Engineered Transfer Chute Technology
Air Flow Analysis and Dust Mitigation

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Transfer Chute Replacement - Project Description

- Rio Tinto North Antelope Mine, Near Gillette, WY
- Powder River Basin Coal
- One-to-One Belt Transfer
  - CV5 belt feeding onto CV6 belt
  - 72” Wide Belts at 1100 fpm
  - 6600 tons per hour capacity
- Eliminate Baghouse Dust Collector
- Subject to Regulatory Dust Opacity Testing
Transfer Chute Replacement
- 3D Model
Transfer Chute Replacement - Installed
Transfer Chute Replacement - Initial Results

- Tonnage Requirements Achieved
- Spillage Requirements Achieved
- Dust Levels Not Acceptable
- Inconsistent Dust Levels
- Failed Regulatory Opacity Test
Transfer Chute Replacement
- Course Of Action

- Existing Applications Using Similar Designs Did Not Exhibit High Levels Of Dust
- Extend Skirting From Load Point To 3/4 Belt Covers
- Add Staggered Rubber Baffles Inside Skirting To Knock Down Any Airborne Dust
Transfer Chute Replacement
- Results of Skirting Extension

- Still Experiencing Dusting At Exit Of Skirting
- Still Fails Opacity Test
Transfer Chute Replacement
- Find Cause Of Dust Generation

- Contract Airflow Sciences Corporation to Analyze Air Flow at Transfer Chute
Field Inspections

Field Measurements
- Dirty Air Velocity (3 locations)
- Static Pressure (4 locations)
- Wind Velocity & Direction
Field Test Results

- Measured Velocity the Same With Belt On or Off at Outlet of Skirting (10 ft/s)
- Measured Velocities Less Than 5 ft/s Inside the Skirting
- Wind Velocity 30 ft/s (21 mph) Around Skirting
- Max Static Pressure Measured in Transfer System ~0.01 IWC
CFD Flow Study

- Flow Induced by Belt
- Flow Induced by Wind
Belt-Driven Flow Field

- Max Induced Flow 18 ft/s
Wind Induced Flow Field

- Stationary Belt
- Determined 30 mph Wind Induces up to 25 ft/s Flow in System (10 ft/s Average)
- Maximum Exit Velocity 54 ft/s
Corrugated Cover

- Noted Dust on Cover
Corrugated Cover Model Results

- Assumed 25 mph Cross Wind
- 40 ft/s Flow Through Gap
- ~20 ft/s Flow Over Belt
Select Design Results

- Revised Exit Skirting
  - Remove Rubber Curtain at Exit of Skirting
  - Eliminate High Velocity Jet
Summary

- Performed Field Testing & CFD Flow Modeling on Transfer Chute
- Determined Wind Effects Cause for Coal Dust Ejection
- Determined Numerous Designs to Reduce or Eliminate Coal Ejection
- Solution Was to Remove High Speed Jet at Exit
Questions?

For More Information
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