Rain Impact on Ballast Contaminated with Coal Dust
Undercutter Work – Normal Ballast is not Black
Schematic of Typical BNSF/UP Dustfall Collector Orin Subdivision Site

Note: Distances from centerline of track will vary slightly due to site geography.

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Dustfall Collectors

- Measure amount of dust deposited in the railroad right-of-way
Trackside Monitor (TSM)

MP 90.7 TSM

- Propeller Anemometer
- Dust Monitor
- Temperature/Relative Humidity Sensor
- Data Logger
- Precipitation Gauge
- Dustfall Collector
Trackside Monitors

- Measures dust emission of each passing train

- Locations:
  - MP 90.7 on Orin Sub
    - Towers on East and West sides of tracks
    - Approximately 50% of trains useable
  - MP 558.2 on Black Hills Sub
    - Towers on North and South sides of tracks
    - Approximately 75% of trains useable
  - MP 693.4 on Big Horn Sub
    - Data collection only at this time
Post-Processing of Train Data

- Train Removal Criteria for Compliance Analysis
  - Additional train (loaded or empty) passing TSM site within 6 minutes
  - High/Erratic background dust
  - Bin data into proper wind components
    - e.g., East dust monitor uses data with westerly wind component
    - e.g., West dust monitor uses data with easterly wind component
Coal Dust Train Measurement

Dust Values for Passing Train at TrackSide Monitor

Dust Value

Time (Seconds)

Environmental Background Dust

Train Passage at MP 90.5 According to BNSF Train Data

Train arrives at MP 90.7

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**Integrated Dust Value (IDV.2)**

**Dust Values for Passing Train at TrackSide Monitor**

- **Integrated Dust Value Version 2 = 412**
- **Train arrives at MP 90.7**

**Notes:**
- Environmental Background Dust
- Train Passage at MP 90.5 According to BNSF Train Data
- Front Diesel: Ignore first 30 seconds of values once dust signal exceeds threshold
- Rear Diesel: Ignore last 15 seconds of dust signal > threshold

**Threshold = 10 + Background Average**

**Integrated Dust Value**

**Time (Seconds)**

- Dust Value
- Threshold = 10 + Background Average

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**Improved Loading Profile**

**Redesigned Chute**
- Flared to 7 ft. wide
- Same height as normal chute
- Promotes bread loaf shape
- Limits height chute can be raised

**Normal Chute**
- 5 ft. wide
- Promotes center peaked load
- Allows loading heights 3’ to 4 ‘ above sill
Impact of Modified Chutes

BEFORE
Note Peaked Loads, Sharp Lines, Steep Angle of Repose and other irregular surfaces which are susceptible to erosion

AFTER
Note Rounded Contour, No Sharp Angles, Flatter Angle of Repose and few irregular surfaces which are susceptible to erosion
Field Profile Audits

- Monthly unannounced audits
- Trains found not in compliance, provide mines
  - Written report
  - Photograph
  - Video of train
- Audited 225 trains year to date
RTEPS and Passive Collectors

RTEPS typically applied on last car of train with Passive Collector to determine external forcings (Wind Speed/Direction, Precipitation, Ambient Temp/RH, Coal Surface Temp, and Airborne Dust)

Passive Collectors applied in sets of 5 – 10 to test effectiveness of dust suppression method compared to control technique.
Instrumentation

- Rail Transit Emission Profiling System (RTEPS)
  - Airborne Dust Monitor
  - Precipitation Gauge
  - Ambient Temperature/Relative Humidity Sensor
  - Propeller Anemometer
  - Infrared Sensor for Coal Surface Temperature
  - Global Positioning System
- Passive Dust Collector (PC)
Coal has filtered down to the top of the bridge deck.