Process Trends in Extruded Petfood Manufacturing

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Mac Process

Process Trends

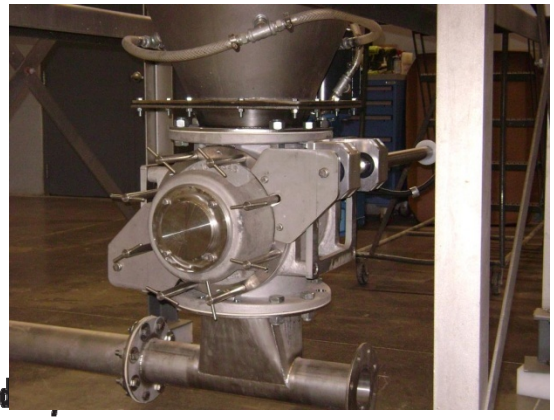
System and Equipment Design Changes to Improve Sanitation Levels

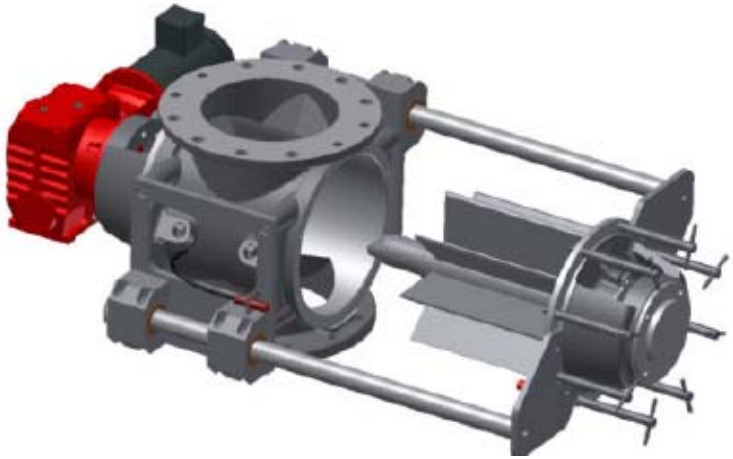
Process Control Improvements to Increase Efficiency and Product Integrity

Breakage Reduction for Improved Product Quality and Process Efficiency (Pneumatic Conveying)

Equipment Design for Sanitation

- Cleanable rotary airlock
- Tool-less removal of rotor
- Access to line adapter





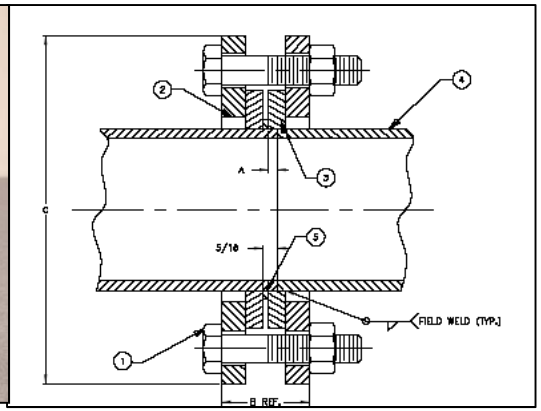
Equipment Design for Sanitation

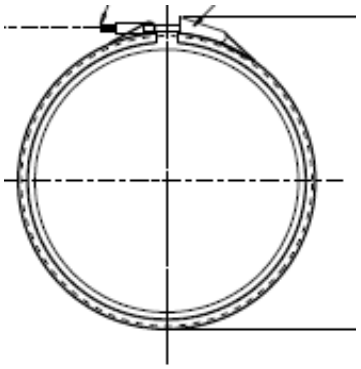
- Tool-less removal of filtration media
- Side entry access to filtration media
- Hinged tubesheet for full internal access

Equipment Design for Sanitation

- Storage bins, hopper, cyclones
  - Flush mount doors
  - Passivated , electropolished
  - Support legs and mounts
  - Ledge-free designs

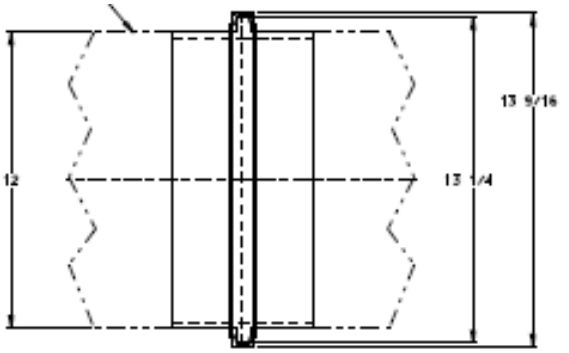
Equipment Design for Sanitation





Couplings

- Joint alignment (no gaps)
- Sanitary clamps
- Recessed gasket (no product contact)



Process Design for Sanitation

In-place sanitation of convey lines:

- Pigging
- Dry Ice
- Ozone
- Heat

Different solutions being used around the industry

* Key missing step is the validation to create a 5 log reduction in microbial count

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Breakage Reduction for Improved Product Quality and Process Efficiency (Pneumatic Conveying)

Process Control Improvements

- Lot tracking
- Operate processes more efficiently
    - Grinding
    - Ingredient batching
    - Extrusion
    - Drying/Coating
    - Packaging distribution
- Cleanout automation to eliminate cross-contamination

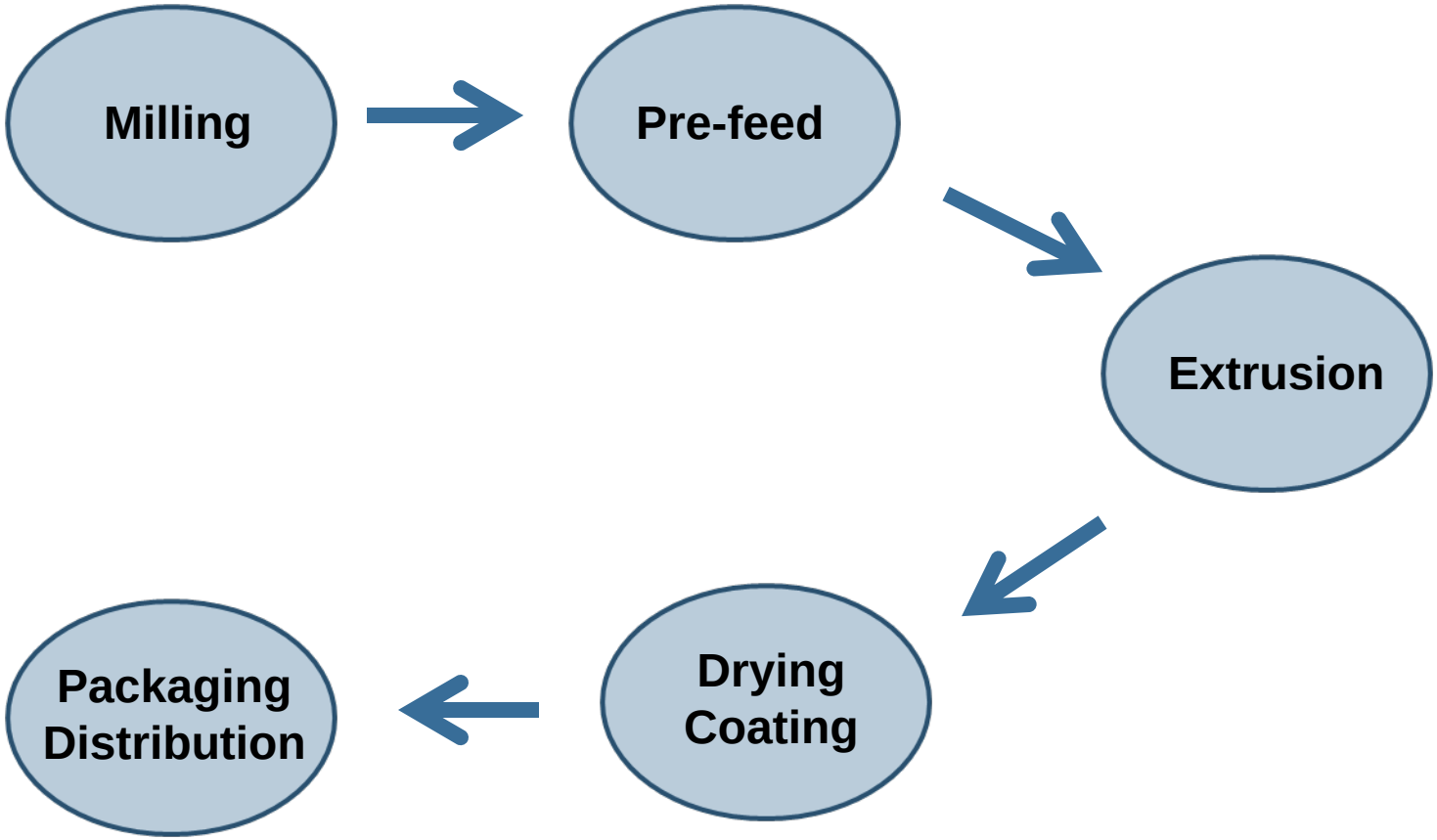
Process Control Improvements

Lot Tracking

We all remember Melamine (rice protein concentrate)

- Lot identification allowed many suppliers and producers to identify contaminated material and minimize the breadth of recalls
- Microbial contamination quarantine
- Quality control rejections

Process Control Improvements



Process Control Improvements

Case Study – Lortscher Animal Nutrition (LAN) Bern, KS

- Concerned about hammermill efficiency.
- Energy surcharge during peak use times

Controls package installed that monitors power usage on:

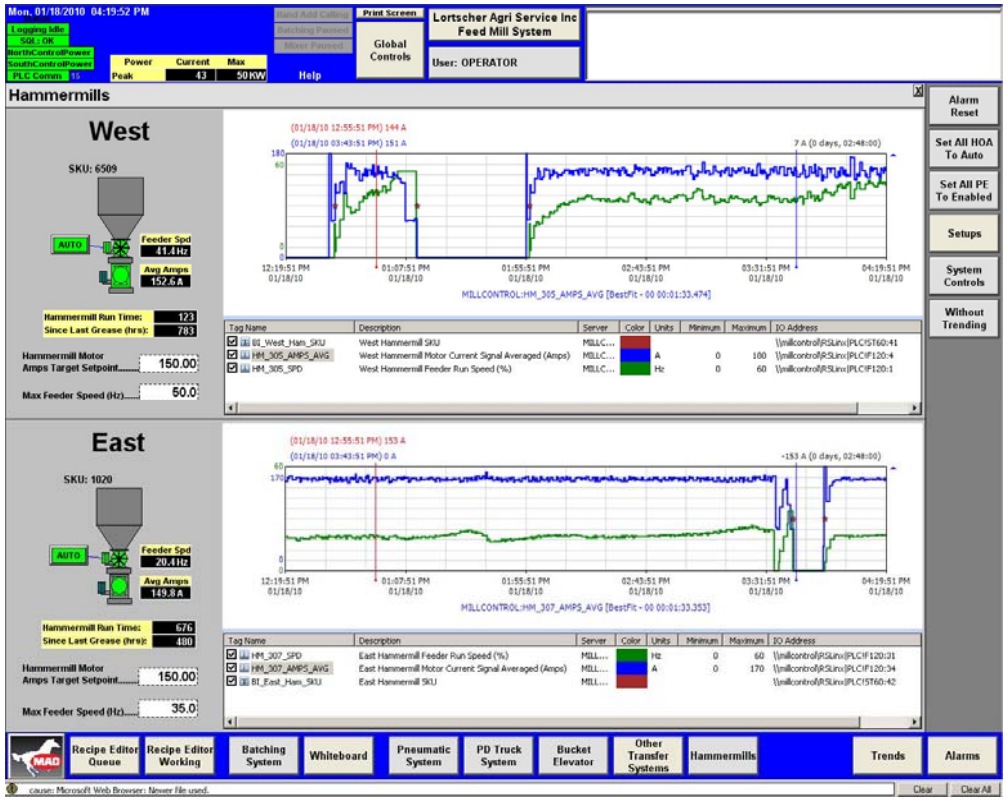
Individual Mills

Total Plant

Process Control Improvements

- Trending/Tracking of:
  - Total Plant Power
  - Individual Mill Power
- Benefits:
  - No more overages
  - Maximize mill usage
  - Faster response to process issues

ROI <1 Year



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Breakage Reduction

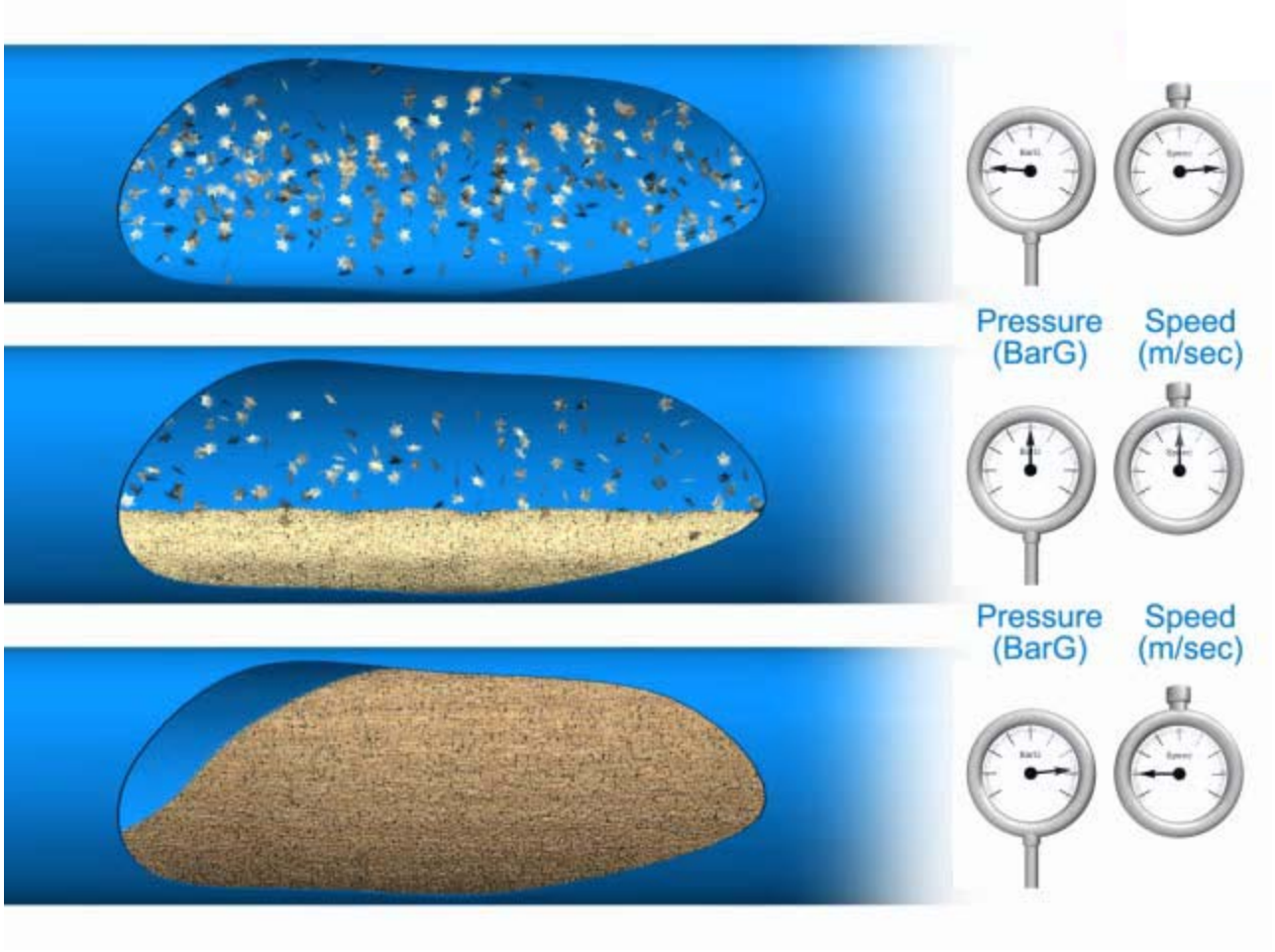
Product Quality – retention of particle size & shape including coatings

Process Efficiency – reduction of screening requirements and subsequent rework material

Cleanliness – reduction of small particles in all areas of the plant

Breakage Reduction

Flow regime in the convey line



Breakage Reduction

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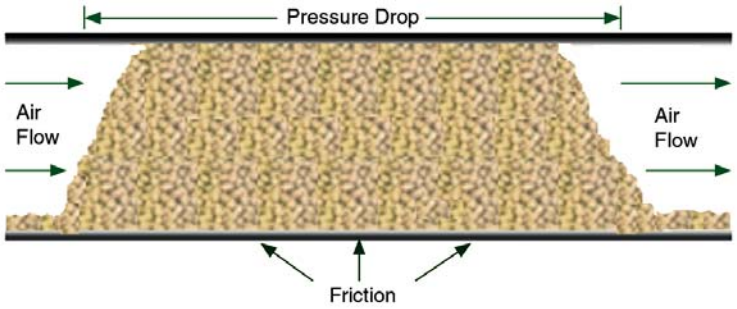


Material travels at significantly reduced velocity

Slugging motion of product reduced contact with metal surfaces

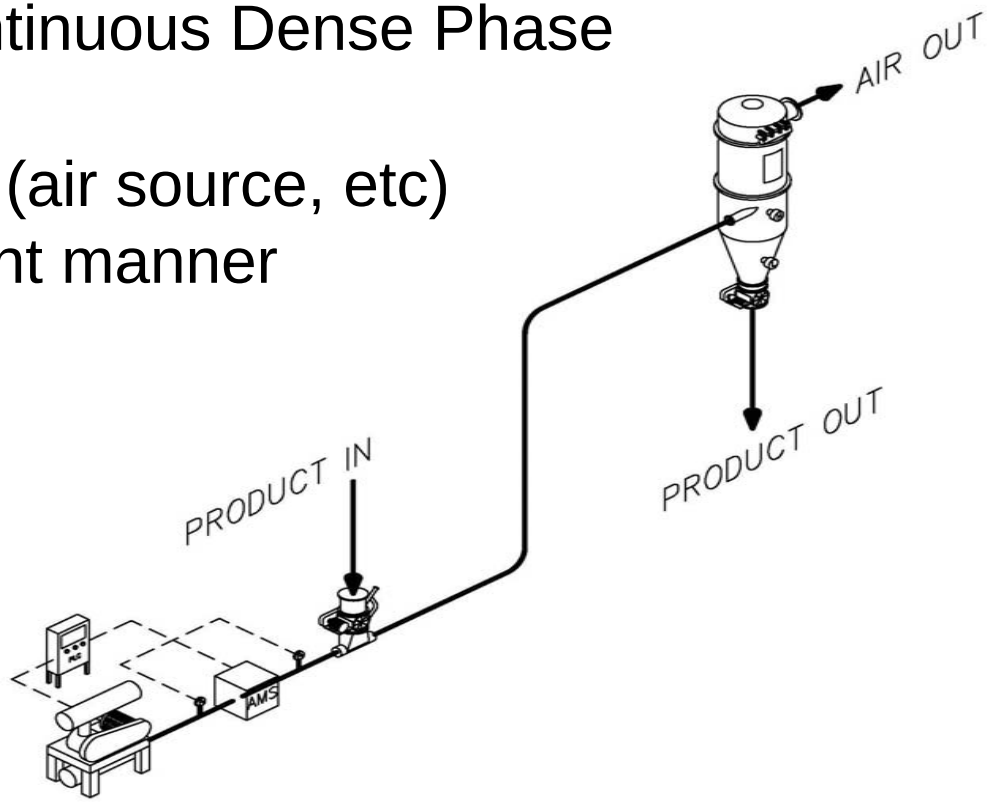
More sophisticated air controls required as compared to dilute phase flow

Breakage Reduction

Flow regime in the convey line

Low-Pressure Continuous Dense Phase

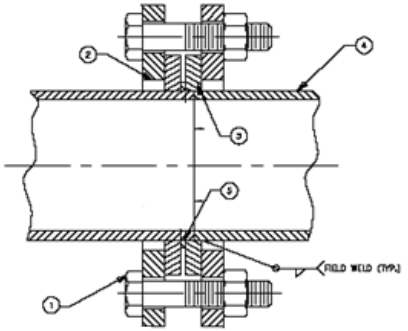
Similar equipment (air source, etc) operated in different manner



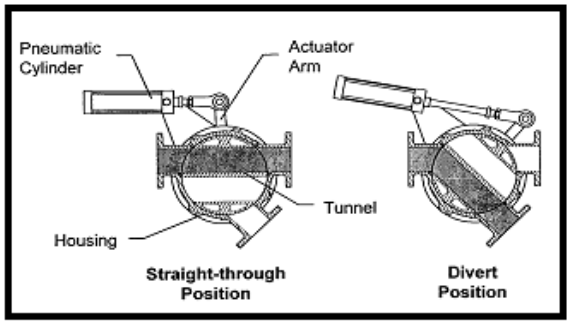
Breakage Reduction

Convey Line Components

Ledge-Less couplings

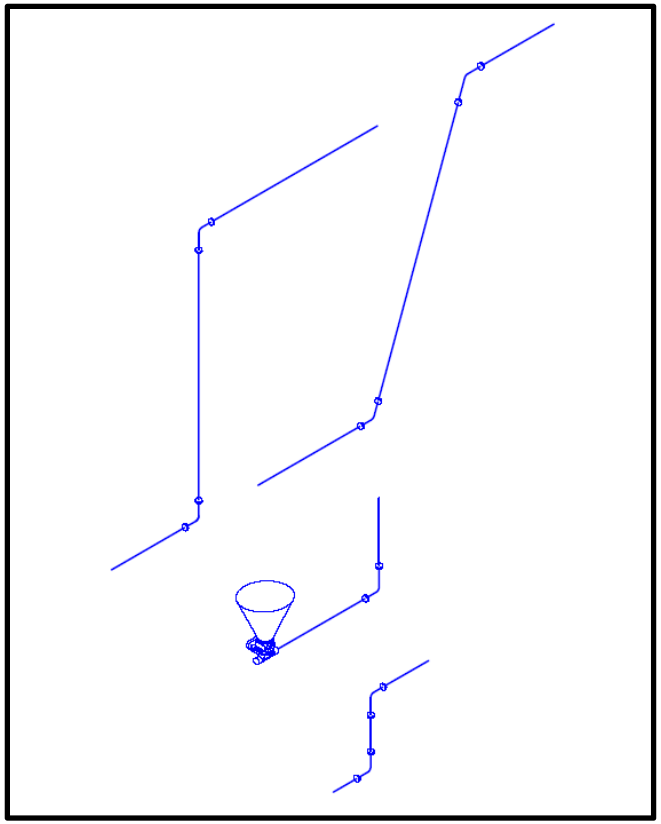


Diverter valves



Breakage Reduction

Convey Line Layout

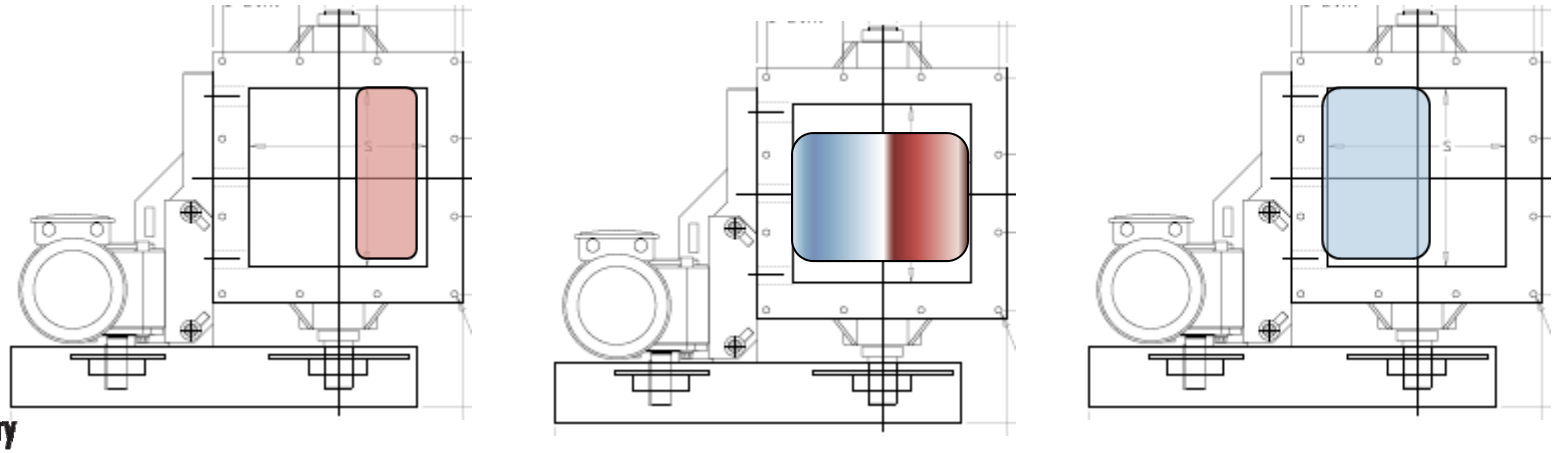


- Straight over and straight up (no inclines)
- Straight pipe out of feedpoint (~25D)
- Minimize # of elbows
- No back-back elbows
- Long radius elbows (>6D CLR)
- Optional ID polishing

Breakage Reduction

Airlock Shear

- Mechanical damage from the rotary airlock
- Metered feed introduced to the airlock properly
- Shear protectors (flood fed condition)



Breakage Reduction

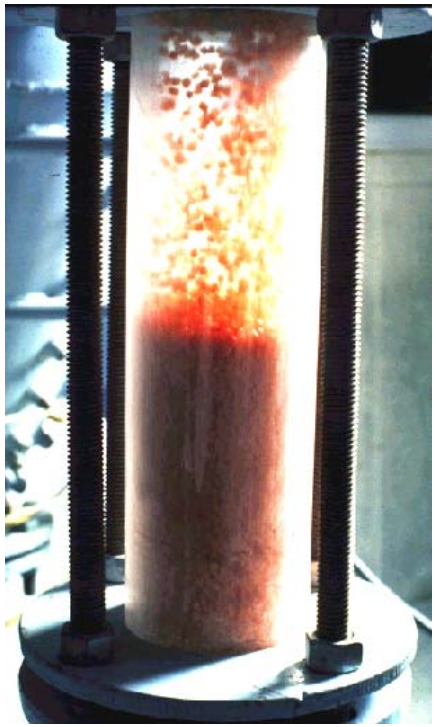
Receiver Design

- Radial inlet
- Tangential inlet
- Top Inlet

- Kibble reaches critical velocity in 1.3 sec (27 ft)
- Material-on-material best
- Operate storage bins with level when possible

Pneumatic vs Mechanical Conveying

- Flexible convey line routings
- Plant footprint
- Material conveying in enclosed piping system
    - Product protection
    - Improved housekeeping
- Plant footprint



Thank You