CrossFlow Separators:

Maple Creek Coal Preparation Plant

An Overview
OUTLINE

- CrossFlow Separator
  - Introduction
  - Testing
  - CrossFlow: Coal
  - Advantages
What is the CrossFlow?

**Conventional**
- Feed
- Increased Velocity
- Constant Velocity
- Water
- Coarse
- Fines

**Cross-Flow**
- Feed
- Constant Velocity
- Water
- Coarse
- Fines
What is the CrossFlow?

- Separation Chamber
- Dewatering Cone
- Fluidization Water
- Underflow
- Feed Well
- Control Loop
- PID
- Overflow
- Feed
- Overflow
- Underflow
- Control Loop
- PID
- Feed Well

Eriez / Minco CrossFlow: An Overview
What is the CrossFlow?

The Eriez CrossFlow is a hydraulic teeter-bed separator used to upgrade minerals/coal based on size and SG (particles ranging from 0.2-4 mm).

The device operates based on the principle of hindered settling of solids against a rising water flow.
CrossFlow Separator

- Used as a classification device.
  - Exploits the different settling velocities between particles of varying size.

- Used as a gravity separation device provided size range is tight enough.
  - Exploits the density difference between particle types.

- Coal (1.2 from 2.7)
- Iron Ore (5.1 from 2.65)
- Heavy Minerals (5.0+ from 2.8)
CrossFlow Separator

**Hindered-Bed Separators:**

- Injection of Fluidization Water across the Base of the Separator.
- Suspends the Particles into a Teeter-Bed.
- Use Water Rate to Control Separation Cut-Point
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CrossFlow Testing: Sizing

High Classification Efficiency
Comparative Testing: Sizing

Feed Rate (tph/ft²) vs. Imperfection

- Conventional
- CrossFlow
Comparative Testing: Sizing

![Graph showing separation cut-point comparison between CrossFlow and Conventional methods.]
Comparative Testing: Gravity

- HM Recovery (%)

- Feed Rate (tph/ft²)

- CrossFlow
- Conventional
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Maple Creek Preparation Plant

- Maple Creek Preparation Plant is located in Pennsylvania USA.
- Crossflow Separator to replace Coal Spirals
- 7’ x 7’ Crossflow Separator Installed
- Operating at 100 t/h (Designed for 200 t/h)
Maple Creek CrossFlow (Coal)

PID Loop Controller
CrossFlow Test Results (As-Received)

- **Recovery (%)**
- **Product Ash (%)**

- **Combustible (Coal) - Pilot-Testing**
- **Combustible (Coal) - Full-Scale**
- **Mass (Yield) - Pilot-Testing**
- **Mass (Yield) - Full-Scale**
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CrossFlow Advantages vs. Spirals

- 12 Triple Stacks = 36 Separators
- All Must Operate at Same SG<sub>50</sub>
- Circulating Loads (Midds)
- Excessive Head Room
- Only 2-3 tph/start
- High Maintenance (cleaning)
- Manual Control (adjust splitters)

- One Separator/Small Footprint
- High Efficiency/One Cut-Point
- Low Operating Costs
- No Extraneous Piping
- High Capacity (4 tph/sqft)
- Low Maintenance
- Automatic Control
CrossFlow Advantages vs. Other Sizers

- Low Through-put (2-3 tph/sqft)
- Cannot handle swings in feed percent solids
- Possible plugging of orifice plates
- Poor control of water splits
- Low percent solids discharge leading to high valve wear

- High Through-put (up to 2x conventional separators)
- High Classification Efficiency
- Can handle large swings in volumetric feed flow rate
- No plugging, Low Maintenance
- Excellent control of water splits