired Power Station
Beltran WESP
In Bowater Halla Paper Co.

Beltran WESP
Heavy Oil Fired Power Station
In Petrochemical Plant

WESP OFF

WESP ON
CONCLUSIONS

The application of the BELTRAN Wet Tubular Electrostatic Precipitator demonstrates that:

- High Levels of gas cleaning requirements can be achieved for acid mist, dust, and metals.
- Sub-micron acid mist and particulates resulting in high opacity can be removed.