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THE BASICS OF PNEUMATIC CONVEYING 2020.P2

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The Basics of Pneumatic Conveying

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Introductions

Tom Leach – *National Sales Manager, Pneumatic Conveying Systems*

David Barber – *Technical Sales – Pneumatic Conveying Systems*

Mike Abare – *National Sales Manager – Outside Sales Representatives*

CAMCORP News

Keith Horton – Retirement

Jim Weber – New VP of Sales & Marketing

Fiscal Year – March 1, 2021 – February 28, 2022

Rep FIRST Initiative

2020 Rep Recognition

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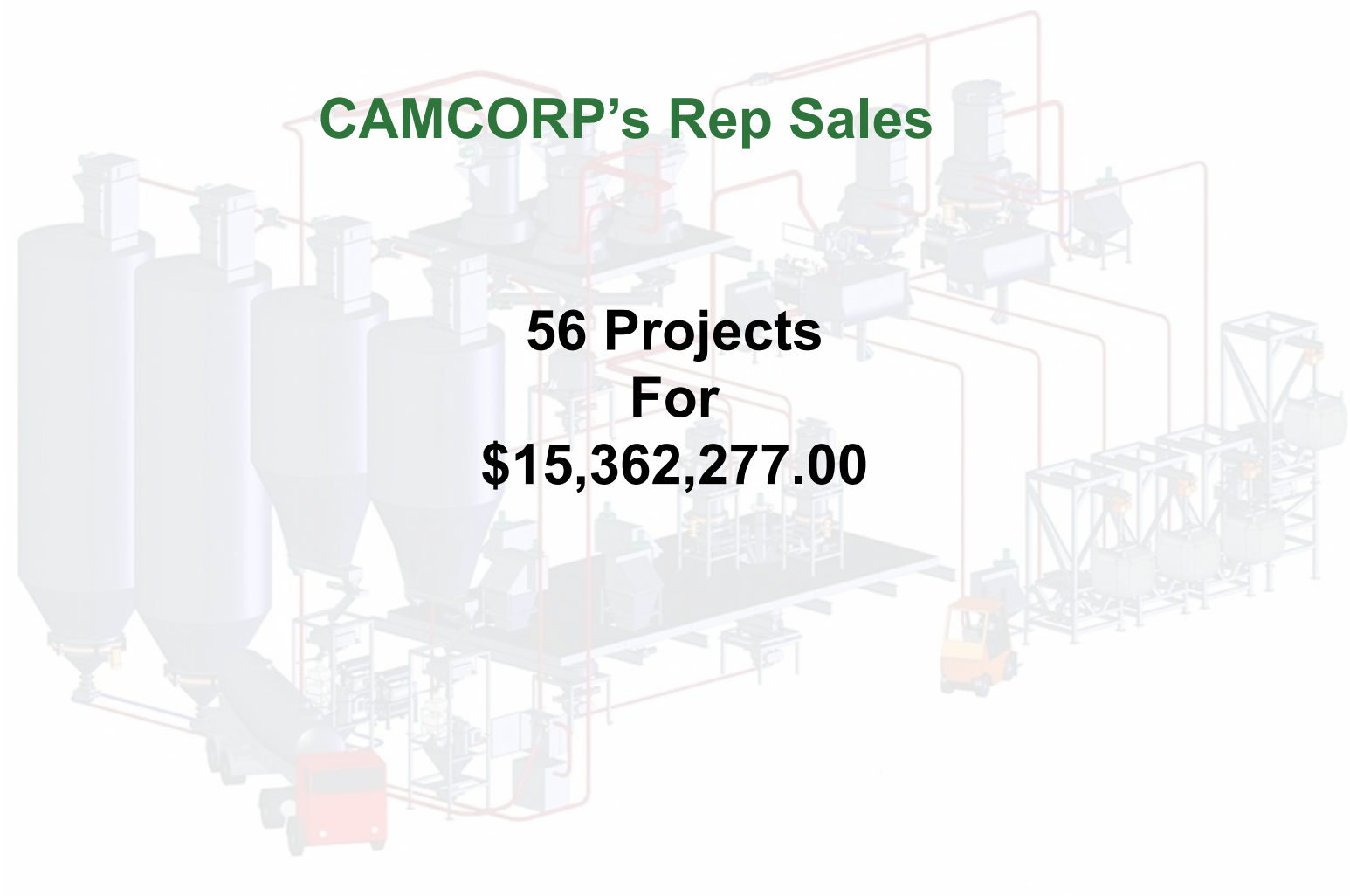
2020 Sales Results



CAMCORP's Rep Sales

56 Projects
For
$15,362,277.00

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Recognition

Representative of the Year

23 Projects

Bill Alsted
Atlantic Process Systems, LLC

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Recognition

Rookie of the Year

30 RFQ's in 12 months

Corey Plucker
EV Systems New England, LLC

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Trivia Question #1

Submit your answer through the chat function.

Can you provide TWO compelling reasons a customer would want to purchase a vacuum convey system in lieu of a pressure convey system?

Submit your answer through the chat function.

Will you be the first to submit a correct answer?

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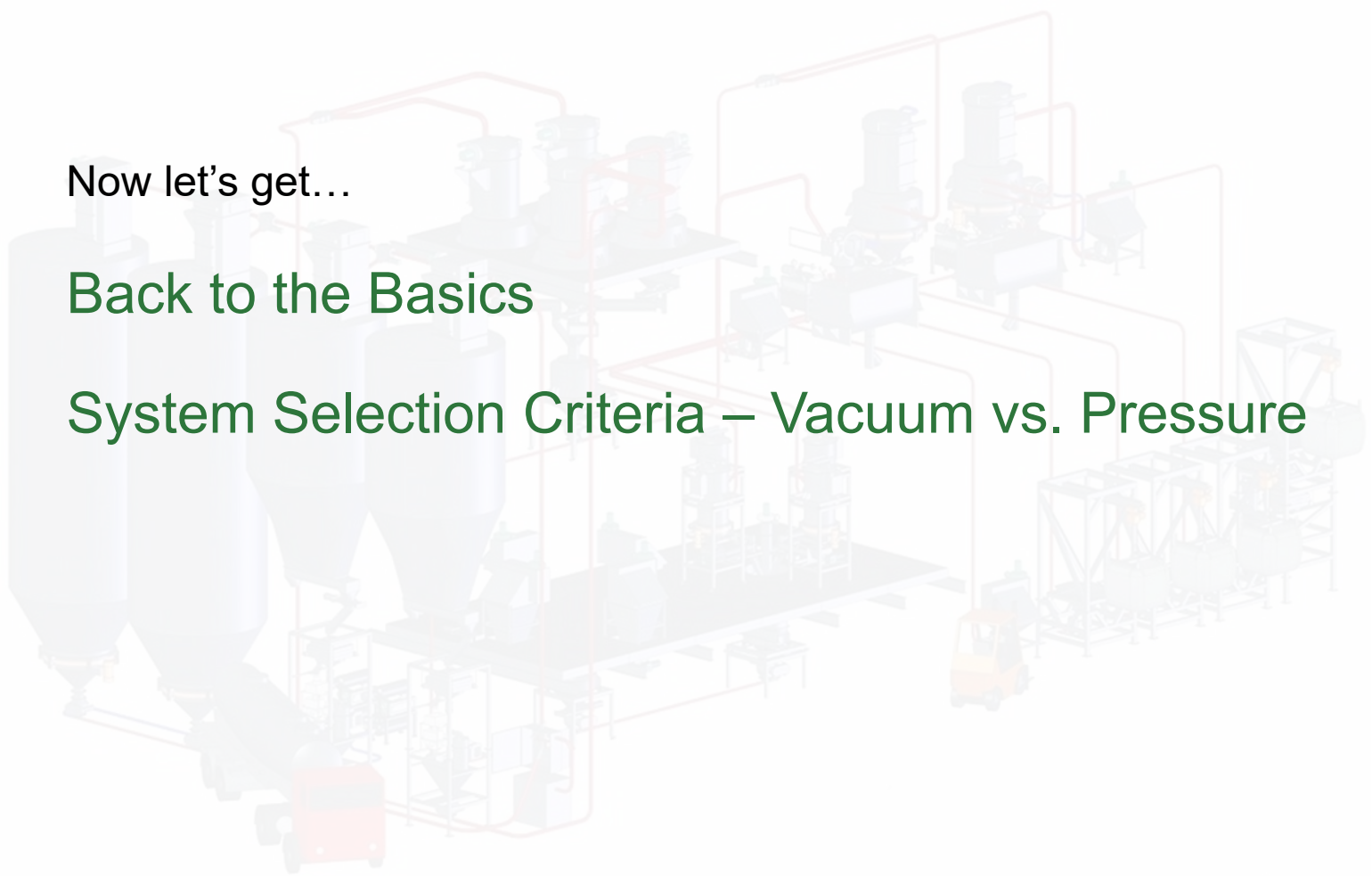
Trivia Question #1

Can you provide TWO compelling reasons a customer would want to purchase a vacuum convey system in lieu of a pressure convey system?

- **Cleaner operation**
- **Multiple ingredients to one location**
- **Short convey distance**
- **Less heat**
- **Customer expressly says they don't want a pressure system.**

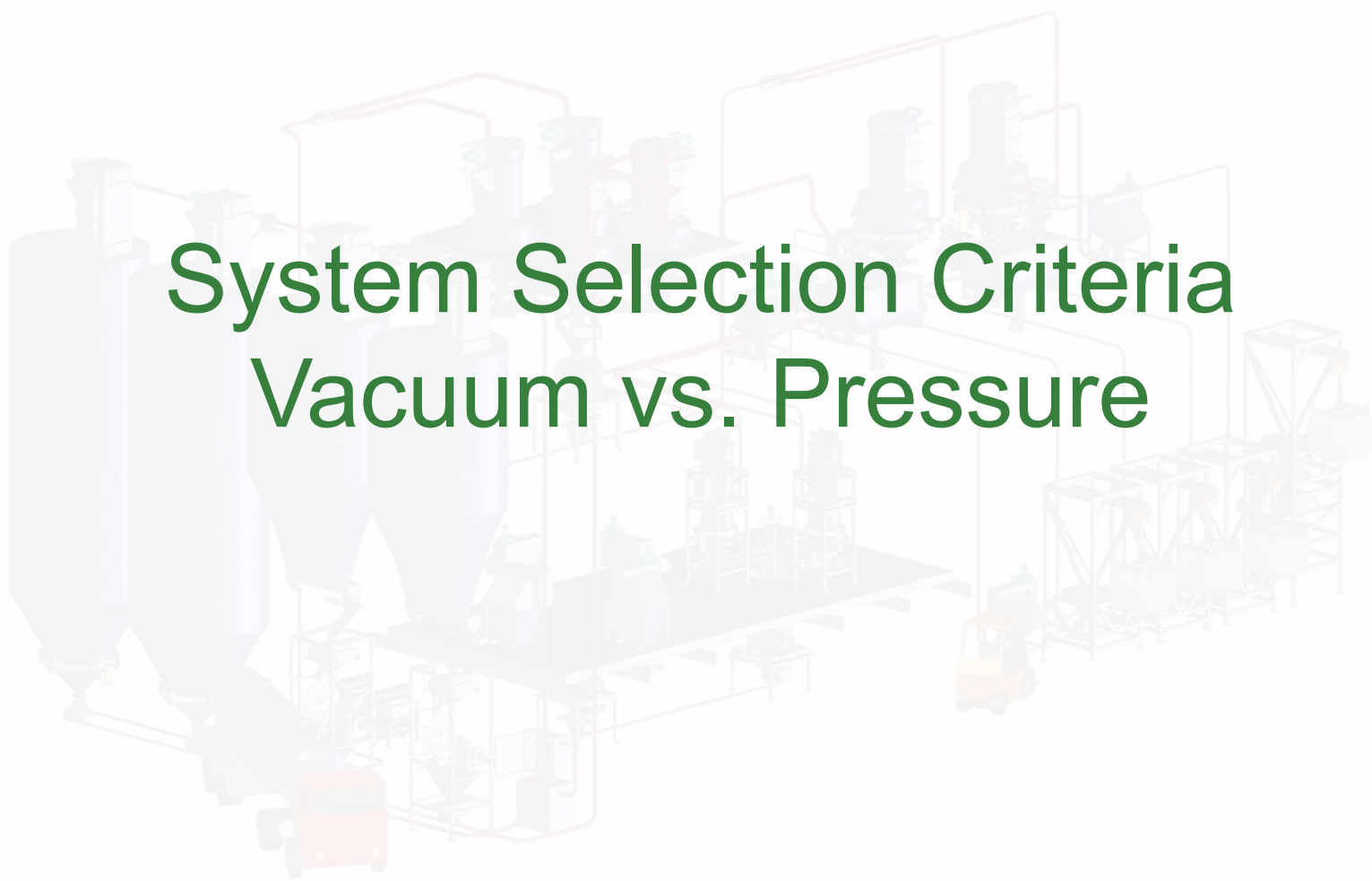
System Selection Criteria – Vacuum vs. Pressure



Now let's get…

Back to the Basics

System Selection Criteria – Vacuum vs. Pressure



System Selection Criteria
Vacuum vs. Pressure

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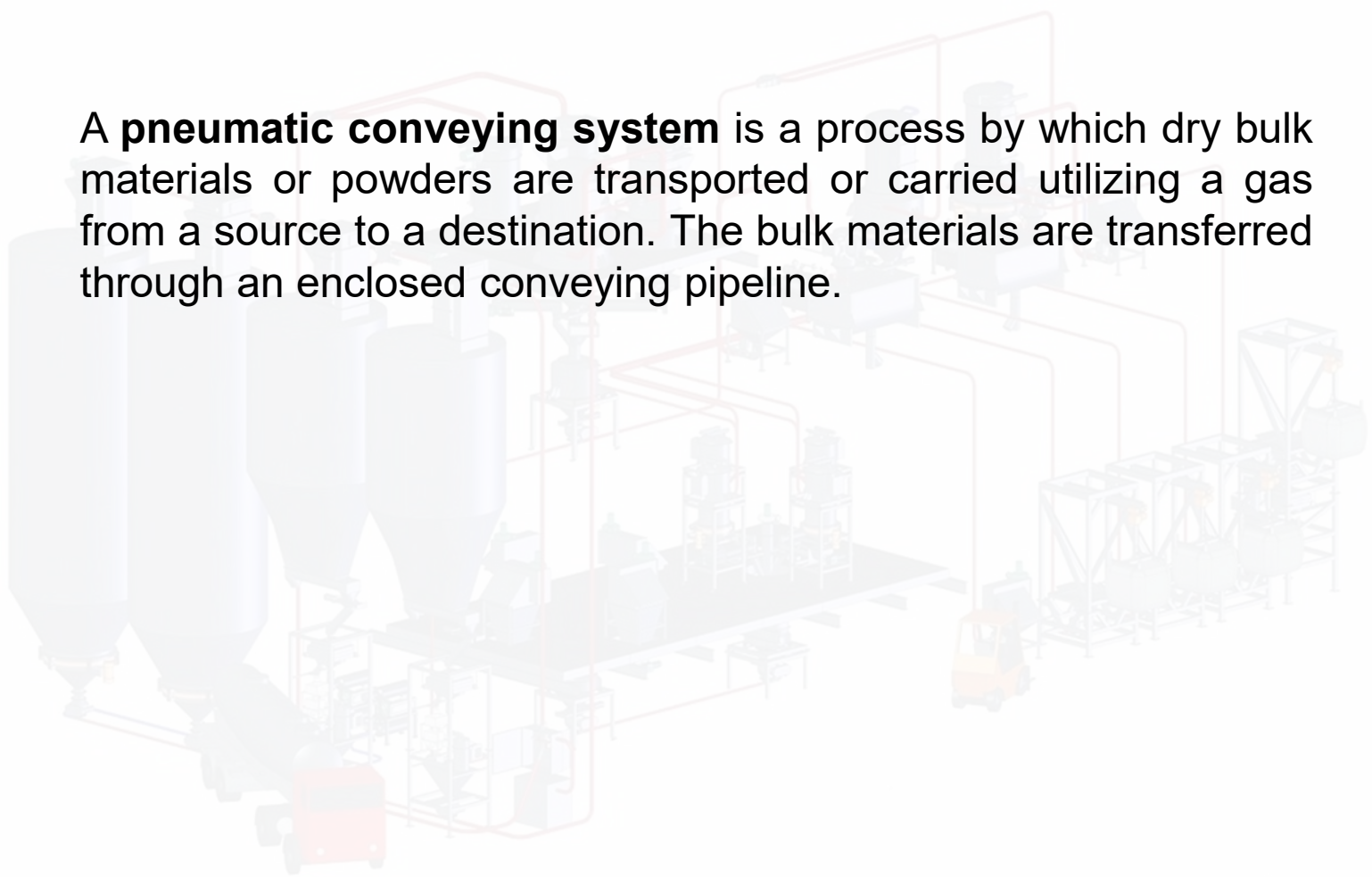
Pneumatic Conveying Defined

A **pneumatic conveying system** is a process by which dry bulk materials or powders are transported or carried utilizing a gas from a source to a destination. The bulk materials are transferred through an enclosed conveying pipeline.



Dilute Phase Conveying - Functionality

Dilute phase transfer systems are designed to push (pressure) or pull (vacuum) the material through the piping to the required destination. Systems use low pressure (1 to 15 PSIG) and high velocities (3,600 to 7,000 feet per minute)

In both pressure and vacuum systems there is typically a rotary valve at the inlet that meters the material into the convey stream at a given rate. A rotary lobe blower creates the power source (CFM and Pressure/Vacuum) needed to provide the proper velocity to entrain the material in the air stream and transfer to the end destination

Dilute Phase Conveying - Benefits

- Provides a consistent and repeatable process.
- Robust design provides for years of reliable performance.
- Reduces fugitive dust (less spills, closed conveying system).
- Reduces manpower
- Reduces injuries (lifting bags)
- Typical ROI is typically about two years.

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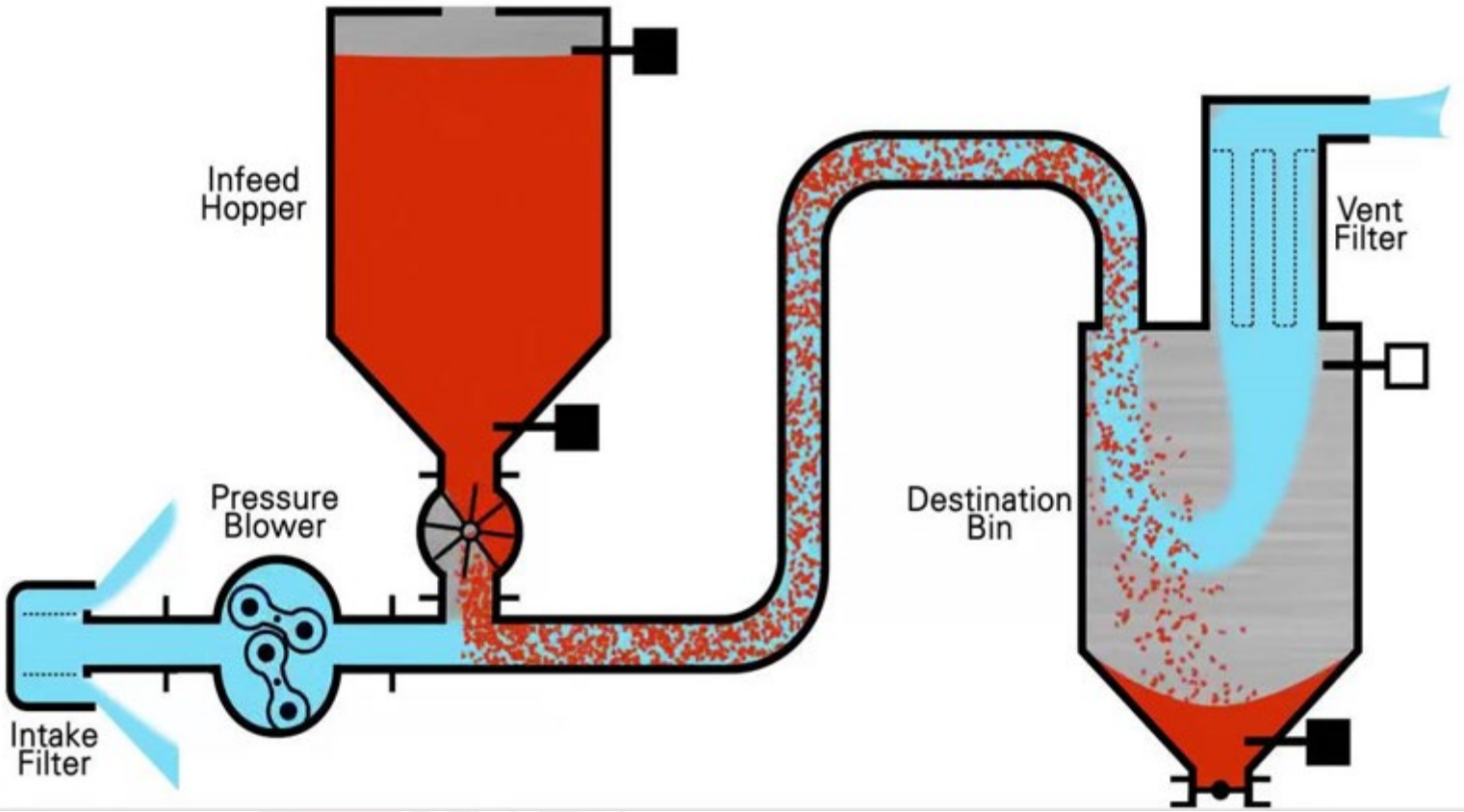
Pressure Dilute Phase Conveying



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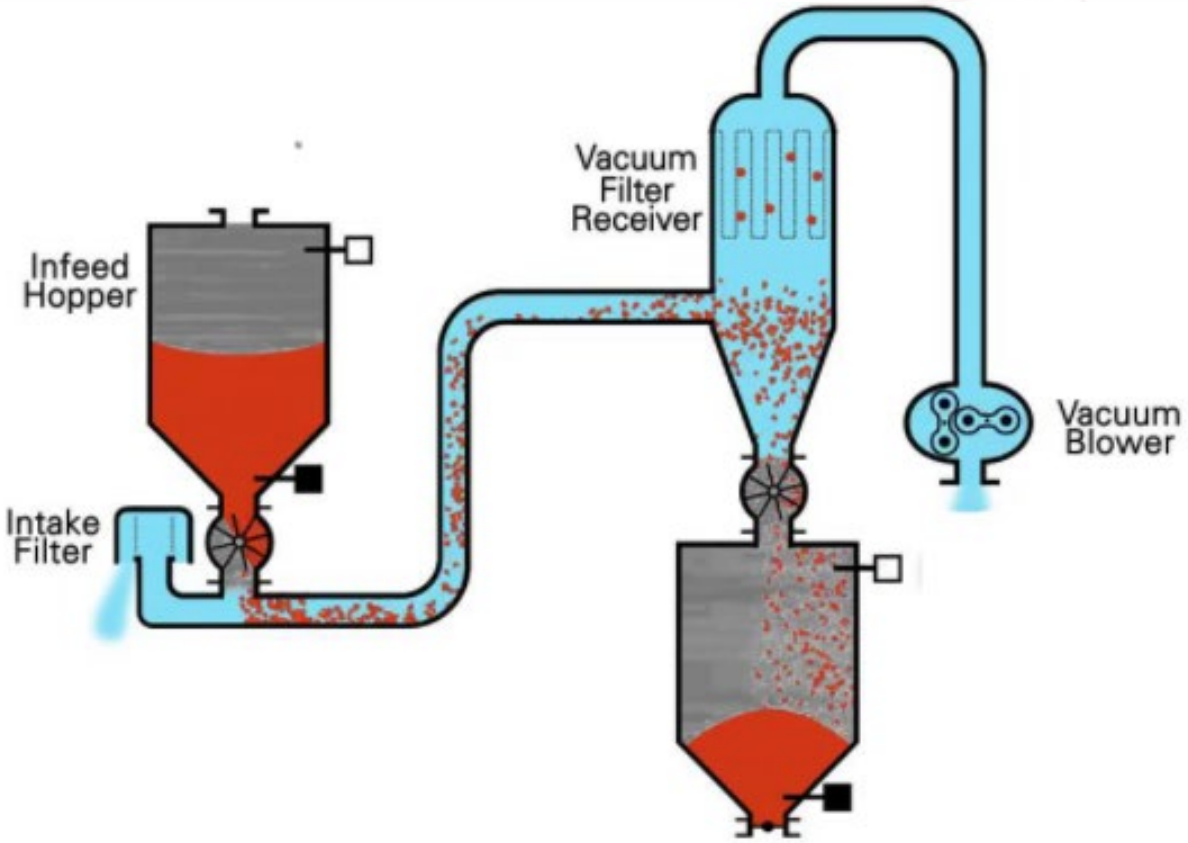
Vacuum Dilute Phase Conveying



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Positive Pressure Systems

Positive pressure dilute phase pneumatic conveying systems are typically employed to convey bulk materials from a single source to one or multiple destinations, over longer distances and with greater capacity than possible using vacuum systems.

- Energy efficiency
- Easy installation and operation
- Customization to better fit your needs – future growth
- Increased plant efficiency
- The ability to use bulk purchases of raw materials
- Lowered material costs
- Bulk system allows for more available plant floor space. Eliminates storage of 25- and 50-pound bags

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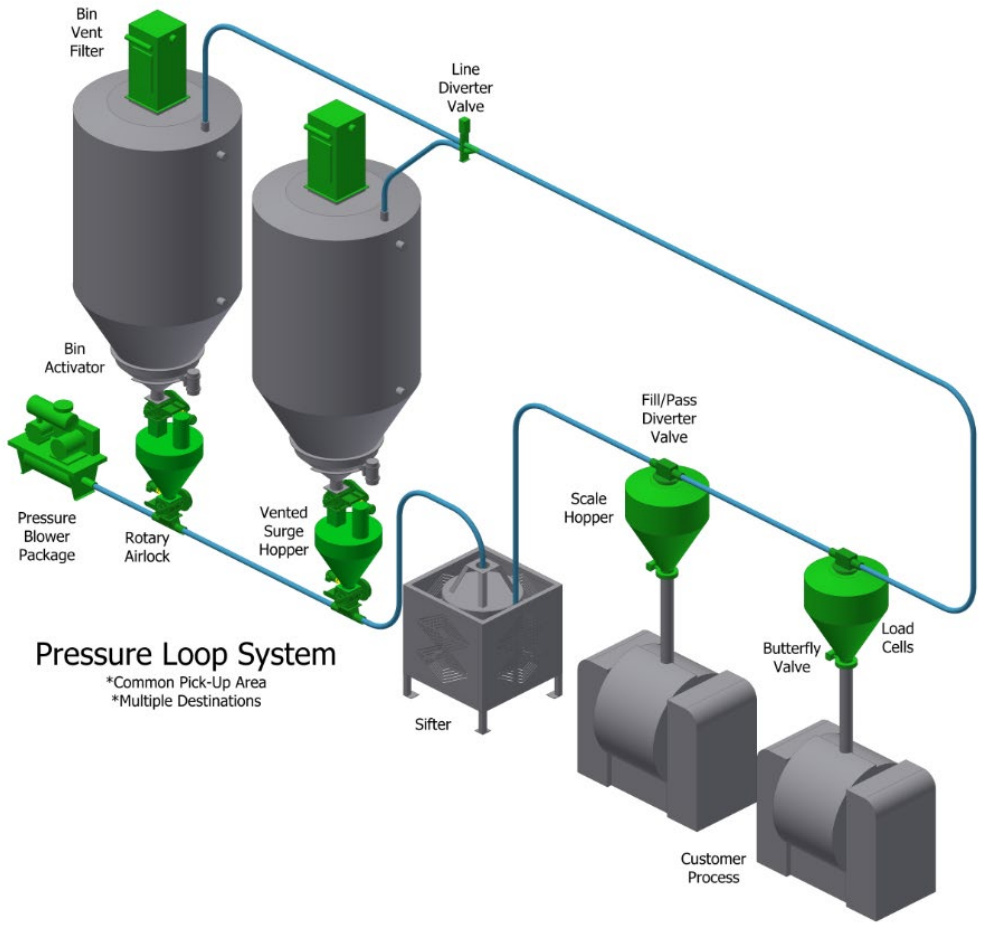
Dilute Phase Conveying – Pressure Loop



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Dilute Phase Conveying – Presure Loop Conveying

Pros:

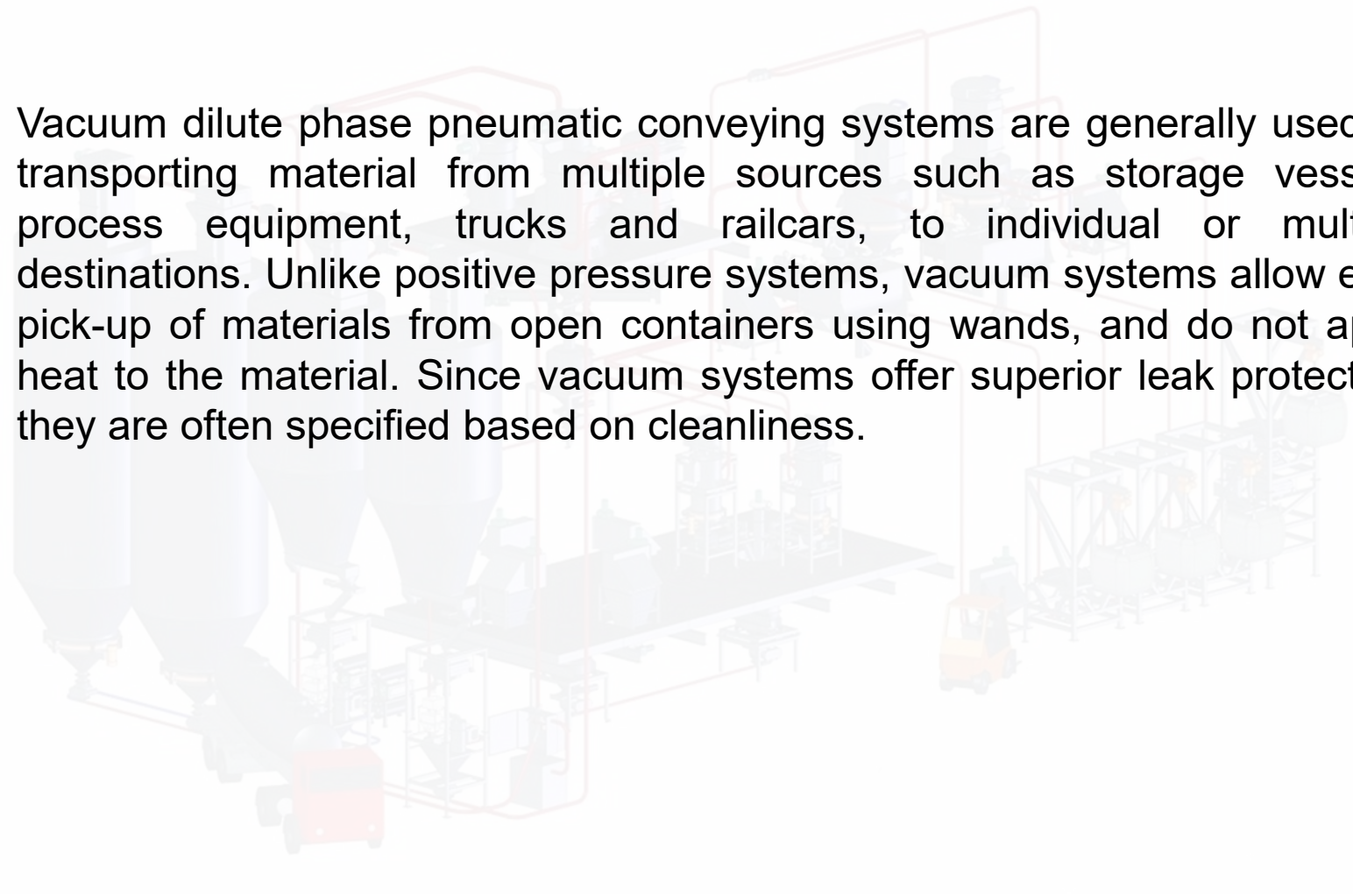
- Typically, the most economical approach
- Able to convey larger volumes of product
- Able to convey further than vacuum systems
- Greater scaling accuracies
- System leaks easily detected

Cons:

- System leaks create housekeeping issues
- Not ideal when multiple materials need to be conveyed

Negative Pressure Systems

Vacuum dilute phase pneumatic conveying systems are generally used for transporting material from multiple sources such as storage vessels, process equipment, trucks and railcars, to individual or multiple destinations. Unlike positive pressure systems, vacuum systems allow easy pick-up of materials from open containers using wands, and do not apply heat to the material. Since vacuum systems offer superior leak protection, they are often specified based on cleanliness.



Negative Pressure Systems

Vacuum systems are ideal for transfer of product 200 feet distance or shorter. You can go further with a vacuum system but typically is not cost effective.

Vacuum systems lend themselves to a more dust-free operation because they operate below atmospheric pressure. This means that there is no tendency for outward leakage.

DILUTE PHASE CONVEY SYSTEMS

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Pressure Vs. Vacuum		
	Advantages	Disadvantages

Pressure	• Transfer to multiple destination
	• Convey longer distances
	• Easier to achieve scaling accuracies (loop systems)
		• Not flexible at pick-up point.
		• Fugitive dust issues
		  • System leaks (i.e., coupler)
		  • Bypass air escape
		• Heat is generated

Vacuum	• Cleaner operation • Better suited for heat sensitive applications.	• Typically, higher priced as additional equipment is needed (i.e., inline secondary filters to protect the blower).
Pressure/Vacuum Combination	• Best of both worlds – flexible at source and destination points.	• Can be more costly to provide a blended solution.

Negative Pressure Systems

Distance is a limiting factor for vacuum conveying, and once the conveying range is past practical limits, it simply becomes more economical to pressure convey. There are situations in which choosing a vacuum conveying becomes overly expensive. (Example: More than 200 feet is typically out of range for an affordable vacuum conveying system when the convey rate requirements are also high.)

While there remain many advantages to vacuum conveying, essentially there are situations in which you can push something further than you can pull it. Pressure conveying offers the right option for these situations.

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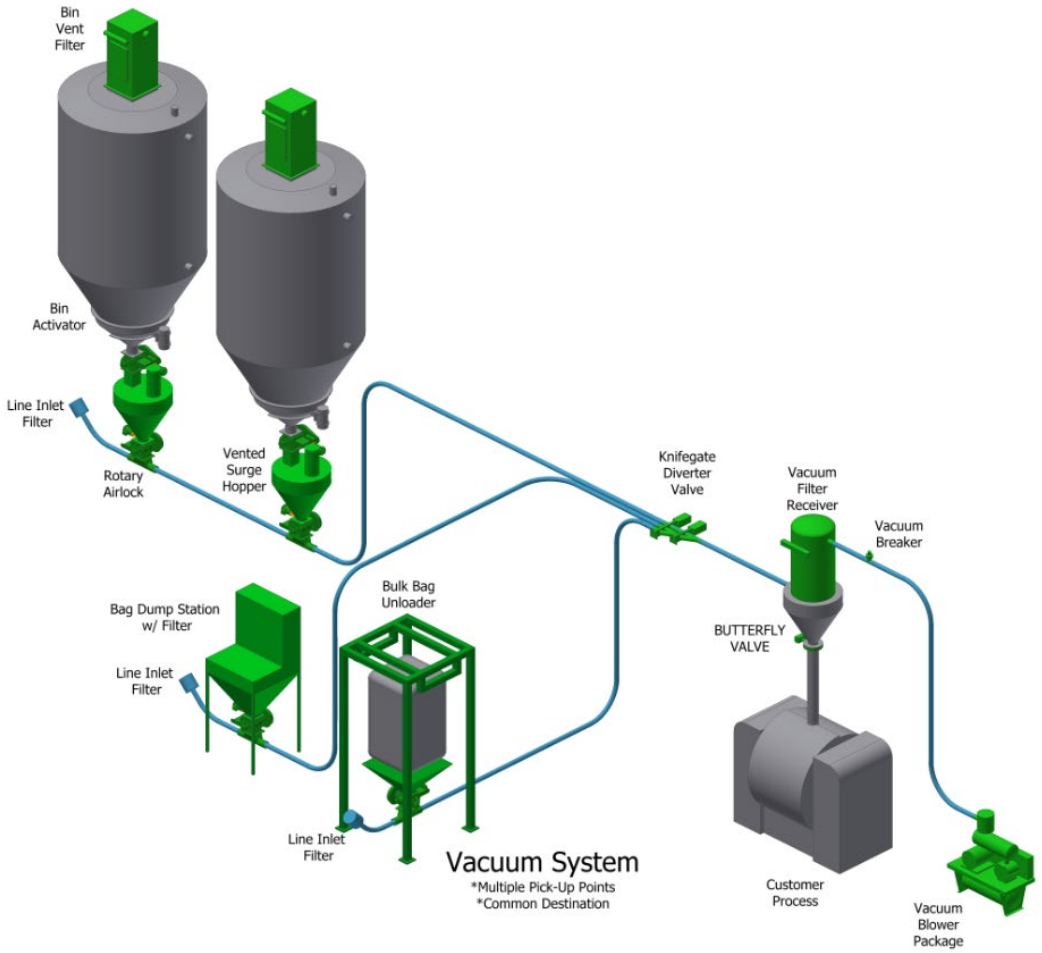
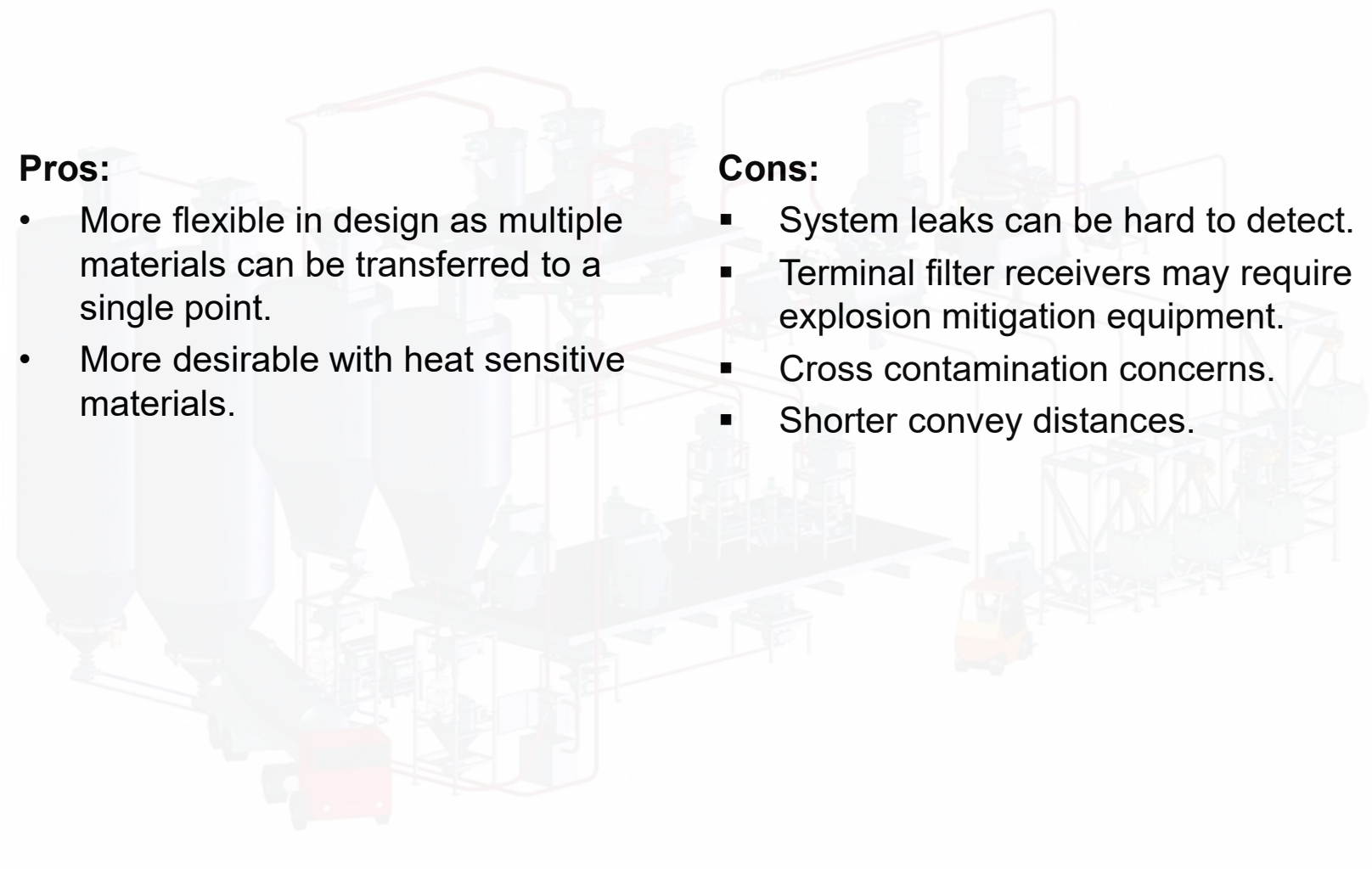
Dilute Phase Conveying – Vacuum Terminal



Dilute Phase Conveying – Vacuum Terminal Conveying



Pros:

- More flexible in design as multiple materials can be transferred to a single point.
- More desirable with heat sensitive materials.

Cons:

- System leaks can be hard to detect.
- Terminal filter receivers may require explosion mitigation equipment.
- Cross contamination concerns.
- Shorter convey distances.

PNEUMATIC CONVEY SYSTEMS

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Required Data

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Phone: 913-831-0740
Fax: 913-831-9271
E-Mail: mikea@camcorpinc.com
Web Site: www.camcorpinc.com

PNEUMATIC CONVEYING APPLICATION SHEET

Customer Information:

Contact Name:	Address:
Title:	City/State/Zip:
Company:	Phone:
Email:	Fax:

Process Information:

Product? Bulk Density? PCF Particle Size/Shape?
Vacuum or Pressure? Rate? PPH Type: Continuous Batching Scaling
What process feeds the system? # of Inlets:
What process is it discharging to? # of Discharge Points:
Is breakage a concern? Is cross-contamination a concern?
Are we supplying support structure? If yes, what is clearance below discharge? In.
Equipment to be installed: Indoors Outdoors
Are there space constraints? Height: Depth: Width:

Drawing or Special Notes:

Application Information:

Vertical convey distance: ft. Horizontal convey distance: ft. # of 90° Elbows:
# of diverters in system: Temperature: °F Altitude: ASL
Is material explosive? KST value?
Special Material Characteristics: (indicate all that apply)
Abrasive Sticky Acidic Alkali Stringy Food Grade Hygroscopic Biohazard Friable
Other:

Construction Information:

Materials of Construction:
Product Contact: Carbon Steel SS [304, 304L, 316, 316L] Aluminum Other:
Gas Contact: Carbon Steel SS [304, 304L, 316, 316L] Aluminum Other:
Weld finish required:
Paint Specification:
Electrical Requirements:
NEMA 12 (general) NEMA 4 (weather tight) NEMA 9 (dust tight) NEMA 7 (gas tight)
Class/Group/Division:
Voltage Required:

CAMCORP, INC.
9732 Pflumm Road • Lenexa, Kansas 66215

P:\Representatives\Strategic Initiative - NSM OSR\Rep Kit\Process Application Sheets\Application Sheets\Pneumatic Conveying Application Sheet 02.01.20.doc

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Required Data

In addition to the info on the Application Data Sheets, we also would like to have each of you develop the B.A.N.T. info.

B.A.N.T.
B = Budget
A = Authority
N = Need
T = Timing

More details to follow in the next Rep Newsletter – The Connector.

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Trivia Question #2

Submit your answer through the chat function.

Who can be the first to name FIVE of the criteria needed to provide a pneumatic conveying proposal?

Submit your answer through the chat function.

Will you be the first to submit a correct answer?

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Trivia Question #2

Who can be the first to name FIVE of the criteria needed to provide a pneumatic conveying proposal?

Acceptable answers:

- B.A.N.T. details
- Contact Info
- Process Information
- Drawings
- Special Notes
- Application Information
- Explosion Mitigation Data (Kst, Pmax)
- Construction Information

Vacuum Vs. Pressure Convey

System Selection Criteria
Vacuum vs. Pressure

Items to consider when selecting a system:

- Convey parameters (distance, elbows, rate)
- The impact of heat sensitive ingredients
- Energy efficiency
- System leaks (is the convey system running through parts of the facility where a leak could cause other issues?

System Selection Criteria - Vacuum vs. Pressure

Convey Parameters

Example #1

Rate – 350 pounds per minute
Distance – 150 feet
Elbows – 4
400 CFM @ 8 PSIG in a 4” diameter tube

Example #2

Rate – 350 pounds per minute
Distance – 300 feet
Elbows – 6
400 CFM @ 11 PSIG in a 4” diameter tube

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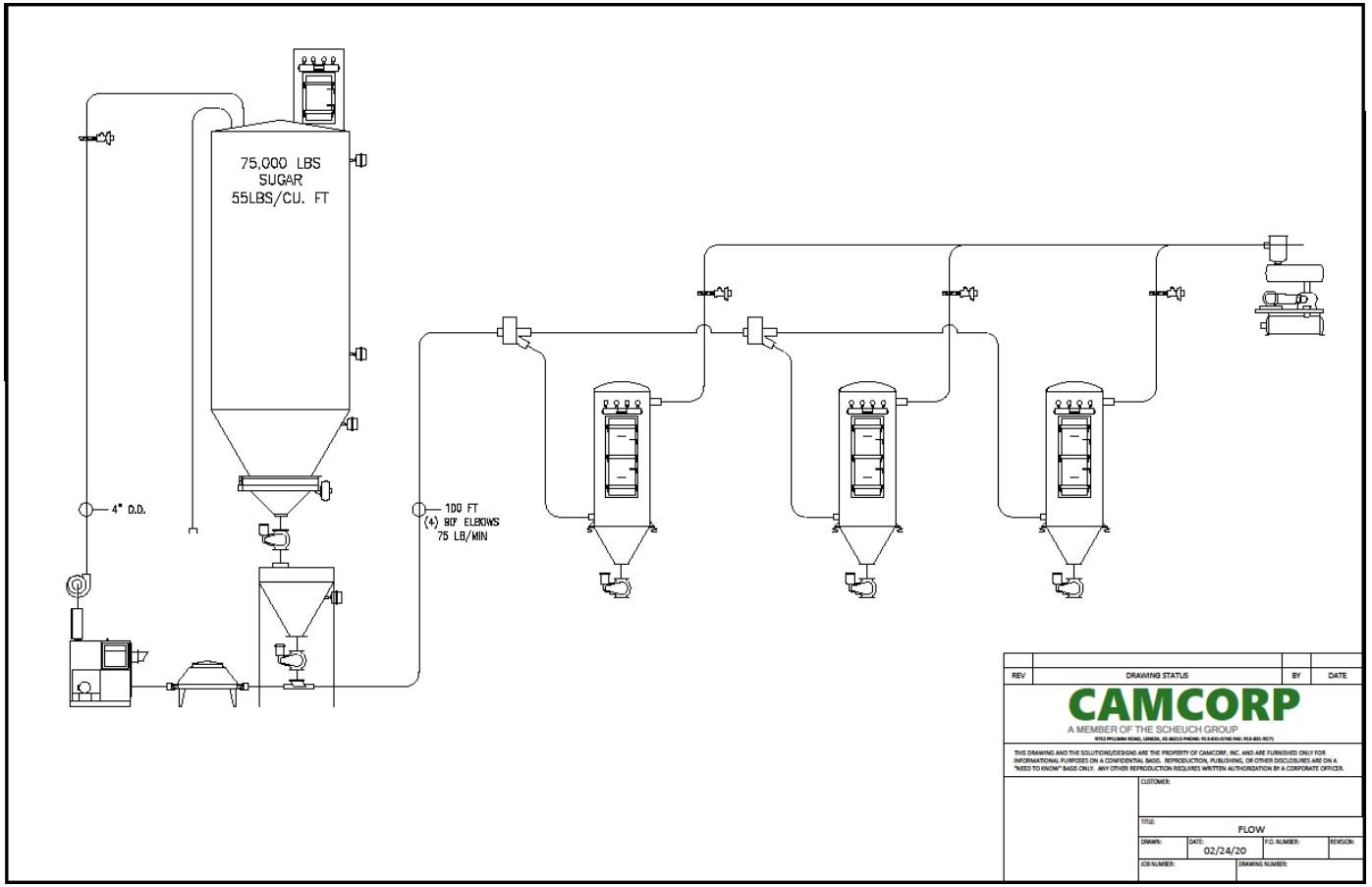
System Selection Criteria - Vacuum vs. Pressure

Conditioned Air / Dehumidification Systems



Equipment – Conditioned Air Systems

Depending on the process and the ingredient being conveyed, conditioned air may be essential to the success of the system's performance. Conditioned air systems provide the best environment for the storage and transfer of ingredients.

In the review of the application CAMCORP will discern the need for conditioned air equipment. The equipment may include:

- Dehumidifiers
- Pre and/or Post Cooling Coils
- Air to Air or Liquid cooled heat exchangers
- Isolation valves
- Gauges

System Selection Criteria - Vacuum vs. Pressure

Conditioned Air / Dehumidification Systems

As a rule of thumb, the temperature rise from the blower is @ 13 to 15 degrees rise for every PSI of pressure.

Convey Pressure = 10 psig
Ambient Temp = 100°F

Temperature rise from compression	=	130°F to 150°F
Add ambient air temperature	=	100°F
Convey Temp	=	230°F to 250°F

Granulated sugar changes state at @ 120 degrees and it begins to melt and caramelize causing it to stick to the tubing and causing plugging issues.

System Selection Criteria - Vacuum vs. Pressure

Energy Efficiency

Rate – 350 pounds per minute
Distance – 150 feet
Elbows – 4

Pressure System
400 CFM @ 8 PSIG in a 4” diameter tube

Vacuum System
368 CFM @ 12” Hg in a 4” diameter tube (12” Hg. Is not desirable for a new system)
550 CFM @ 8 “ Hg. In a 5” diameter tube

.

System Selection Criteria - Vacuum vs. Pressure

System Leaks

Any small pinhole or loose connection is an opening that can allow dust to blow out of a pressure system, creating undesirable conditions in a factory. If the same hole is found on a vacuum system, air is simply pulled into the system.

Project Overview #1

Scenario: Bulk bag ingredient with dust collection and customer wanting to transfer to two locations.

Recommendation: Vacuum conveying

Rationale:

- Vacuuming from a bulk bag unloader is typically a cleaner operation.
- The desire to vacuum out a Gaylord tote required a vacuum system.
- Multiple pickup points and destination points made a vacuum approach more efficient.

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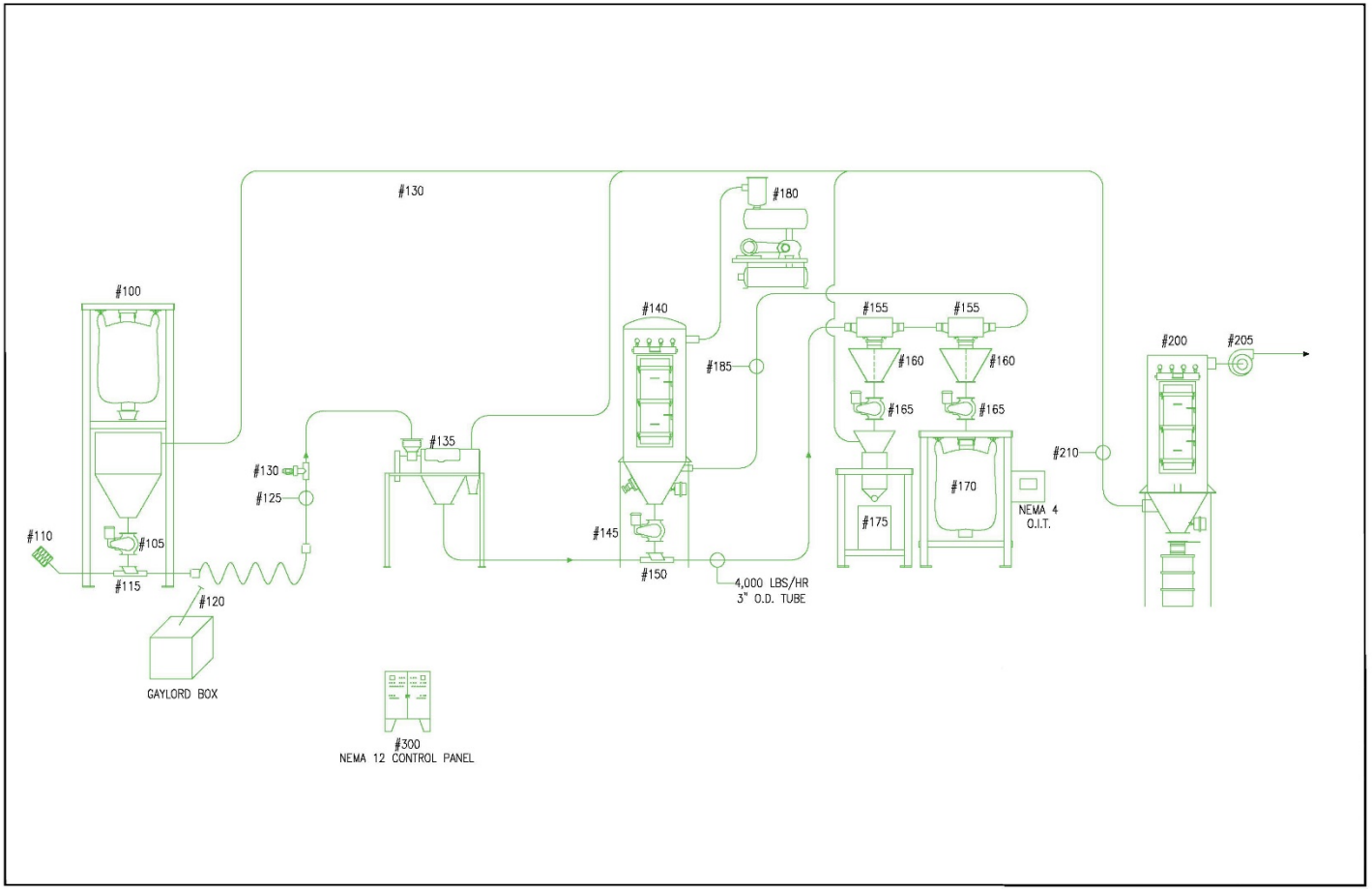
Project Overview #1



Alternatives: If the Gaylord unloading was not part of this scope, a pressure convey system could have been considered. Potential issues with a pressure system would be fugitive dust at the bulk bag unloading station.

Project Overview #2

Scenario:

Vacuum rail car unloading with transfer to multiple destinations (i.e., silos)

Recommendation: Vacuum and Pressure Systems

Rationale:

- Must use vacuum to offload ingredient from railcar.
- Too costly to provide a vacuum only solution as the silos cannot be under vacuum. To achieve a vacuum only concept, a vacuum filter receiver would have to be provided above each silo.
- More cost effective to vacuum to a filter receiver near the railcar spur and then pressure convey to the silos.

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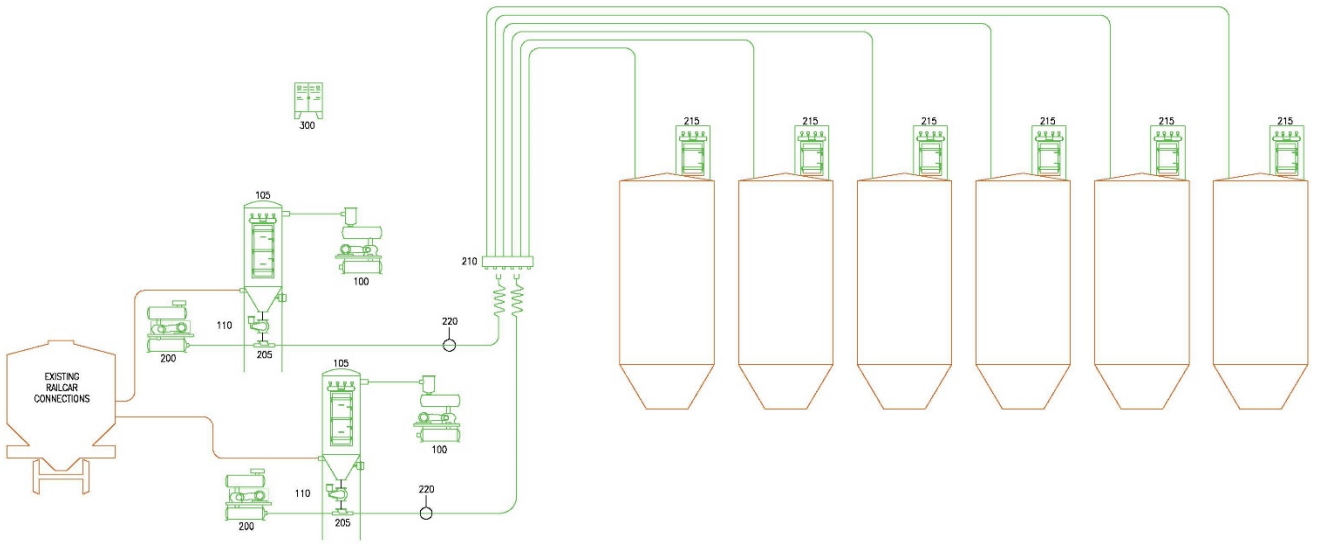
Project Overview #2



Comments: If this was a PD Railcar application, a pressure system could be implemented from the railcar unloading points to the destination(s).

Project Overview #3

Scenario: Conveying at a distance of 400 - 500 feet with a conveying rate of 350 pounds per minute from multiple sources (i.e., silo and use bin) to three scaled use points. The bulk ingredient in the silo must be sifted before going to the use points.

Recommendation: Pressure System

Rationale:

- Distance
- Multiple ingredients
- Improved scaling accuracy
- Price

Comments: If a vacuum system was implemented, the vessels over the use points would need filtration. Potential issues: higher costs, explosion mitigation considerations, and potential accuracy issues.

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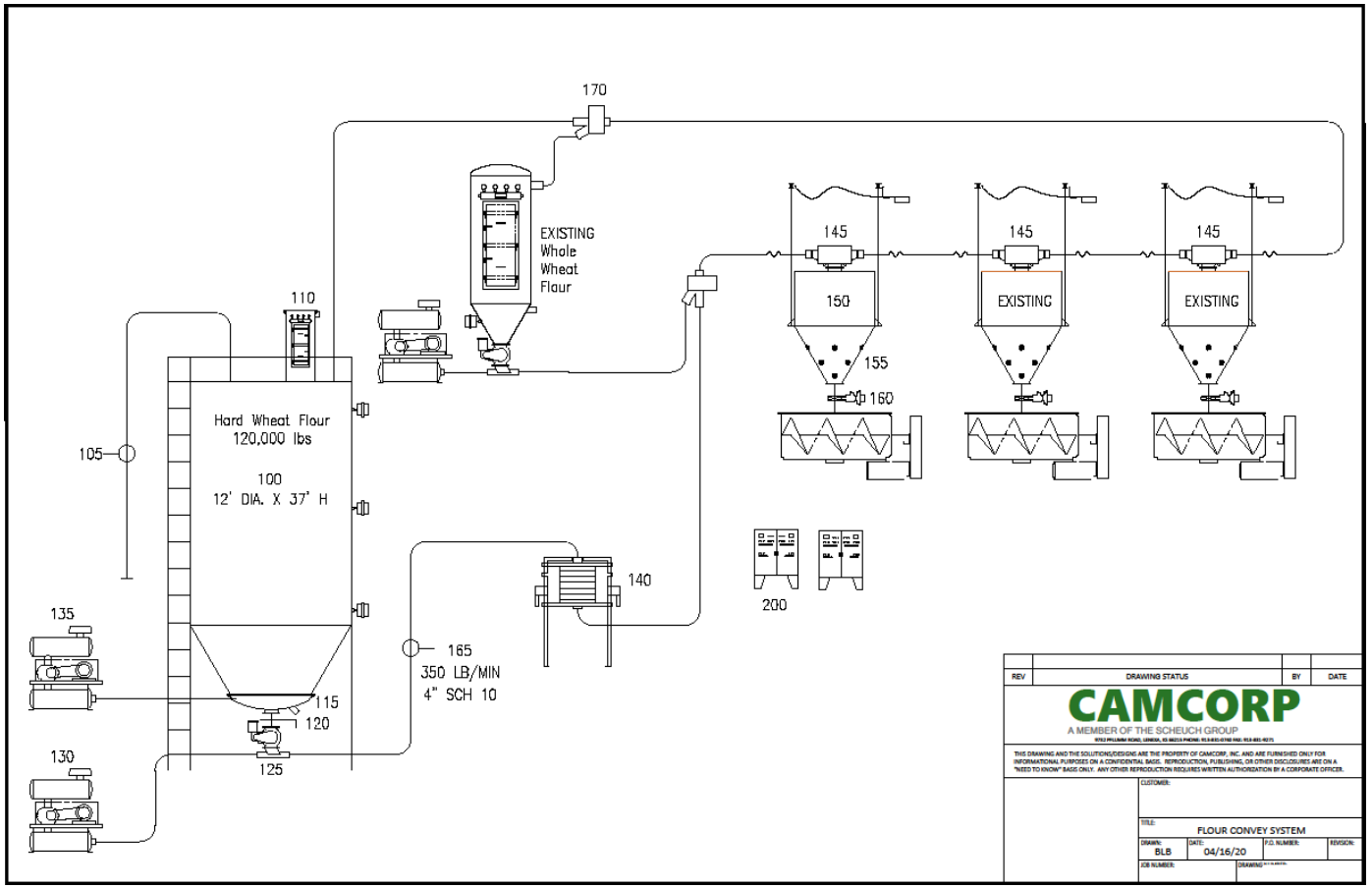
Project Overview #3



Vacuum vs. Pressure Comparisons

What Would You Do?

What Would You Do?

Vacuum vs. Pressure Comparisons

Scenario: Customer is unsure if they want vacuum or pressure. Either approach is acceptable.

What would you do?

Response: We can assist with either vacuum or pressure systems. Let me collect some data and we can evaluate as we design the solution.

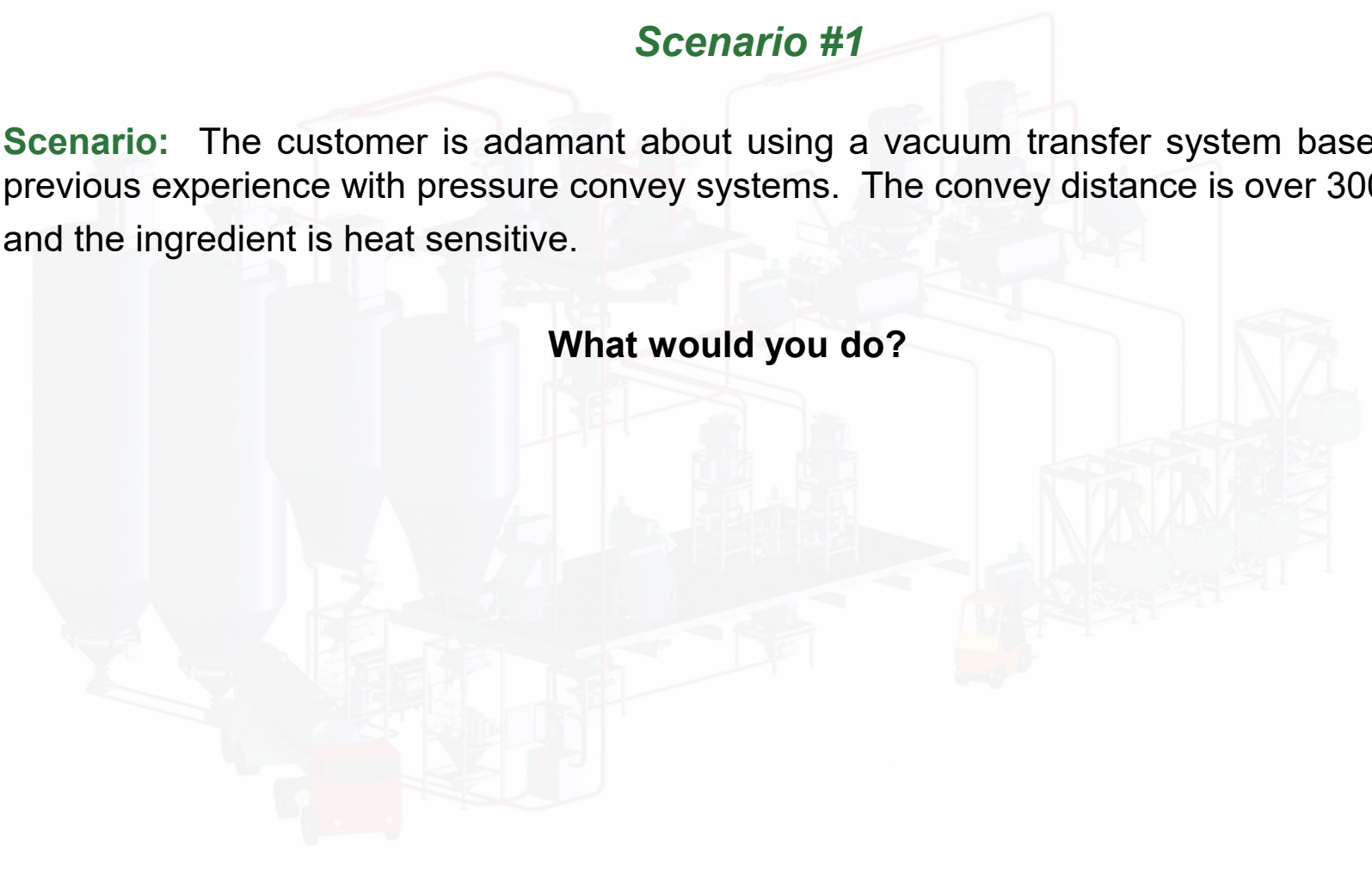
Action: Pull out the Application Data Sheet and start collecting the data.

What Would You Do?

Scenario #1

Scenario: The customer is adamant about using a vacuum transfer system based on previous experience with pressure convey systems. The convey distance is over 300' and the ingredient is heat sensitive.

What would you do?

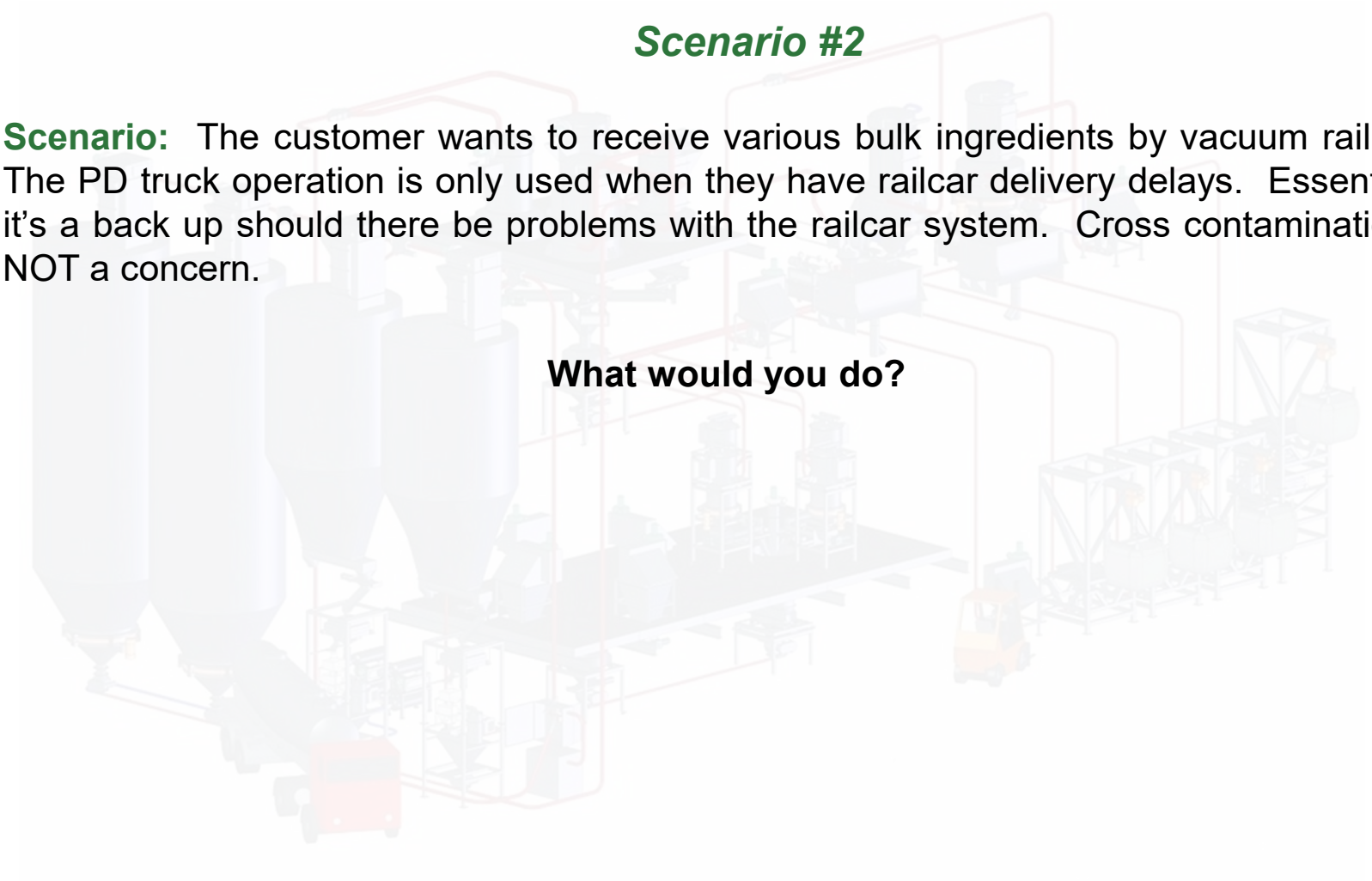


What Would You Do?

Scenario #2

Scenario: The customer wants to receive various bulk ingredients by vacuum railcars. The PD truck operation is only used when they have railcar delivery delays. Essentially, it's a back up should there be problems with the railcar system. Cross contamination is NOT a concern.

What would you do?



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What Would You Do?

Scenario #3

Scenario: The customer has an existing pressure convey system that is at its maximum capabilities. They want to add two additional lines to their facility that will be fed from the same bulk storage silos.

What would you do?

What Would You Do?

Top 5 Industries

While CAMCORP has experienced success across many industries, the TOP FIVE industries over the past THREE years are:

FOOD

PLASTICS

AGGREGATES

WOOD

CHEMICALS

Show me the Money!

You can't be like Donald carrying his loot to the bank unless you get out and beat the pavement first.

Let's do this TOGETHER!

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UPCOMING TRAINING

End of April – Dust Collection – NFPA

Dates and Topics subject to change.

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Questions

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THANK YOU!