Material Handling in Power Plants

Focusing on Truck Unloading

McIlVaine Hot Topic

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Material Handling

Plant Diagram showing areas where Material Handling designers like CBPG get involved.
Railcar and Truck Unloading
The art of bulk material transport has come a long way!
PD TRUCK
Understanding the PD Truck:

Typical Bulk Truck Unloading:

Typical bulk truck unloading would consist of a PD truck connecting to a 4” truck unload line. Using the on-board truck blower the truck was pneumatically unloaded to the storage silo.

PD trucks are typically limited to operate under 14.5 psig.

This technique works best when the truck unload station is close to the silo.

With short distances “dual phase” conveying is possible for optimum performance.
Understanding the PD Truck:

- Air Feed Hose
- Air Balance Valve
- Air Header

Truck mounted blower

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Truck Unloading w/ Separate Blower
Blower Packages

Blower Packages are comprised of state-of-the-art components along with high quality PD (Positive Displacement) blowers.

Typical Blower Packages include:

• PD Blower
• TEFC Motor
• Double Adjustment Slide Base
• Flat or Raised Base Blower & Motor
• Inlet Filter (Replacement Cartridge)
• Inlet Silencer (Double Chamber Type)
• Discharge Silencer (Double Chamber Type)
• V-Belt Drive
• OSHA Drive Guard
• Inlet & Discharge Flexible Connection
• Check Valve
• Interconnecting Piping
• Painting & Testing
• Pressure Gauge

Packages provide acoustical sound enclosures around package or partial enclosures around blower with special treatment for guard & piping if required.

Blowers on raised base packages are pre-assembled.

Flat base blowers may require accessories to be partially assembled for shipping purposes.
Understanding the PD Truck:

- **Air Header**
- **Air Balance Valves**
- **Hopper Gate Valves**
- **Product Feed Header**
Manual By-Pass Station

Conveying Piping to Silo

Gauge

Conveying Piping to Silo

Product Supply hose to PD Truck or Railcar

Air Supply from Aux.Blower

Gauge

Air By-Pass Piping

Manual Air Balance Valve

Air Supply hose to PD Truck or Railcar
Truck Unloading

Manual By-Pass Station
Truck Unloading

Auto By-Pass Station
Principles of Pneumatic Conveying

Design Considerations
Pipe Routing:

Keeping the pipe line short and with the minimum amount of elbows reduces HP and increases conveying rate!
Real World Considerations
CAPACITY GRAPH
(PNEUMATIC CONVEYING)

Design Capacity
Peak Capacity
Average Capacity
Reduced Capacity Phase
End
# Efficiency Chart

<table>
<thead>
<tr>
<th>Min</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>TPH Peak Unload rate</td>
</tr>
<tr>
<td>5.0</td>
<td>Driver Hook-UP</td>
</tr>
<tr>
<td>3.0</td>
<td>System Start (ramp up to max cap.)</td>
</tr>
<tr>
<td>60.0</td>
<td>Convey Time To Unload 25 Ton Truck @ Peak Rate</td>
</tr>
<tr>
<td>5.0</td>
<td>Stop / Purge</td>
</tr>
<tr>
<td>3.0</td>
<td>Driver Un Hook</td>
</tr>
<tr>
<td>76.0</td>
<td>Total Truck Unload Time</td>
</tr>
<tr>
<td>19.7</td>
<td>TPH Average Truck Unload Rate</td>
</tr>
</tbody>
</table>

| 78.9% Efficiency |
Cost of Material Versus Unload Rate
Truck Unloading Example

Example Installation

July 21 2010

- Vent Filters
- Dome Storage
- Dome Aeration
- FGD Slurry
- Transport Piping
  In trench
- Blower Building
- Truck Unloading
  Station