Reinhold Environmental Ltd.

2006 APC Round Table & Expo Presentation

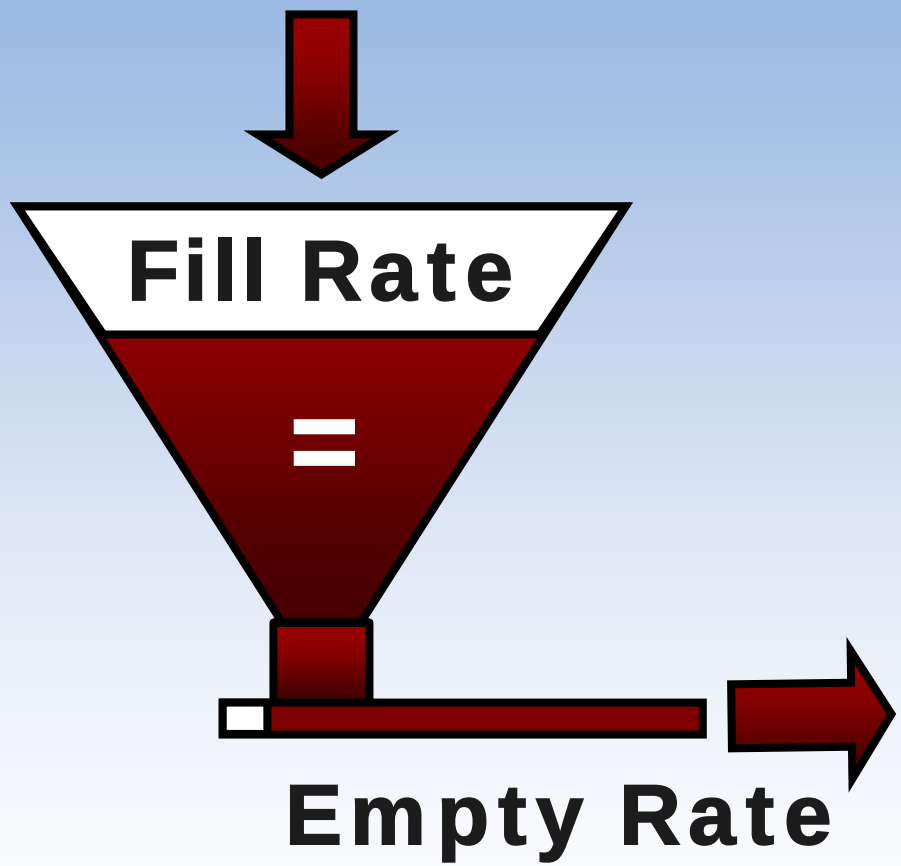
July 16-18, 2006, Columbus, OH

Hopper Level Management

7/17/06

NEUNDORFER PRECIPITATOR KNOWLEDGE

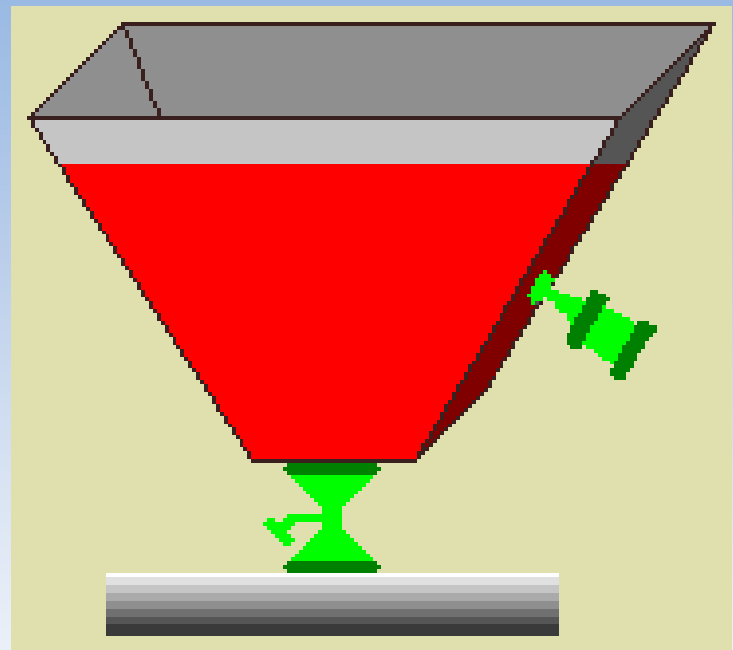
Objective



NEUNDORFER PRECIPITATOR KNOWLEDGE

Ash Empty Rate

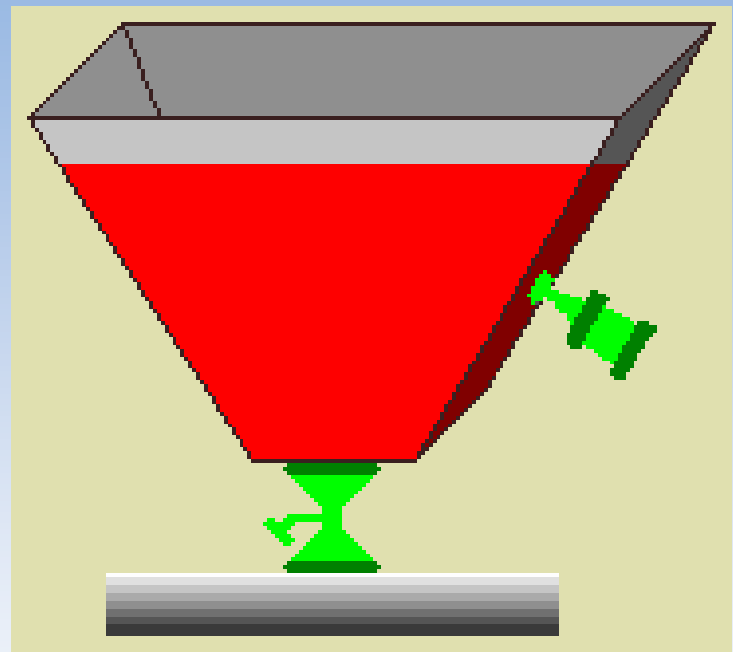
- Empty rate:
  - Evacuation Program
    - Sequence
    - Timing
  - System Capacity
    - Component size
    - Component condition
    - Conveying pressure/vacuum
  - Ash flow
    - Plugged
    - Rat-holed
    - Sticky



NEUNDORFER PRECIPITATOR KNOWLEDGE

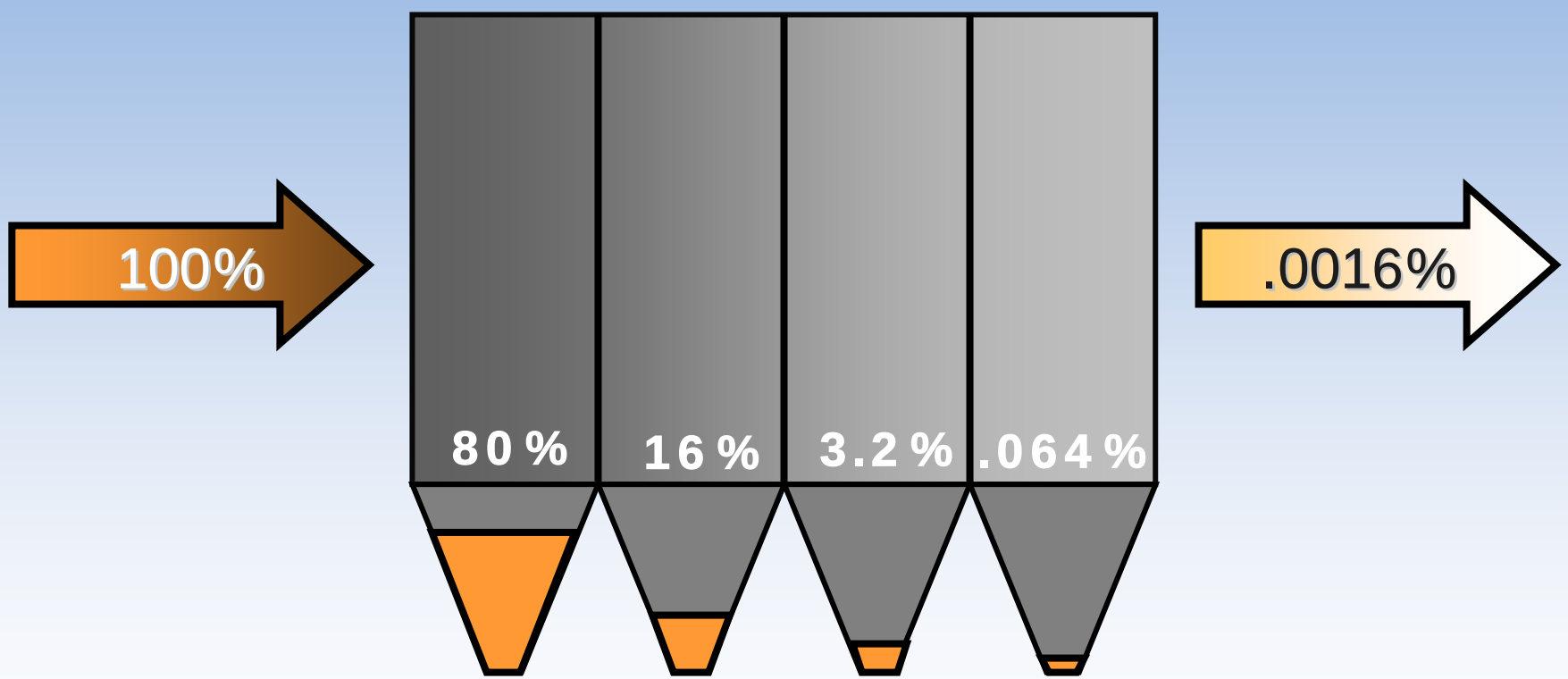
Ash Fill Rate

- Fill rate:
  - Boiler load
  - Fuel % ash
  - Fly ash / Bottom ash split
  - Section power and rapping
  - Hopper position



NEUNDORFER PRECIPITATOR KNOWLEDGE

Field Position



NEUNDORFER PRECIPITATOR KNOWLEDGE

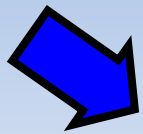
High Hopper Levels

- Result in high opacity from:
  - Sections shorted
  - Boil-up re-entrainment
  - Reduced power from misalignment

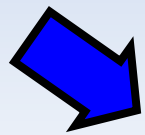
NEUNDORFER PRECIPITATOR KNOWLEDGE

Lost Generation

High Hopper Levels



High Opacity



Lost Generation

NEUNDORFER PRECIPITATOR KNOWLEDGE

Results if Hopper Doesn't Empty

- High Hopper
  - Ground out an electrical section
  - Opacity excursions
  - Lost generation / derates
  - Possible mechanical damage to Precip
  - Tons of hot ash in hopper must be dumped

NEUNDORFER PRECIPITATOR KNOWLEDGE

How do we know the evacuation system is working?

- Historically - High Level Detection
  - Are high level sensors trusted?
  - High level a symptom of another problem:
    - Sulfation/Condensation
    - Bridging/rat-holing
    - Equipment failure
    - Hopper outlet plugged with debris
    - Inadequate evacuation program

NEUNDORFER PRECIPITATOR KNOWLEDGE

How are systems controlled?

- Strict timer basis
  - Each hopper emptied for the same amount of time
- Transport pressure/vacuum feedback
  - Determines if hopper or row is emptied/finished
- Does this take into account changing fuels or other process changes?

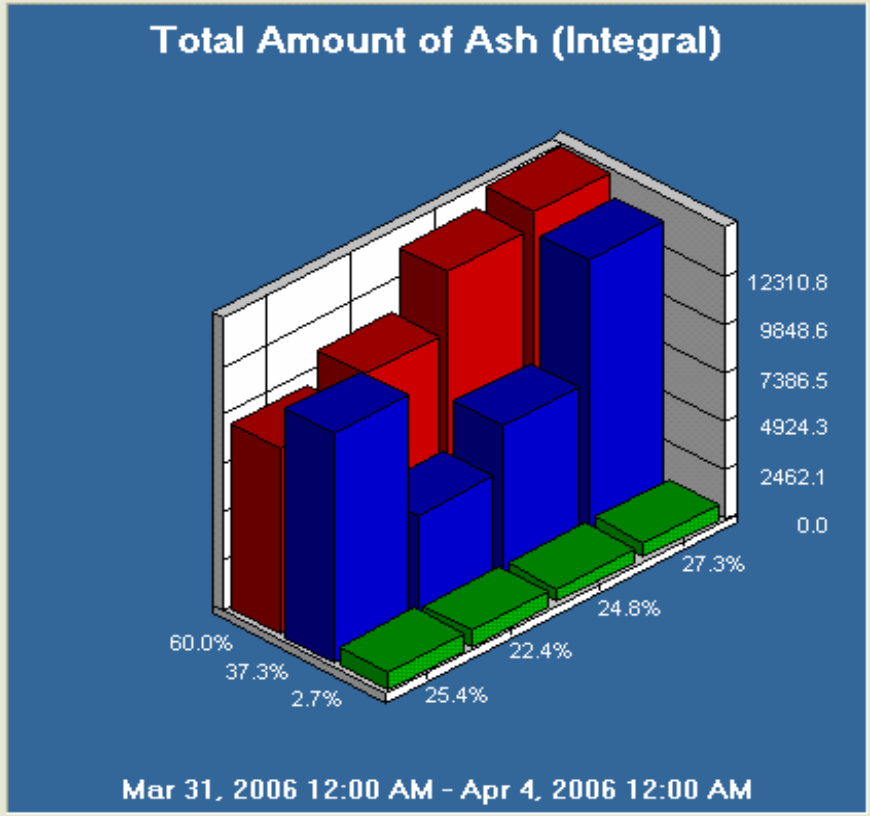
NEUNDORFER PRECIPITATOR KNOWLEDGE

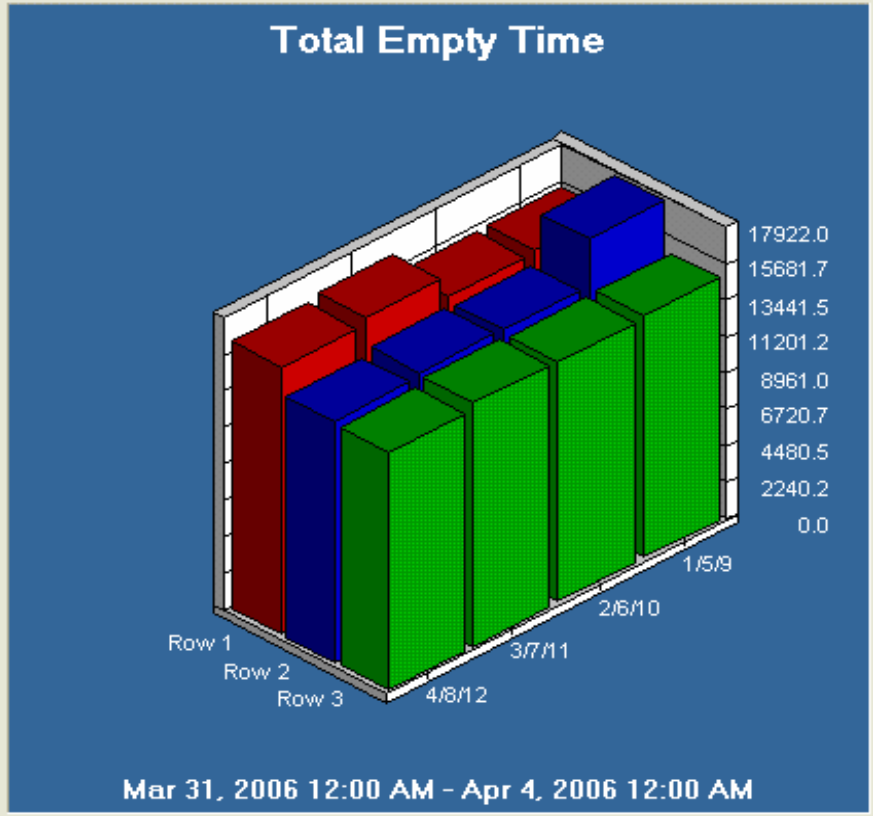
Improved Ash Collection

- Create hopper evacuation program that matches ash deposit rate
  - Spend more time emptying full hoppers
  - Spend less time on empty hoppers
- Increase capacity of the system
  - Use the system to its full potential
  - Reduce wear and tear on system by eliminating unnecessary gate cycling

NEUNDORFER PRECIPITATOR KNOWLEDGE

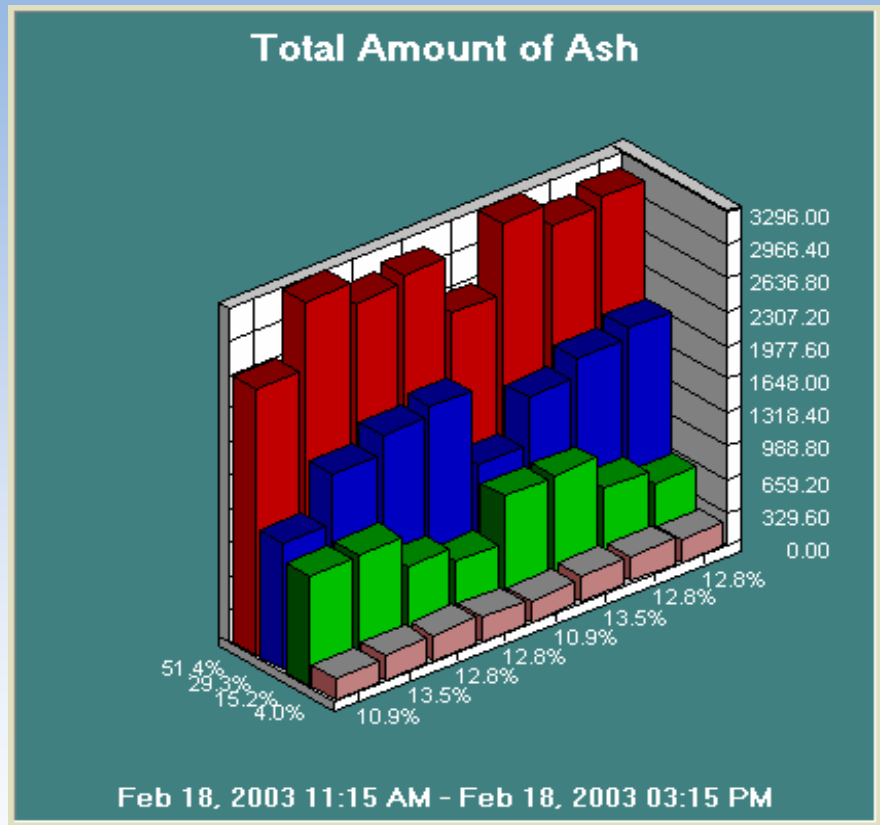
Amount of Ash vs. Empty Time Typical

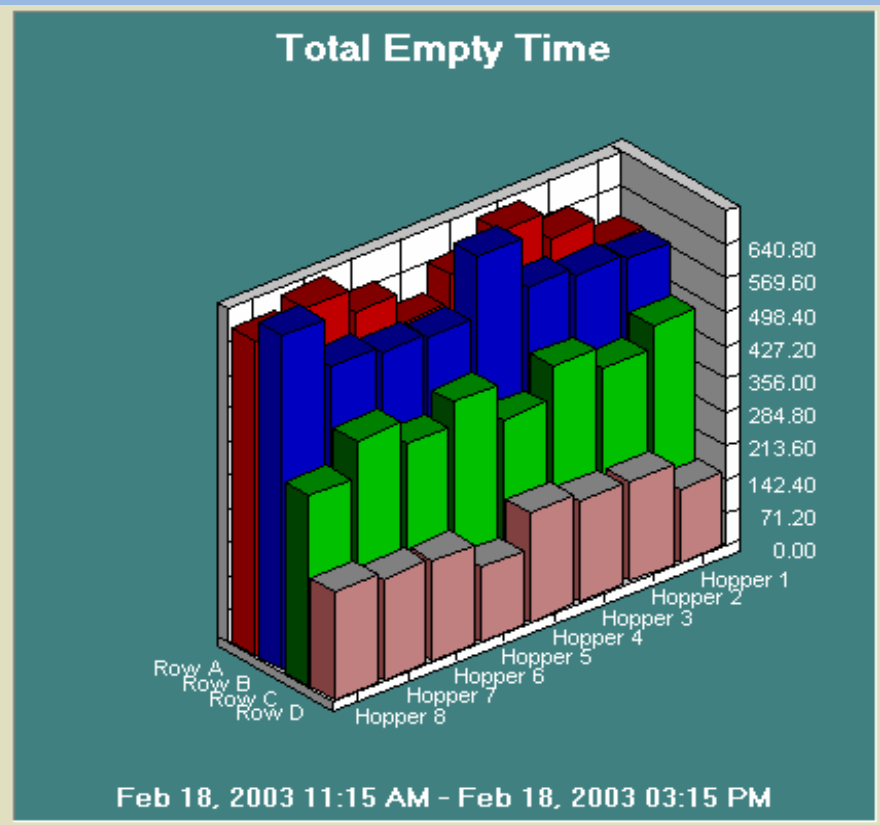




NEUNDORFER PRECIPITATOR KNOWLEDGE

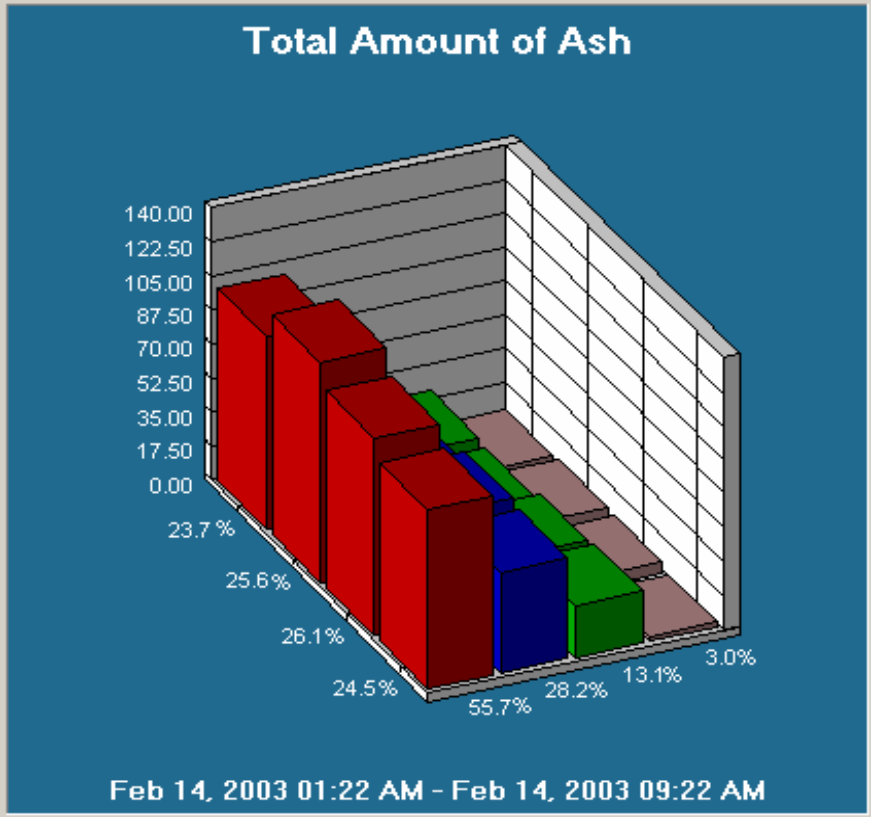
Amount of Ash vs. Empty Time Based on Feedback

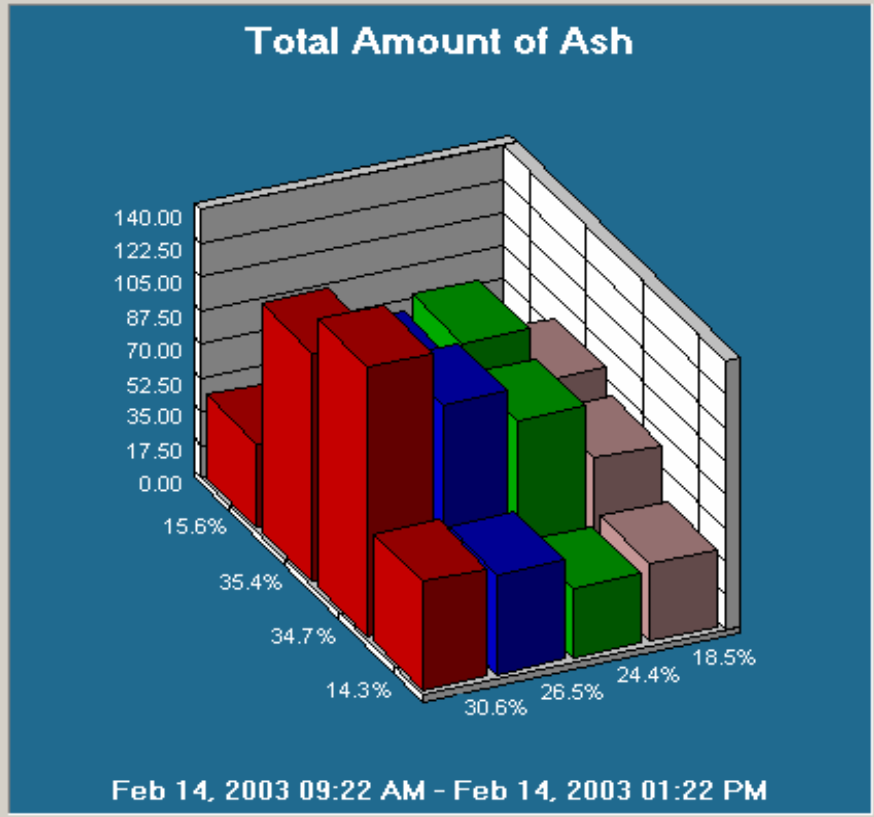




NEUNDORFER PRECIPITATOR KNOWLEDGE

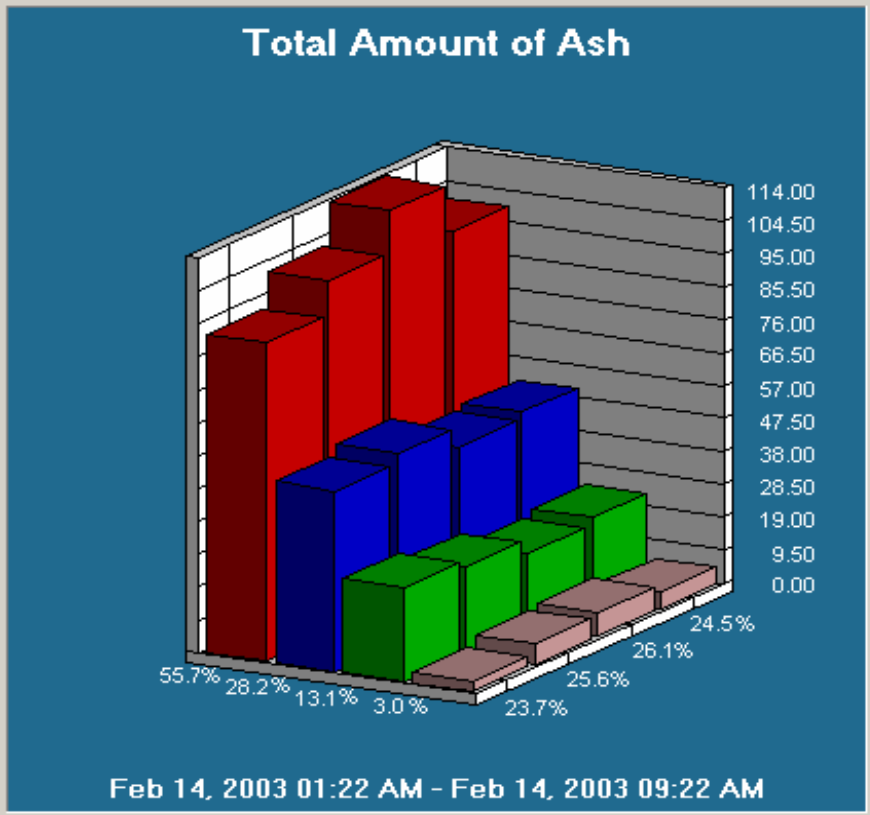
Hi Load vs. Low Load

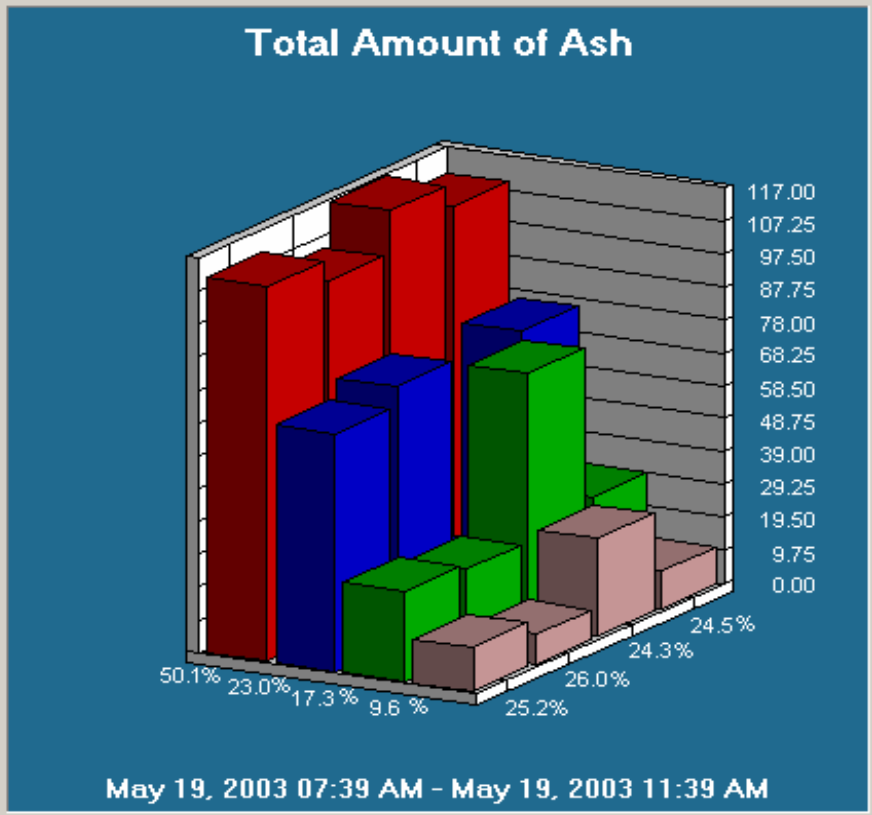




NEUNDORFER PRECIPITATOR KNOWLEDGE

TR Set Out





NEUNDORFER PRECIPITATOR KNOWLEDGE

Information Power

- Fill rate
- Empty rate
- Isolation hopper level
- Isolation hopper pressure

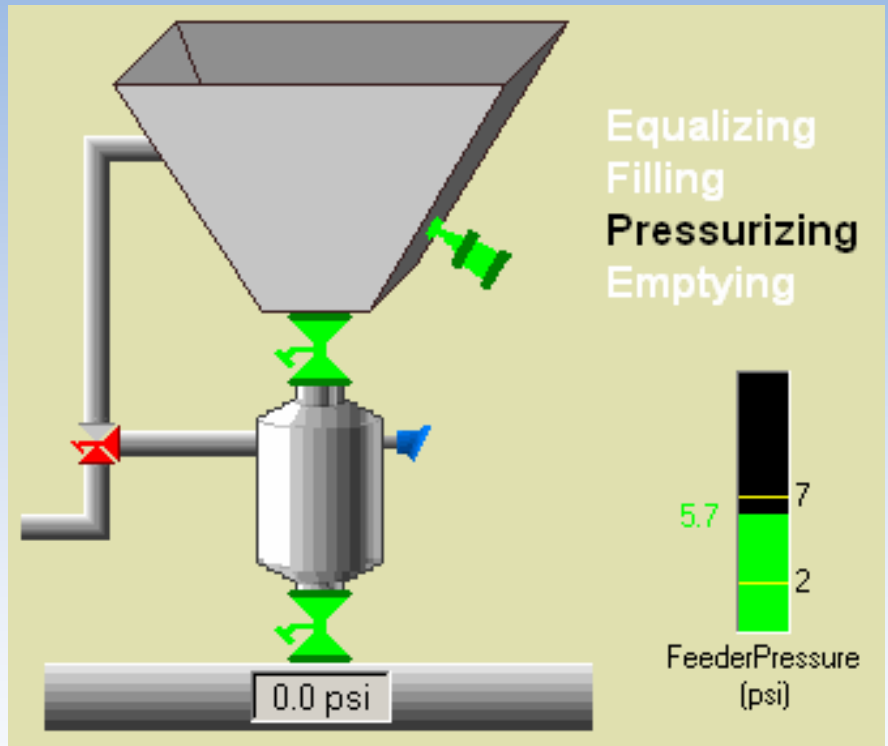
NEUNDORFER PRECIPITATOR KNOWLEDGE

Information enables smart operation and troubleshooting

NEUNDORFER PRECIPITATOR KNOWLEDGE

Isolation Hopper Diagnostics

- Measure Level Inside Isolation Hopper
  - Identify slow fill and empty rates
- Measure Pressure Inside Isolation Hopper
  - Determine proper pressure is achieved in each phase of hopper dumping sequence
  - Pinpoint leaky gates



NEUNDORFER PRECIPITATOR KNOWLEDGE