White Paper

Gardner Denver

Troubleshooting Pneumatic Conveying Systems

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Trouble Shooting Dilute Phase Pneumatic Conveying Systems

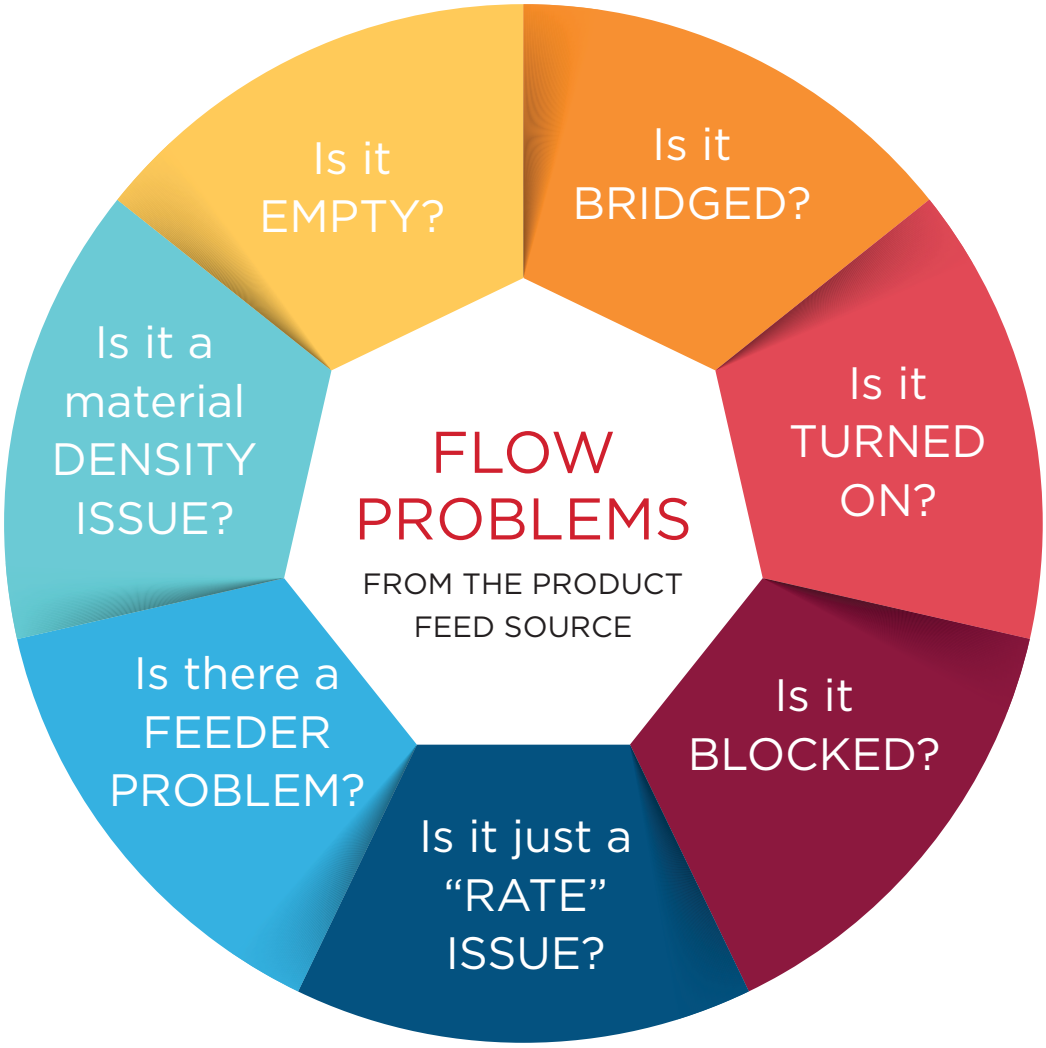
There are four basic conditions which must exist for a dilute phase pneumatic conveying system to operate successfully

1. The material being handled wants to be handled pneumatically and in the method installed
2. The correct amount of material must be introduced into the convey line by the line charger
3. The correct amount of motive gas must be available both in terms of volume and pressure
   - Volume is necessary to maintain stable conveying inside the convey line
   - Pressure is necessary to overcome ALL the challenges between the discharge of the gas mover and the product receiver at the terminal end of the system
4. The right conditions at the terminal end of the system to allow for proper gas / solids separation

Remember to “Listen” to your Conveying System

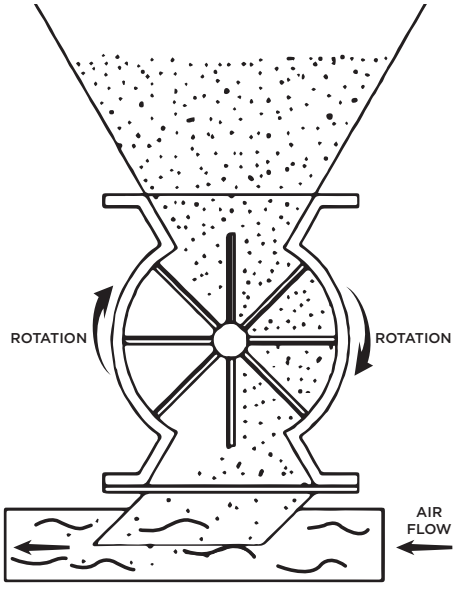
- Prior to attempting to trouble shoot an existing system, it’s beneficial to determine what “phase” or “mode” of conveying is taking place inside the pipe.
- This can help pinpoint causes and eliminate some factors which need not be considered.
- If the mode of conveying identified does not match up with the products physical characteristics and the way the product wants to be conveyed, all the trouble shooting in the world won’t be able to easily fix that situation.

Why There May Not be the Right Amount of Material Getting into the Convey Line



Typical problems with the rotary airlock linecharger

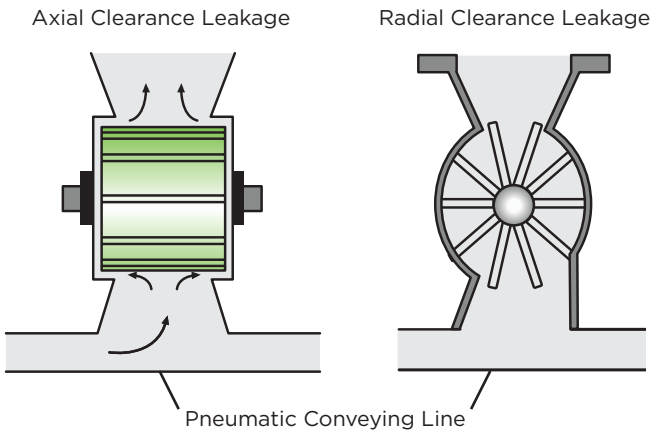
- Low Capacity
  - Speed vs Product Density
- Excessive Leakage
  - Rotor Clearance
  - Differential Pressure
- Poor Venting
  - Fine vs Coarse Material
- Poor Discharge
  - Rotor Design
  - Material Characteristics



Why There May Not Be the Right Amount of Gas Volume Getting Into the Convey Line

1. Excessive gas leakage through line charger
2. Excessive gas leakage through pipe connections
3. Diverter valves or isolation valves not sealing
4. Too high of material to gas ratio
5. Have the product's physical characteristics changed?
6. Is the gas mover at fault?
7. Has the plant elevation been correctly accounted for?
8. Have we considered the effects of gas / material temperature?

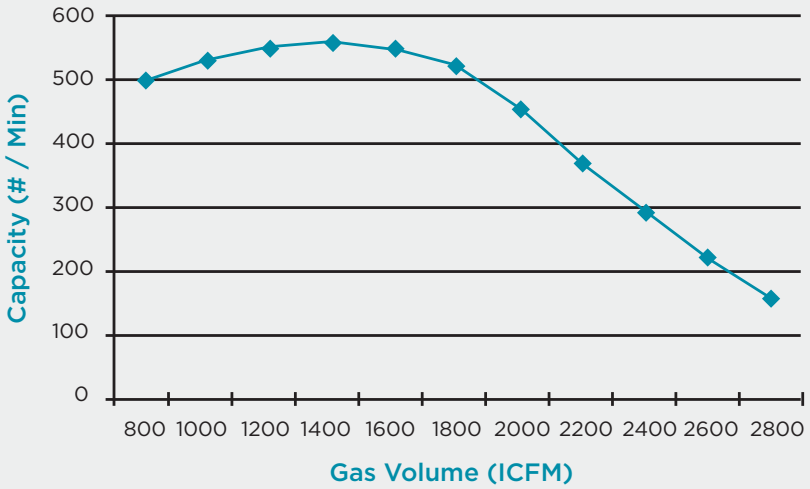
Positive-Pressure Systems



Many times the opposite situation occurs. Too much gas volume leads to excessive convey line velocities which wastes valuable blower energy thereby lessening the ability to move material.

While intuition would normally tell you to increase gas volume if there is a conveying problem—do not overlook the opportunity to decrease gas volume and compare the capacity results.

Sample Convey System Characteristic Curve



Why There May Not Be the Right Amount of Gas Pressure Available to Overcome the Convey Line Resistance

- Blocked inlet conditions of the gas mover
- Obstruction in discharge piping
  - Clean gas line problems
  - Partial movement of diverter valves on convey line
- Over feeding of product into convey line
  - Check calibration of weighing equipment
  - Check for line charger problems
  - Check for material density issues
- Backpressure at discharge end of system
  - Faulty dust collector
  - Over filling of receiving vessel
  - Process related back pressure

Transport Convey Line Issues

- Typical problems associated with the transport line include
  - Line Plugs
  - Leakage
  - Low Capacity
  - Product Degradation
  - Excessive Wear
- If plugs occur within the first 50’ of piping usually means
  - Air volume is too low
    - Check air supply capacity
    - Check for high pressure loss at receiving end of system
  - Material feed rate is too high
    - Check line charger capacity
- If plugs occur further downstream, usually means a system related problem
  - Check for vertical rise in first 20’ of piping
  - Check for “back to back” bends
  - Check for air leaks in piping
  - Check for sloping lines (refluxing of material)
- Check for piping concerns
  - Can overall equivalent length of line be reduced?
  - Horizontal
  - Vertical
  - Total curvature of elbows
  - Can a stepped line or total larger line be implemented?

Product Degradation Issues

- Reduce conveying velocities
- Reduce number of bends
- Evaluate different bend configurations
  - Tees
  - Jug Handles
  - Short Radius
- Check alignment of pipe and fittings
- Check receiver device
  - Avoid cyclonic separation

Wear in Convey Line & Components

- Reduce velocity
  - Airflow adjustment
  - Line stepping
  - Wear is proportional to velocity to an exponential between 3 and 5.
- Increase line loading if possible
- Try special materials of construction
- Try different bend configurations

Troubleshooting the Product Receiver

- Problems commonly associated with equipment at the discharge end of a pneumatic system
  - High Pressure Differential
    - Wrong choice of filtration media
    - Incorrect air to cloth ratio for product and/or type of filter element
    - May be filter reverse cleaning system related
    - Filter media may need special surface finish to help release dust cake
    - Check for product filling up in hopper section
- Wear and Erosion
  - Eliminate “sliding” contact (tangential entry) and use radial inlets
  - Step the convey line diameter prior to entry into receiver
  - Consider special materials of construction
- Poor Material Discharge
  - Excessive leakage of discharge rotary airlock
  - Material staying entrained in upper section of dust collector
    - Velocity too high
    - Separation zone too small
    - Interstitial velocity too high
  - Product build up in lower section of hopper

Useful Links

Learn more about our positive displacement blower offering and how customers saved money with Gardner Denver: http://www.gardnerdenver.com/gdproducts/blowers

Focused on maximizing your return on investment through a new system or by upgrading an existing one; our team of audit experts work with you to determine the most efficient system design. Contact your local Authorized Gardner Denver Distributor today.

References & Further Reading

Selecting a TYPE of Pneumatic Conveying System — WP-GD-TYPE-PCS 9/17
Selecting a MODE of Pneumatic Conveying System — WP-GD-MODE-PCS 3/18

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Gardner Denver Industrials Group delivers the broadest range of compressors and vacuum products, in a wide array of technologies, to end-user and OEM customers worldwide in the industries we serve.

We provide reliable and energy-efficient equipment that is put to work in a multitude of manufacturing and process applications.

Products ranging from versatile low- to high-pressure compressors to customized blowers and vacuum pumps serve industries including general manufacturing, automotive, and waste water treatment, as well as food & beverage, plastics, and power generation.

Our global offering also includes a comprehensive suite of aftermarket services to complement our products. Gardner Denver Industrials Group, part of Gardner Denver Inc., is headquartered in Milwaukee, Wisconsin, USA. Gardner Denver was founded in 1859 and today has approximately 7,000 employees in more than 30 countries.

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