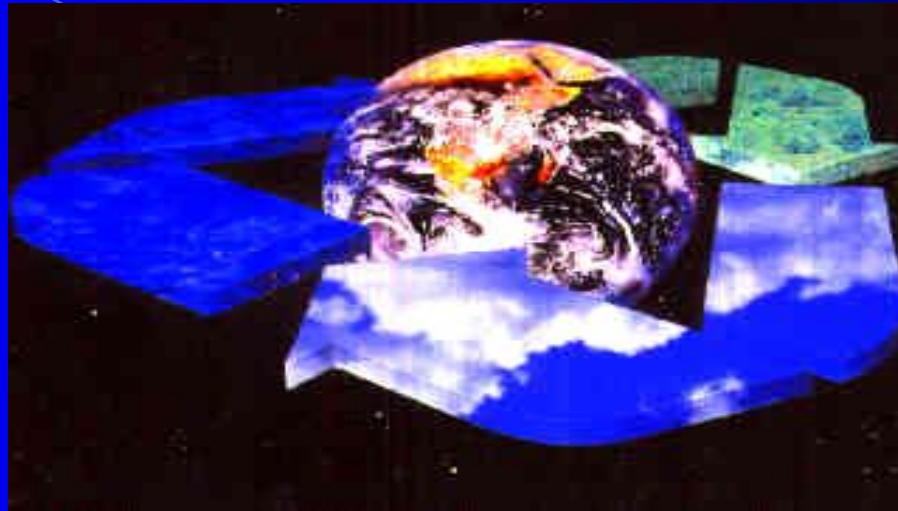


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# Electrostatic Precipitator in Power plants and Gasifiers



**Beltran Technologies, Inc.**

1141 East 35 Street  
Brooklyn, N.Y. 11210

## Markets – Applications & Locations

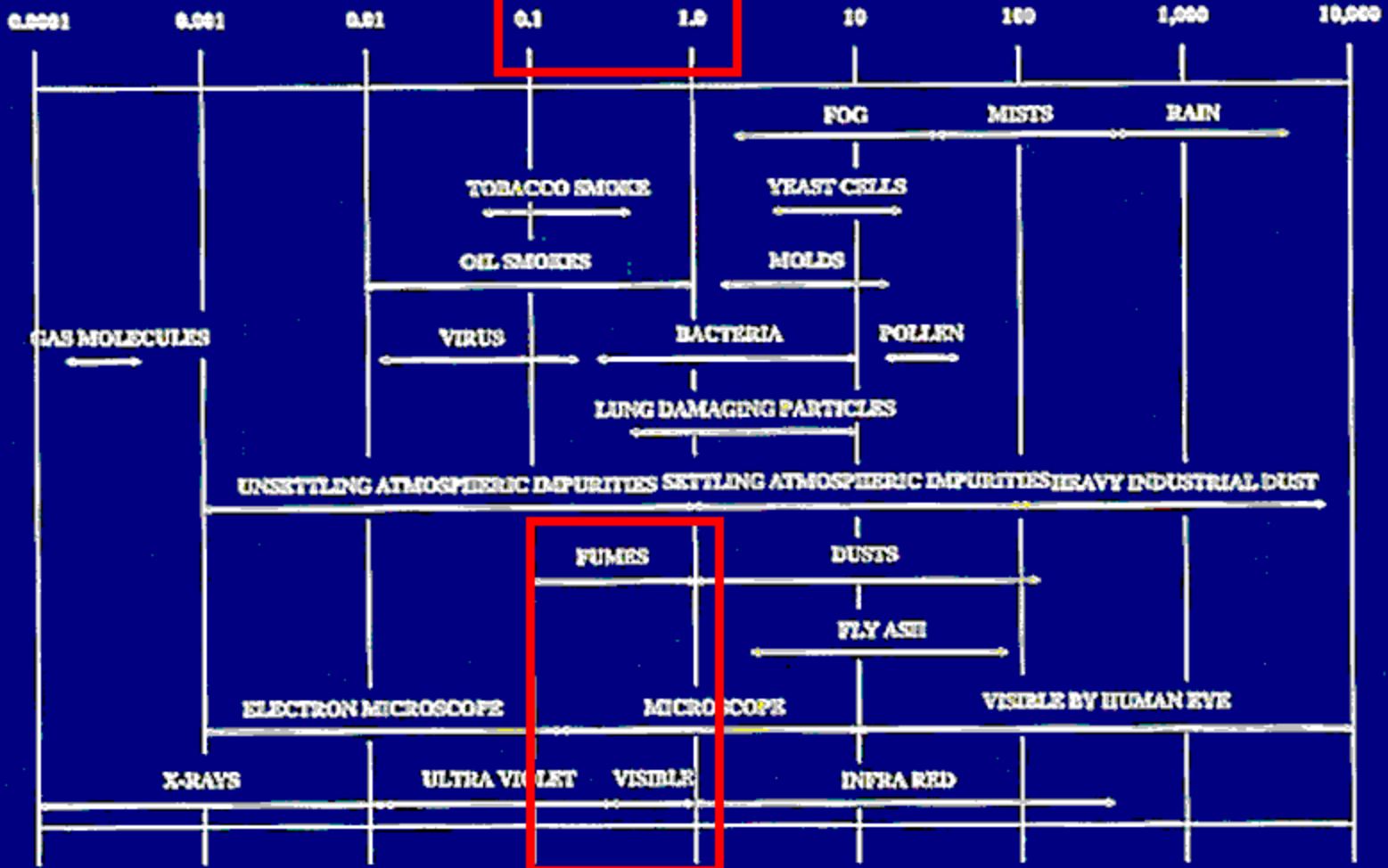
- Acid Mist Collection – Titanium Dioxide
- Non Ferrous Smelters – Copper, Zinc, Nickel, Molybdenum, Zirconium, Gold
- Spent Acid Recovery
- Power Boilers
- Incinerators- Haz. Waste, Sewage Sludge
- Gasification
- Steel & Coke
- Automotive Spray Paint Finishing
- Chemicals & Pharmaceuticals
- Pulp & Paper
- North & South America, Europe, Asia and Africa

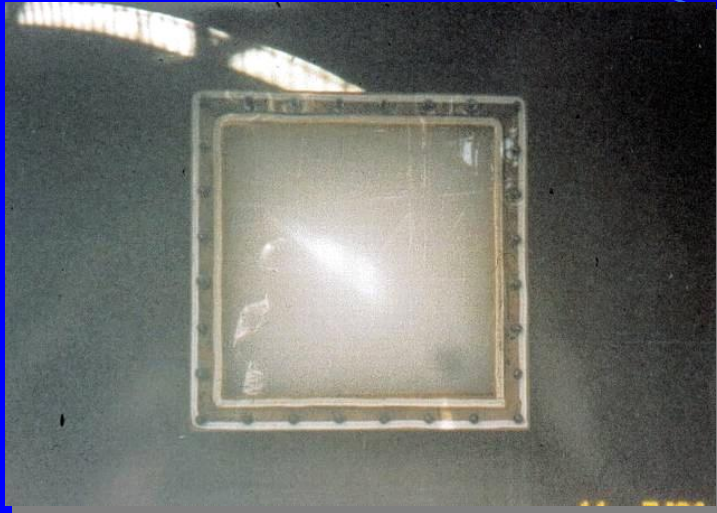




- **Sub-Micron Particulate Emissions**
  - **Visible Emissions**
  - **Air Toxics ( HAP) Emissions**
  - **Hydrocarbon and Odor Emissions**
  - **Acid mist**
-

# PARTICLE DIAMETER, MICRONS - LOGARITHMIC SCALE





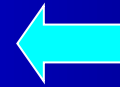
Acid mist before WESP

Clear gas after WESP





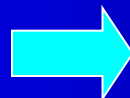
# BELTRAN TECHNOLOGIES, INC.



WESP OFF



WESP ON



# Precipitator Efficiency

$$E = 1 - \exp[-(A/F)W]$$

Where

**A = collector area**

**F = Gas flow**

**W = Particle migration velocity**

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Precipitators work by charging particles.

Particles are charged in two ways:

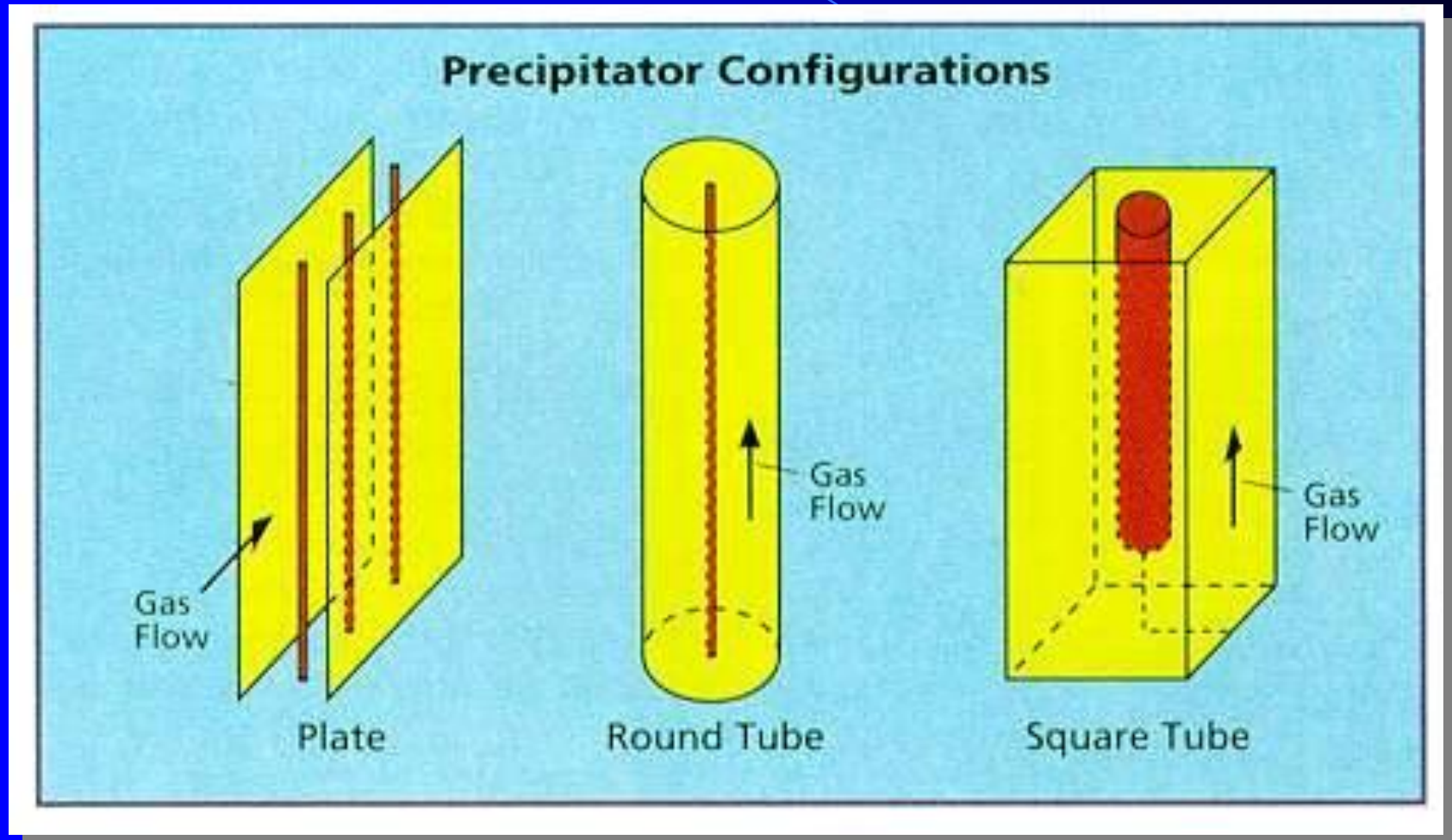
Field Charging where the particles enters an electric field containing ions. The ions exchange their charge with the particle. Field charging works best with larger particles.

Diffusion Charging where brownian movement results in an ion bumping into a particle allowing the ion to exchange it's charge with the particle. Diffusion charging works best with fine particles.

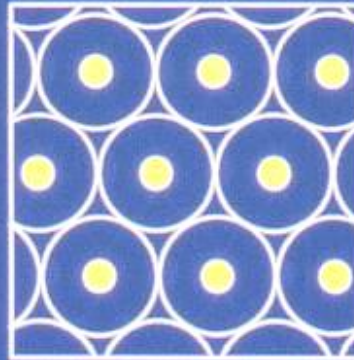
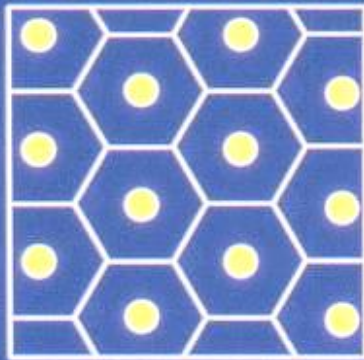
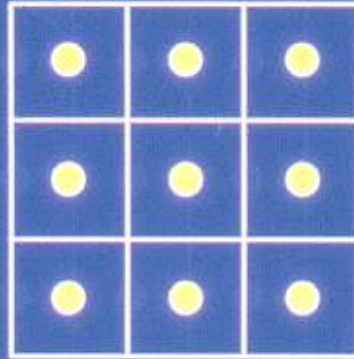
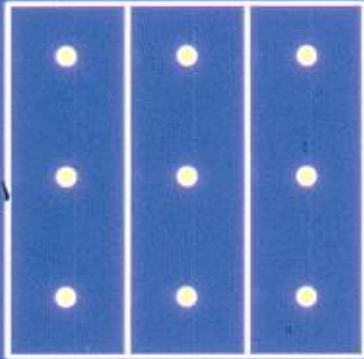
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# Comparison Of Tube Type



### ESP COLLECTOR SHAPE

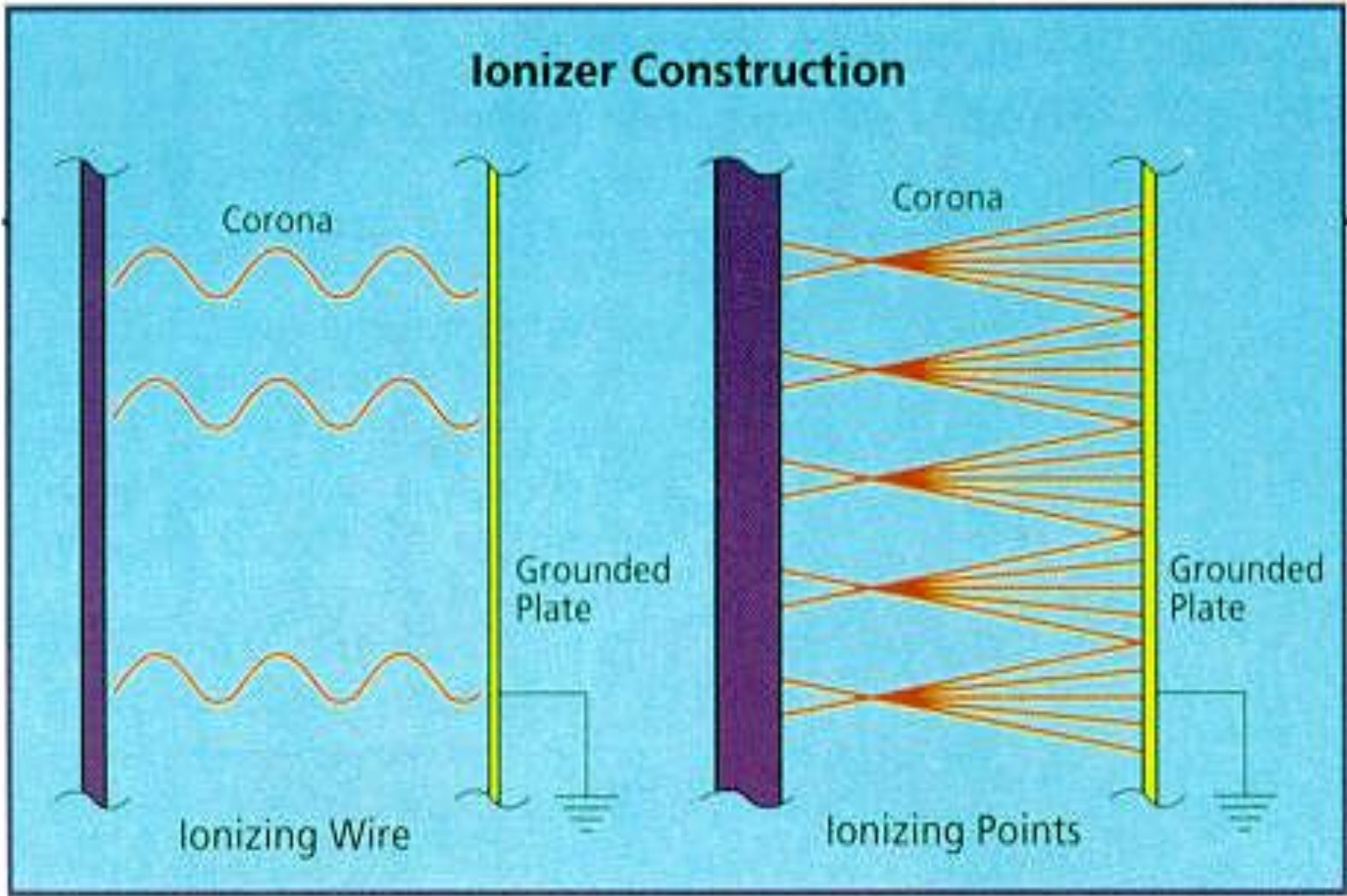


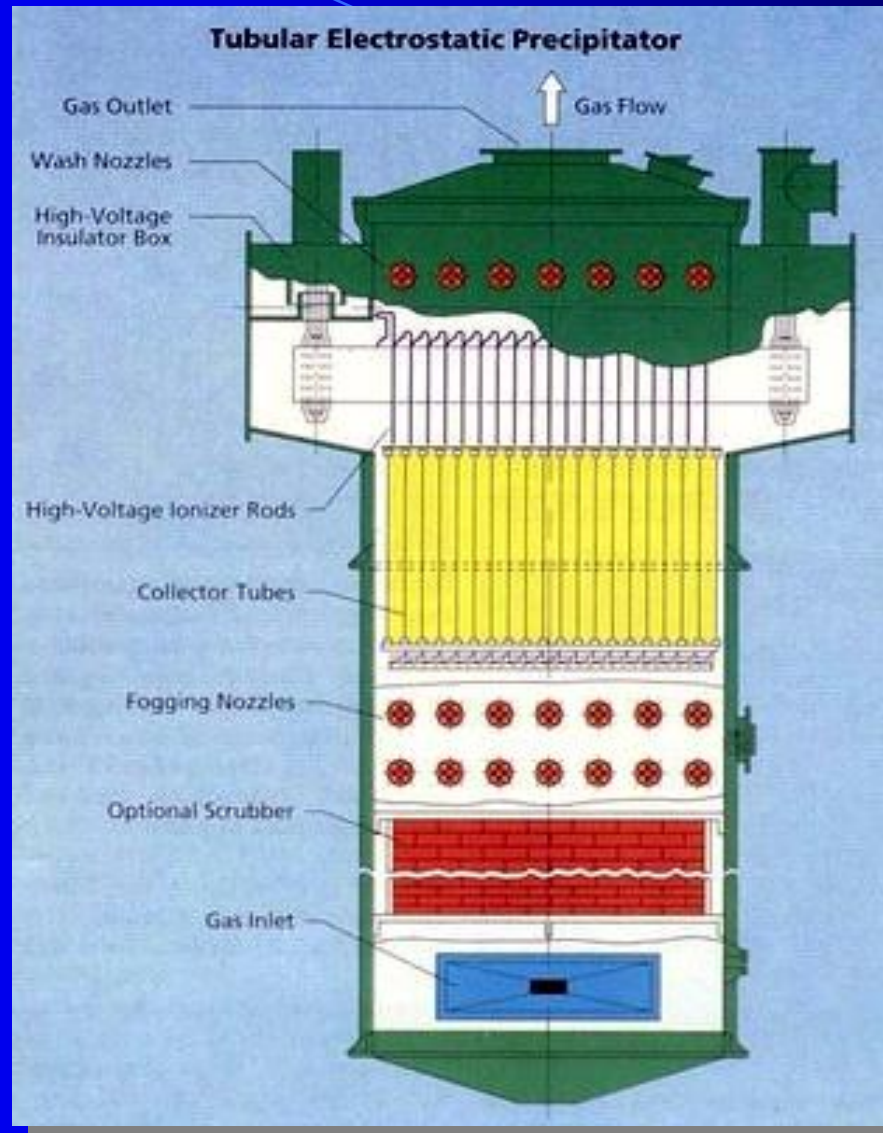
### RELATIVE SIZE (for same % and flow rate)





### Ionizer Construction





# Wet Electrostatic Precipitator

## Design Comparison

- **CORROSION RESISTANT DESIGN** –  
Corrosion resistant alloy, FRP, and lead.
  - **SQUARE TUBE** vs. Round Tube -  
More Efficient Use of Space  
No wasted space, both inside and outside of tubes can be utilized with Beltran design
  - **SHORTER TUBE LENGTH** –  
Easier to maintain Ionizer alignment
  - **CONDUCTIVE FRP** over PP tube -  
Does not rely on water film for grounding, withstand temperature excursions better.
-

# Wet Electrostatic Precipitator

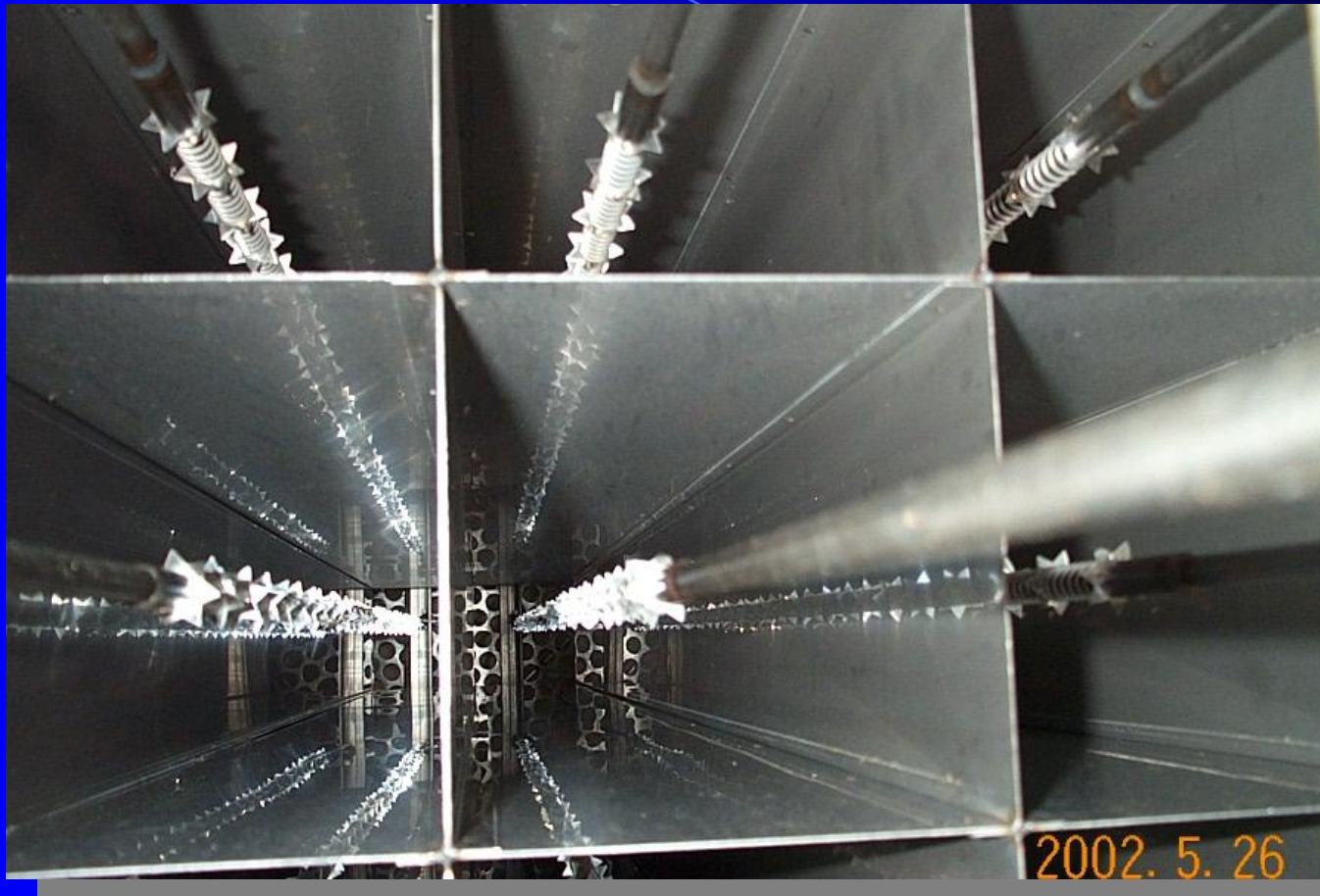
## Design Comparison

- **RIGID MAST ELECTRODES** -  
From alloy or lead.
  - **MECHANICALLY STRONGER** –  
Easy to clean, more corona discharge points per rod
  - **RIGID FRAME** –  
Does not elongate and move to affect ESP performance
  - **ISOLATED INSULATORS** –  
No stabilizing insulators at the bottom in gas stream
-



# BELTRAN TECHNOLOGIES, INC.









**Beltran WESP:  
in Bowater Halla Paper Co.**



**Beltran WESP: Heavy oil fired  
power station in petrochemical plant**



**10 WESPs cleaning smoke from stacks at  
Coal Fired Power Station  
CESC - INDIA**

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# CONCLUSIONS

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

- ✓ Tough particulate regulations can be easily complied with by this design.
  - ✓ Sub-micron particulates resulting in high opacity can be removed.
  - ✓ FRP WESPS effectively combine corrosion protection with high efficiency.
-