

The logo for CECO, featuring the letters 'CECO' in a bold, blue, sans-serif font. Each letter is composed of three horizontal bars, giving it a stylized, industrial appearance. The background of the entire slide is a dynamic image of water splashing, with a blue sky and white clouds at the top and a green gradient at the bottom.

CECO

ENVIRONMENTAL

Wood Bioenergy

Fisher Klosterman

Ultra Efficiency Cyclones

*Global Market Leader in Air Pollution Control,
Power and Fluid Handling Technology*

Fisher–Klosterman: Founded in 1947

- Custom design for gas absorption and particulate filtration of cyclones, scrubbers, pulse jet collectors, condenser/coolers and systems
- Over 67 years of installed base
- Engineering – Difference by design.
- Guaranteed Gas Cleaning Technology

Partial Wood Products Customer List

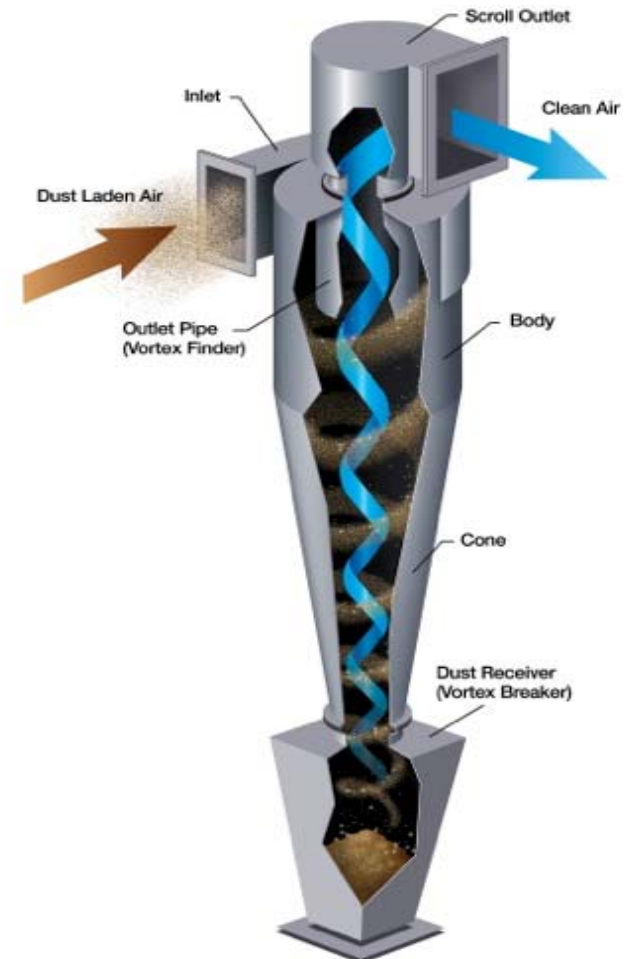
Georgia Pacific	Langboard
Louisiana-Pacific	West Fraser
Weyerhaeuser	Plum Creek
Temple Inland	Flakeboard
Boise Cascade	New England Wood Pellets
Norbord	Fram Renewable Fuels
Masonite	Miles Lumber
Roseburg Forest Products	Gulf Lumber

ADVANTAGES OF A CYCLONE

- Often the most economical form of gas/particle separation
- Simple to operate and maintain
- No moving parts
- Severe Service Design:
 - High pressure/vacuum, High temperature, Erosion, Corrosion, explosive dusts, etc.
- No product contamination

CYCLONE ANATOMY

- Two main factors determine cyclone efficiency
 - How quickly the particle moves towards the wall or collection area of the cyclone where it is theoretically collected
 - The length of time available for collection: **Residence Time**
- Two main factors describe cyclone performance
 - Pressure drop
 - Fractional efficiency curve (FEC)



PERFORMANCE

- **GUARANTEED EFFICIENCY – How?**
 - Empirical Testing
 - Aerodynamic Particle Sizing –
 - Why not use a sieve analysis?

DATA REQUIRED FOR CYCLONE DESIGN

Mechanical

Temperature, pressure, corrosion allowance, MOC, paint requirement, etc

Process (Performance)

Gas flow, temperature, pressure, gas density, viscosity, particle specific gravity, particle loading, efficiency

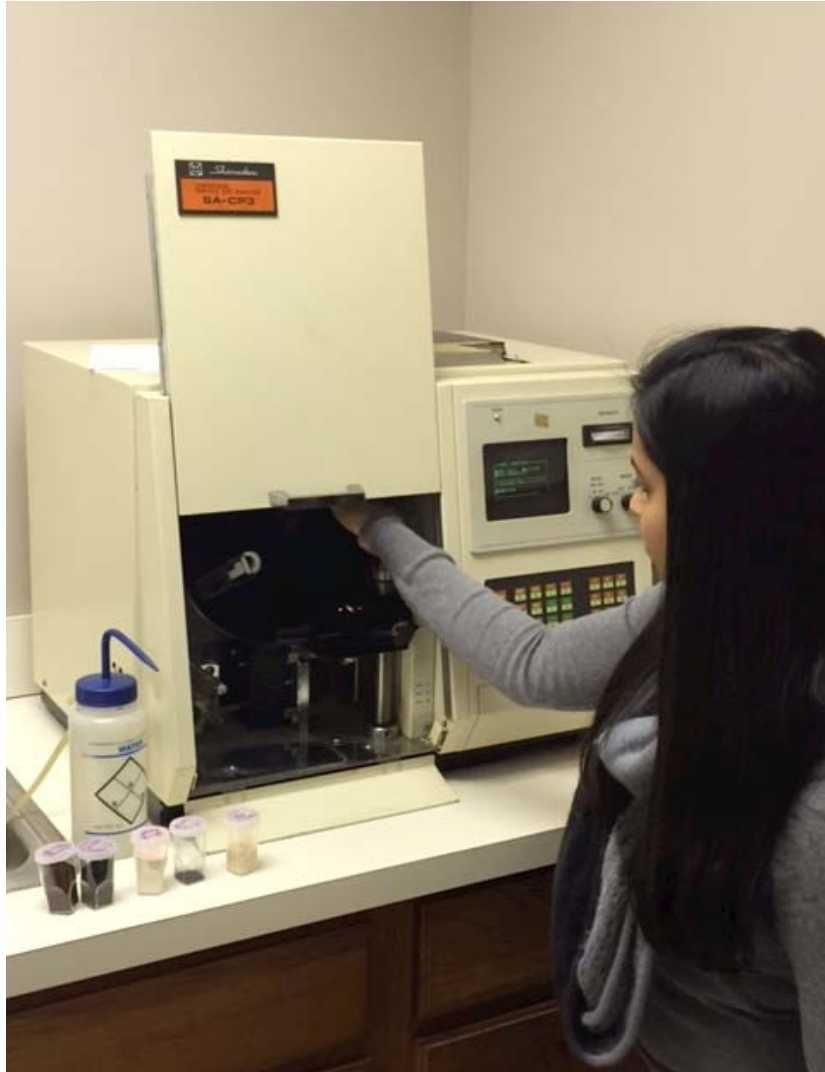
Importance of Aerodynamic Particle size distribution
(BAHCO micro classifier, liquid sedimentation, cascade impaction)

FKI Lab Capabilities in Louisville, KY

SIEVE ANALYSIS

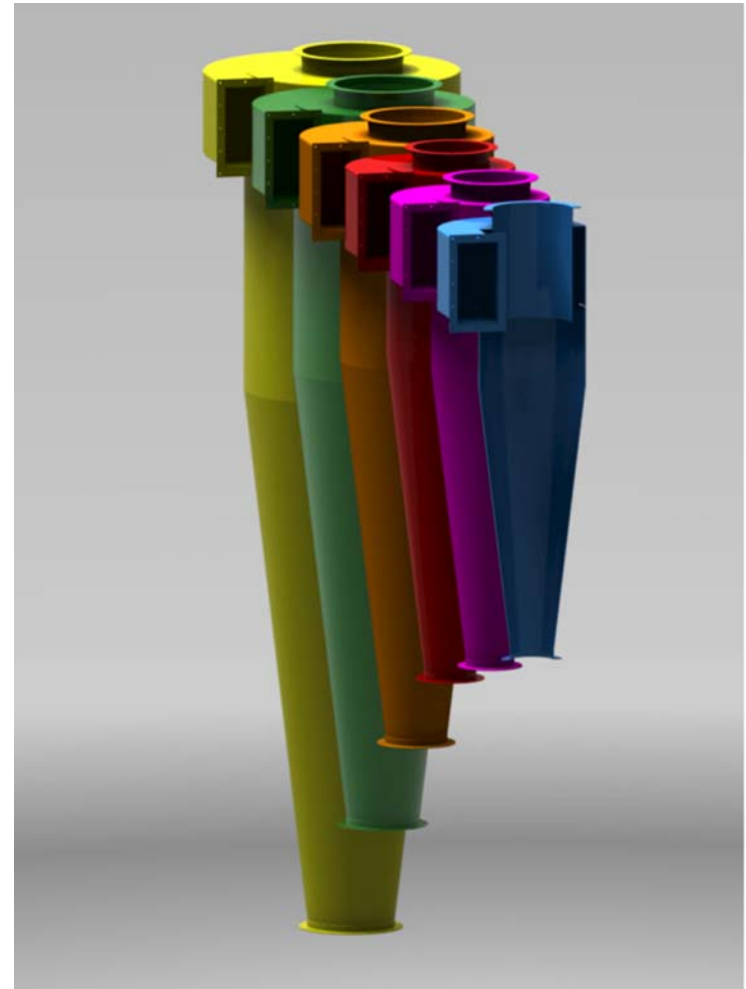


Guaranteed Performance Aerodynamic Particle Size Analysis

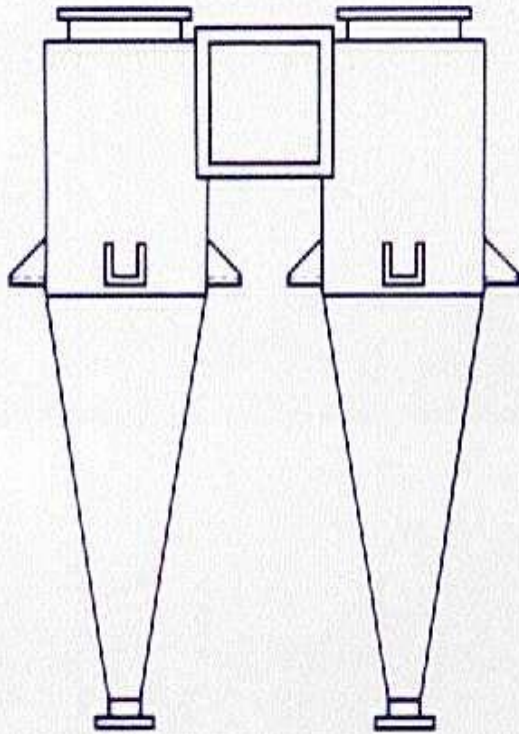


XQ SERIES

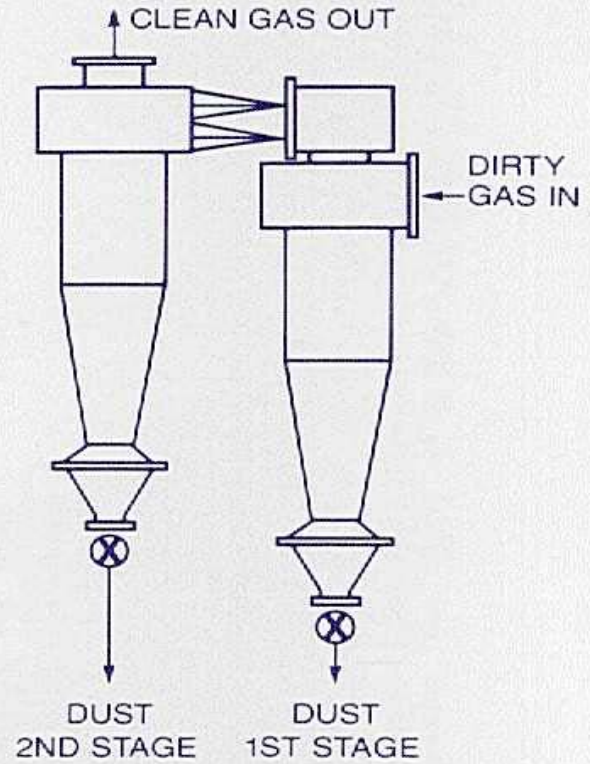
- Seven Models
- Multiple Arrangements
- Optimization for Performance & DP Limitations
- Customization
- High Pressure / Temp
- Alloy Construction
- Abrasion & Corrosion Resistant Linings



ARRANGEMENTS



PARALLEL CYCLONES



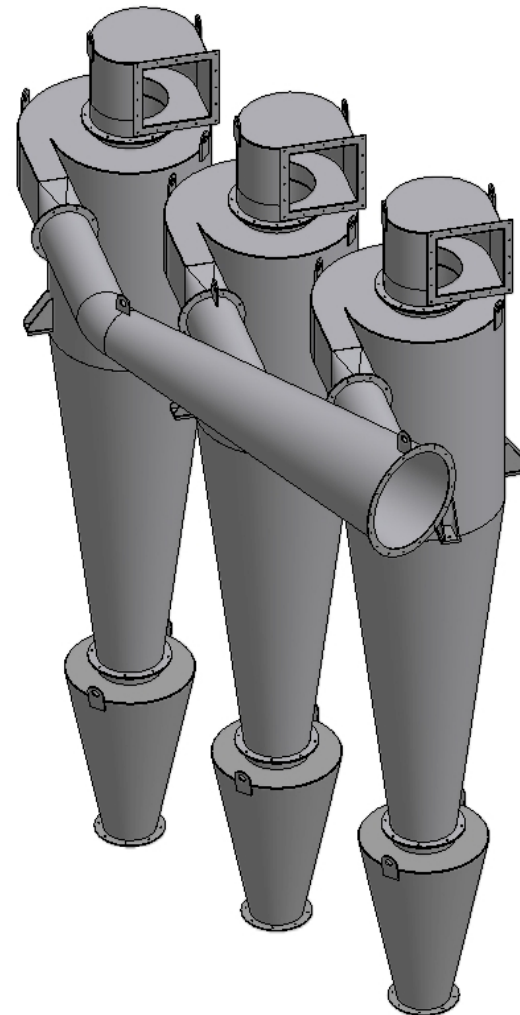
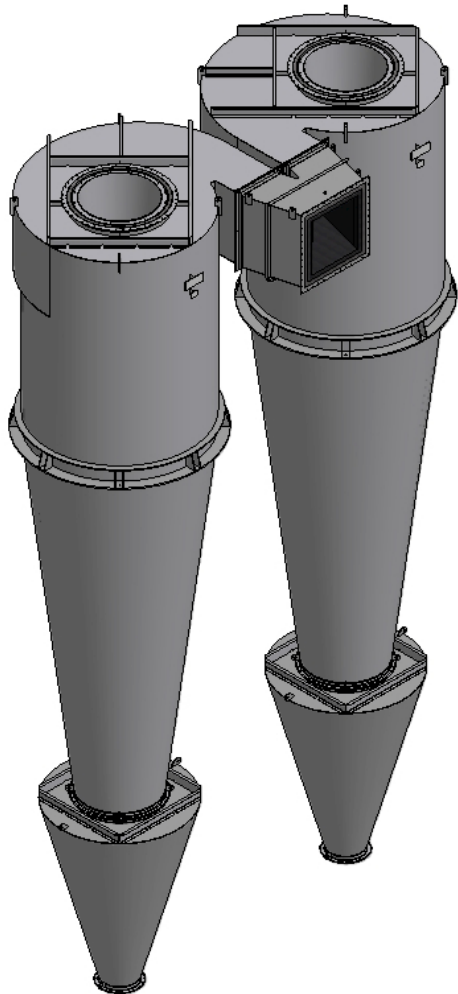
CYCLONES IN SERIES

FISHER-KLOSTERMAN
SEM-TROL

A CECO Environmental Company

CECO
ENVIRONMENTAL

ARRANGEMENTS



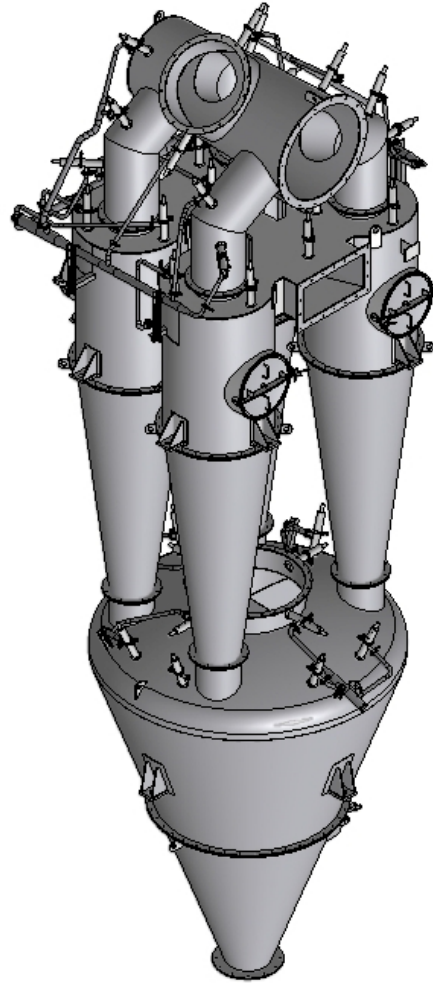
A Global Leader Providing Air Pollution Control Technology

FISHER-KLOSTERMAN
EMTROL

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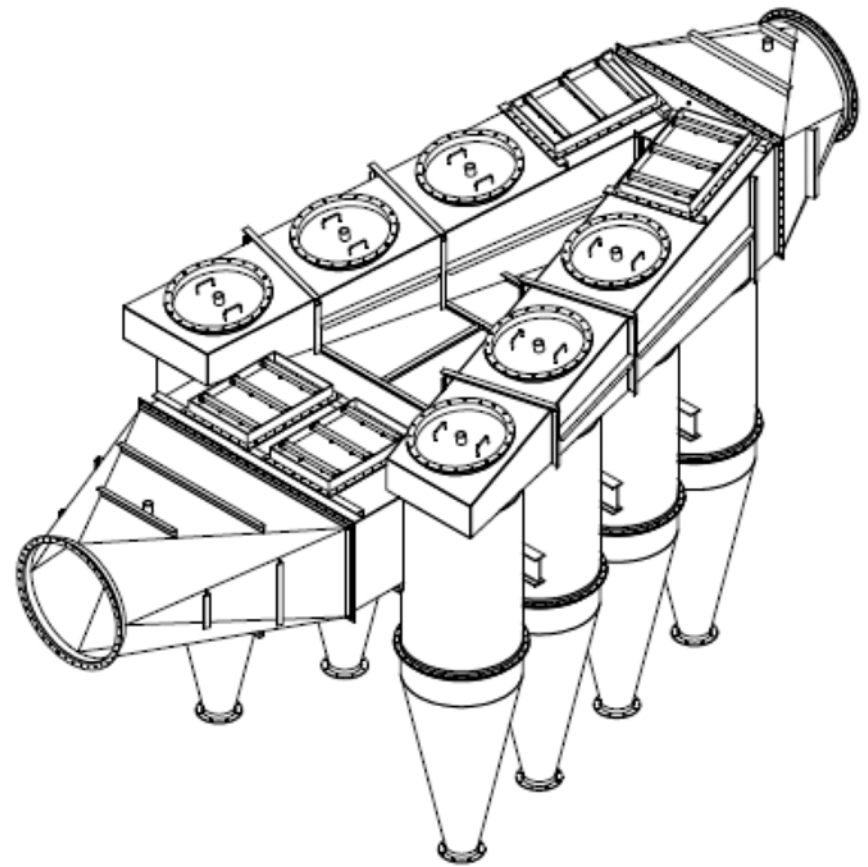
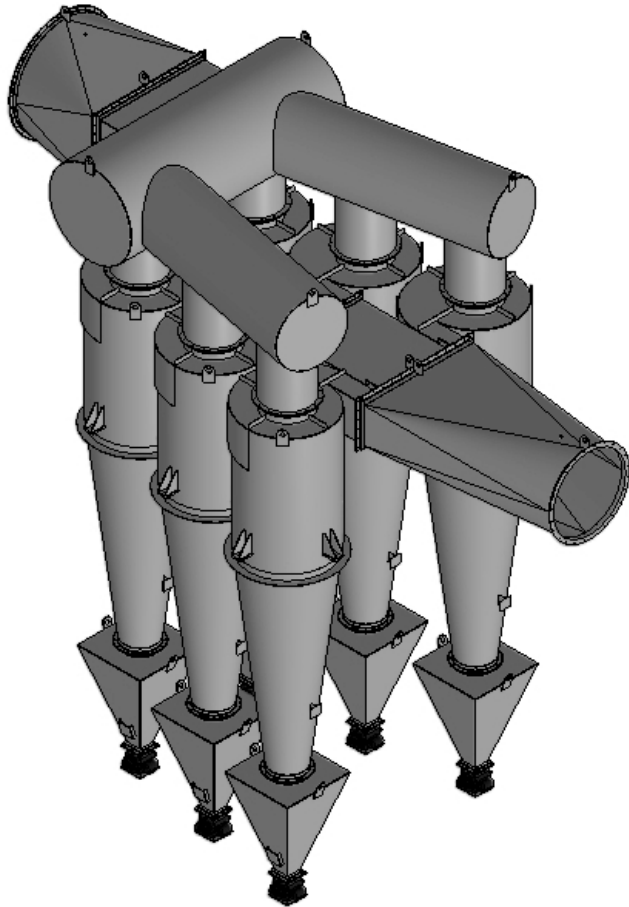
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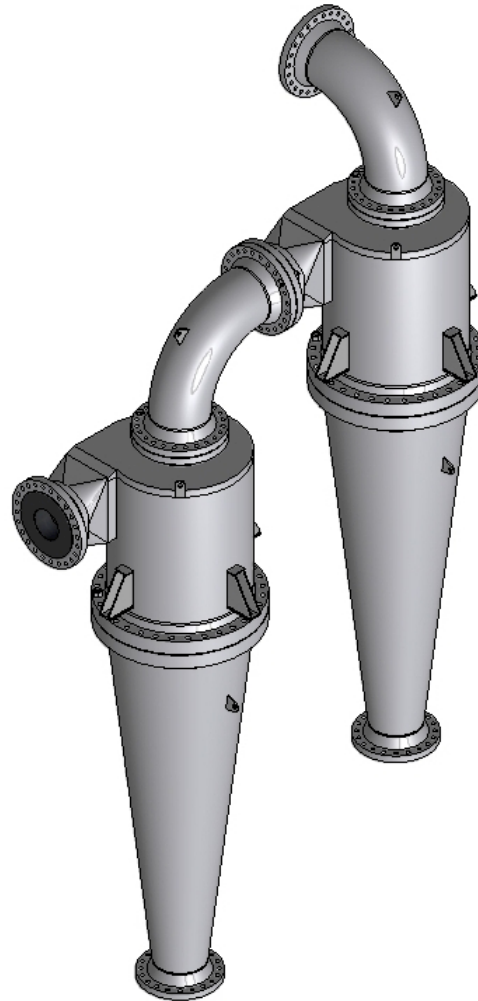
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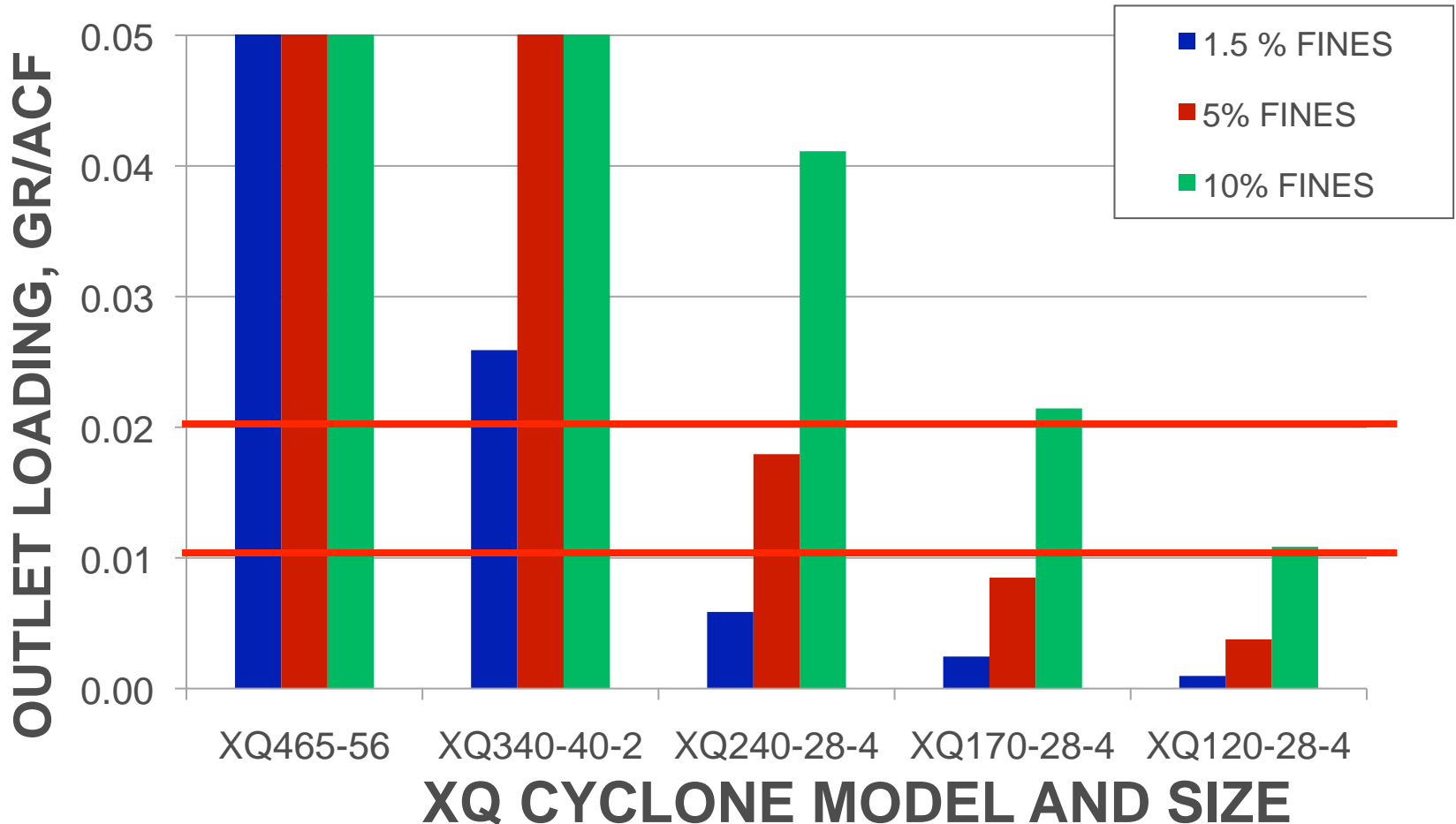
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ARRANGEMENTS



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PLANER SHAVINGS, 40,000 ACFM & 30,000 LBS/HR



NFPA DESIGN

- Cyclones are different from Baghouses
- Finite Vent Area
- Flame Length, L/D Ratio, Vessel Volume
- Higher Pred (Pdes)
- Dust Receiver Venting
- Chemical Suppression





Steel Mill - Indiana

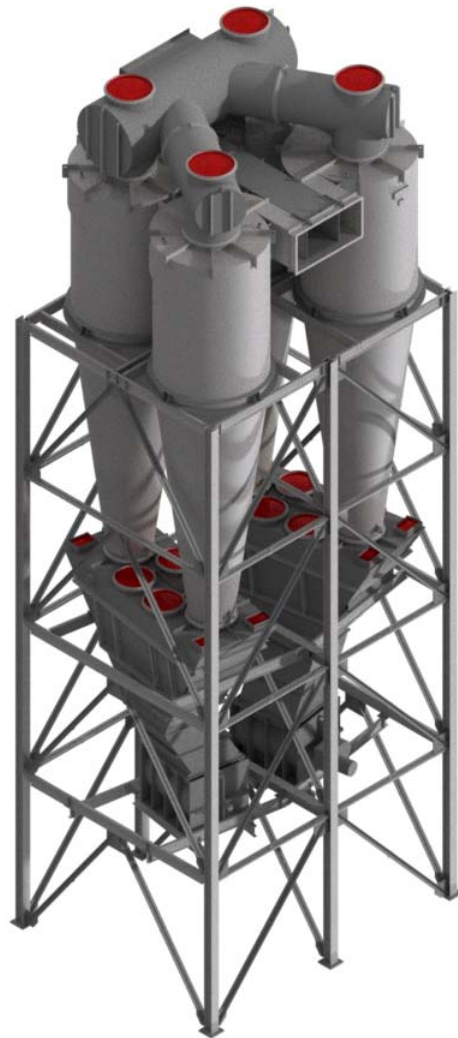
- DRI Dust
- QUAD Cyclone
- Tile Lining
- Ex Vents
- Chem. Isolation
- System design & Install with K&B

NFPA DESIGN



Metal Dust

- XQ340
- Custom Receiver
- Ex Vents
- CO2 Nozzles
- Airlock,
Stand, Drum Kit
- System Startup



Planer Mill

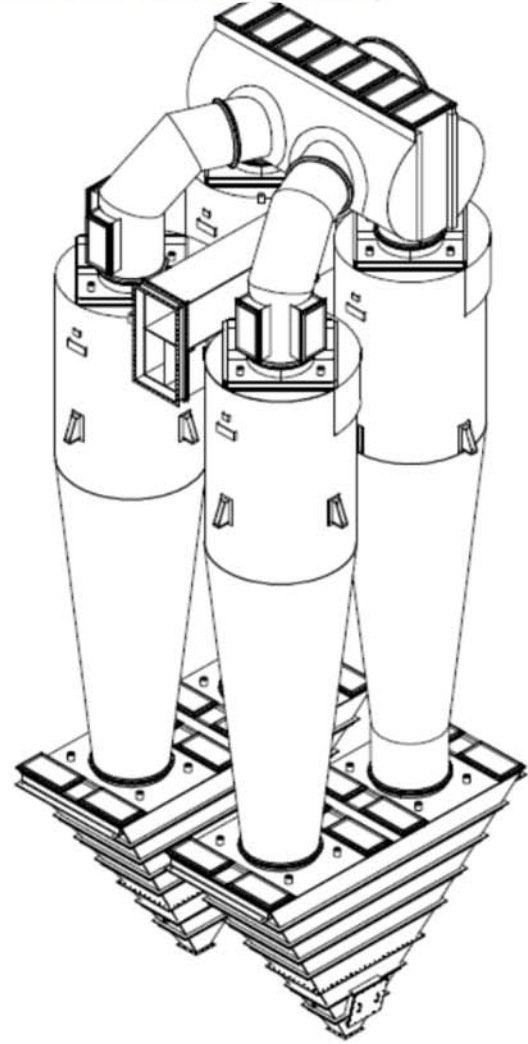
- NFPA Vented
- 99.99%+ Eff.
- Meets EPA Emissions
- 60,000 ACFM
- 75 TPH

**FISHER-KLOSTERMAN
SEMTRON**

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HIGH EFFICIENCY

CECO
ENVIRONMENTAL



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**FISHER-KLOSTERMAN
SEMTROL**

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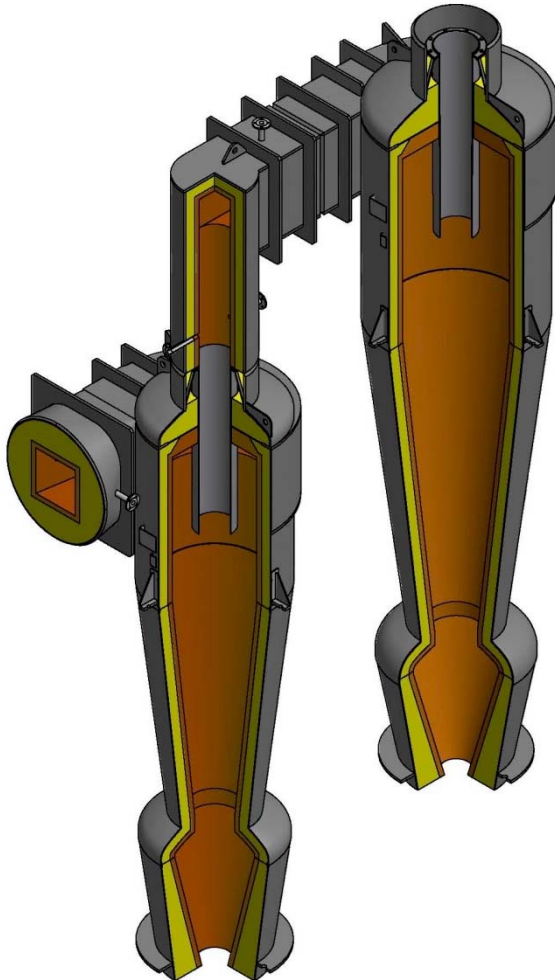


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GASSIFICATION

FLUID BED GASSIFIER

- Grass Pellets
- 1800 F, 10 bar
- Series Cyclones
- Dual Layer Refractory
- All welded connections



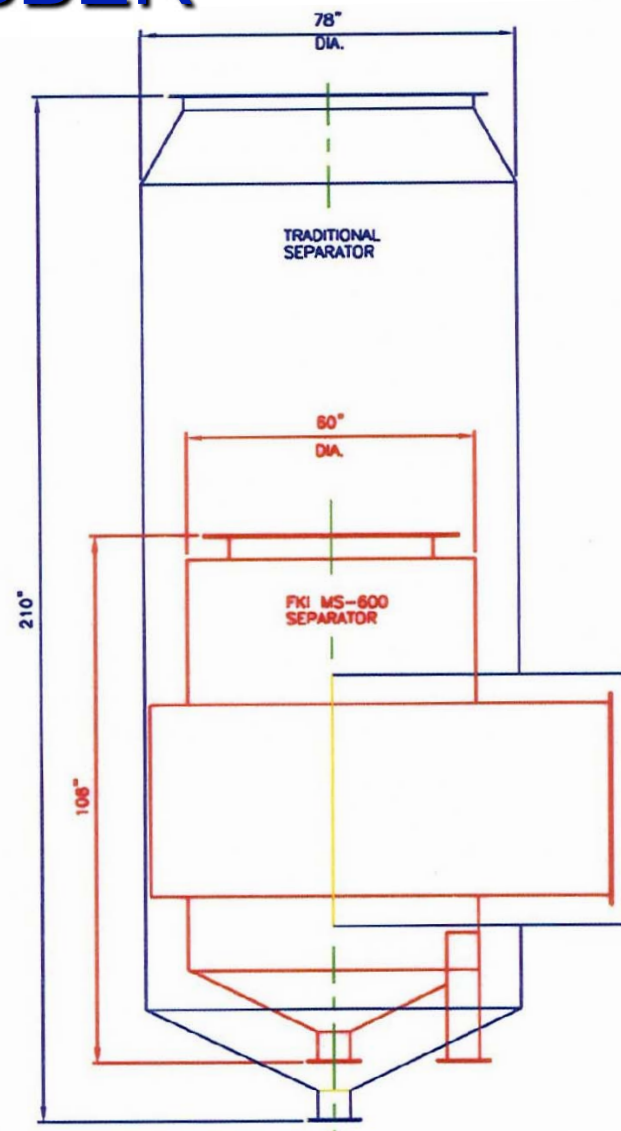
ISOMETRIC VIEW - SECTIONED



COAL CALCINER

- 275,000 ACFM
- 2,250 F
- 6-PACK
- Refractory Lined
- Suspended Alloy Outlet Pipe

MS SCRUBBER



MPS SCRUBBER



WHY

Fisher Klosterman?

Guaranteed Performance
Designed Per Application