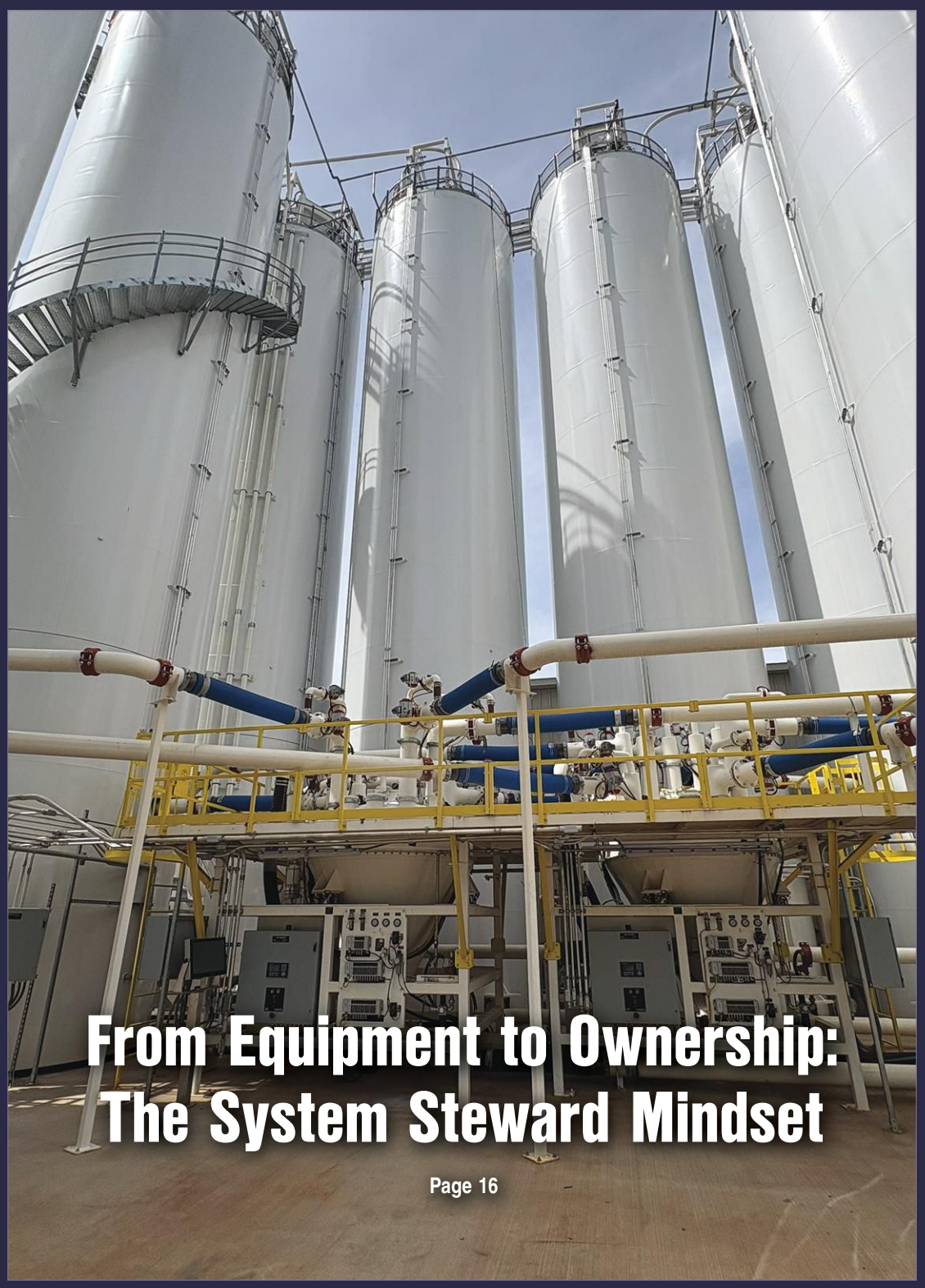
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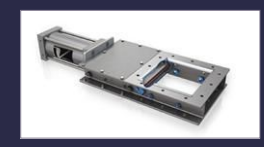
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### Gentle, High-Efficiency Rotary Batch Mixer



The new rotary batch mixer is engineered for consistent blend quality, gentle material handling, and simplified sanitation across dry bulk processing environments. The machine utilizes a gravity-driven rotary tumbling process rather than internal paddles, ribbons, or agitators. This low-shear mixing method minimizes particle damage, segregation, and heat generation, while achieving uniform blends in short cycle times, including applications involving minor or trace ingredients.

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### 115-Volt ACD Certified Dust Collector



The new ZEFIRO EV AP 420 ACD is a compact, portable dust collector designed to safely handle both combustible and non-combustible airborne dust in non-classified areas. Its rugged, all-steel construction ensures durability in demanding environments. The motor delivers up to 677 CFM, providing high airflow for efficient capture of fine particles. Its 115-volt configuration makes it compatible with virtually any work environment.

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# From Equipment to Ownership: The System Steward Mindset

*By Scott Schmid, Cyclonaire*

Pneumatic conveying systems are not just equipment purchases. They are long-term performance assets that require intentional ownership across design, commissioning, operation, and maintenance phases.

Often when a new system is being planned and the project gets underway, the focus is on getting the system delivered, installed, and running to meet a defined performance objective.

While these are, of course, important objectives and milestones, what happens after it is commissioned and the performance is demonstrated? The project team celebrates the success and moves on to the next project.

What happens next is not always given proper consideration in the early planning stages. When it isn't, you can find yourself "painted into a corner" that is difficult or impossible to get out of.

The new system that you just installed is going to operate for the next 20-30 years. If you have overlooked the related "human interaction" considerations, you just made someone's life — maybe your own — much more difficult for a long time.

Here are some examples:

- No thought was given to how a diverter valve on top of a silo would be maintained. Every time maintenance is required, your system is down until you can bring in a crane to access it. (Not only is the cost of downtime a problem, but the cost for the crane is unplanned and expensive.)
- Baseline performance was not documented, nor were important machine settings. As components wear, fail, or are misadjusted over time, your system performance deteriorates without an understanding of the impact this may have on throughput, energy consumption, and reliability.
- Critical spares were not identified, nor were plans for procuring them. A component failure of a "long lead" item could result in a long, unplanned outage for



*Pneumatic conveying systems are a long-term performance asset that require intentional ownership.*

equipment, which is critical to the operation of your business.
- Lock-out-tag-out (LOTO) strategies were not planned. You are now bringing a contractor back in to modify the new compressed air piping, cutting in valves to allow component maintenance isolation without shutting down the air for the entire process area.
- The maintenance gate above your truck load-out spout is 25 feet in the air, with no planned access. There is no room to bring in a manlift to reach it. Temporary scaffolding must be set up to access the gate prior to performing work on the air chute directly beneath it.

All these oversights add to the total cost of ownership of the system over its lifetime, and they can compound. If you haven't planned your maintenance access, it is likely far from optimal. That means that maintenance will likely not be done until it cannot be ignored any longer.

A good lifecycle plan seeks to optimize:

- Total cost of ownership
- Uptime/reliability
- Safety performance
- Energy consumption
- Ease of maintenance
- Asset longevity
- Future adaptability
- Operational performance

This plan must start in the design stage and continue through lifetime operation to succeed.

## Design Phase

The following considerations must be made during the design stage:

- **Maintenance Access**
  - Wherever possible, group pumps, valves, filters, and instrumentation and locate them at "grade" or "platform" level, where they are easily visible and accessible.
  - Wherever this is not possible, provide additional platforms or access structures.
  - Consider rigging steel for removal and re-installation of items that are too heavy for maintenance personnel.
  - Provide lighting to facilitate visibility and safe working conditions.
  - Make filters ergonomically accessible for inspection and change.
  - Include LOTO isolation devices with equipment.



*No top of silo steel for support or rigging*



*Rigging/support steel and jib crane for raising valves from grade*

If a valve is difficult to access, it won't be inspected regularly.

If changing a filter is hard, it will be delayed.

If a system requires confined space entry, it will be avoided.

- **Process Visibility**

Include adequate instrumentation to pull information out of your system for ease of visibility. Ensure that:
  - Pressure transmitters capture the operation of the pneumatic transfer.
  - Load cells or level transmitters can capture key transfer rate information.
  - Filter differential pressures capture the health of the dust collection system.
  - Airflow measurement can ensure systems operate efficiently.
  - Current monitoring on blowers, fans, and feeders can capture baseline performance and act as a leading indicator of maintenance needs.

All these signals should be logged using standard "dashboards" that are compared to baseline commissioning performance with some regularity.

- **Design for Reliability & Redundancy**
  - Select robust system components for their intended use.
  - Failure Mode and Effects Analysis (FMEA) thinking must be applied to designs to ensure that a single failure point does not create unwanted secondary and tertiary effects on the system. (Backup sensors, pressure protection, etc.)
  - For critical process operations, consider redundant or flexible designs to allow the process to keep operating when maintenance is required, or a failure is encountered by a specific system component.
  - Use common parts wherever possible to simplify spare parts stocking plans (and/or provide the opportunity to "borrow" a component from elsewhere in the system as needed).



- **Documentation**
  - Provide detailed P&ID drawings to reference the system's ASA roadmap. Include important device settings.
  - Make fully detailed mechanical drawings (Ex: belt tension details, etc.), electrical schematics, and network details like IP addresses available for future reference.
  - Provide device-level manuals covering details like VFD parameters and sensor and scale calibration procedures for troubleshooting.

## Commissioning Phase

The following considerations must be made during the commissioning stage:

- **Performance Baseline Benchmarking Documentation**
  - Once the system has been "tuned" to achieve the design performance, adequate information should be captured to provide a picture of what this performance looks like. The best baselines capture operating trends of the system, so that many nuances, such as ramp up and ramp down pressure profiles, operating pressures, and cycle times, can be captured. In lieu of data trends, these times and pressures can be documented, but "a picture is worth a thousand words," and recorded times and average pressures never capture the whole story.
  - Document important machine settings (regulator settings, flow valve settings, key pressure setpoints, key weight or level setpoints, etc.) in a way that is easily accessible for future reference. (I like to populate these on the P&ID.)

- **System Training**
  - Conduct detailed training for supervisors, operators, and technicians responsible for owning and using the system in the future. Ideally, this training will include concepts of operation, baseline performance data, description of all the operating HMI screens and functions, a discussion of safety and LOTO, and identification of common maintenance tasks and recommended PM schedules. If possible, this training should be recorded for future employees.



*No access to maintenance gate*



*Maintenance platform for gate and equipment access*

## 'Handover' Phase

- **Ownership Accountability Questions**
  If clear ownership of accountability is not assigned and accepted, the concept of ownership quickly fades.
  - Who owns uptime?
  - Who owns project management (PM)?
  - Who reviews key performance indicators (KPIs)?

- **LOTO Plans**
  - LOTO plans are required by the Occupational Safety and Health Administration (OSHA), so I generally see these get executed. It is best to start this process early (plan during design, begin labeling during installation) so that plans can be used during commissioning and handover phases. The best executed plans provide clear labeling of lock points and always identify where the upstream hazard originates.
- **PM & Inspection Planning & Launch**
  - Start clearly identifying which items need scheduled maintenance early to begin any timing or cycling tracking intervals.
  - Clarify tracking for these maintenance intervals. More sophisticated industrial plants utilize computerized maintenance management systems (CMMS) or manufacturing execution systems (MES) to capture and schedule this information. Someone must enter the component details and recommended maintenance schedules.
  - Many PLC or SCADA systems today can track valve cycle counts, motor run times (hour meters), and other equipment information. These counters and timers can be used to help schedule maintenance activities.
  - Specific PM tests for individual machine modules can be defined. These are simple tests that can be conducted "offline" to validate performance. A conveyor can be pressure tested and/or vacuum tested to ensure proper pressures are being generated, and no significant leaks are present. Load cells can be verified with test weights. Blowers can be load tested against known pressure/current/horsepower/temperature criteria to ensure proper function. Defining and documenting these procedures can provide instructions for scheduled performance checks.
  - This is the time to ensure that adequate data logging/historical trends are created to capture important instrumentation points (PLC tags). Create dashboard trends and a clear schedule of who will review them and how frequently.
  - Will the system supplier play a role in supporting the PM and performance auditing processes? If so, you may want to engage them to get the work scheduled at intended intervals.

- **Spare Parts Stocking**
  - Identify system "consumables" (filters, lubricants, shaft seals, etc.) and keep them on hand for scheduled replacement.
  - Create a stocking and/or sourcing plan for critical system components prone to failure (pretty much any moving part, sensor, or high-wear component).

- Prepare an "outage" or stocking plan, even if stocking major system components may not be feasible. Consider, for example, the failure of an air compressor for a dense phase pneumatic conveying system (or even just instrumentation air for a dilute phase system). If possible, design air systems with some redundancy (two smaller compressors rather than one large, for example). Alternative plans, such as "tie ins" to other compressed air in the plant, or a plug-in location for a rental compressor in case of an outage, can work.

- **Documentation Locations/Accessibility**
  - A lengthy list of system documentation was provided in the Design, Commissioning, and Handover phase, but if that documentation is not properly categorized and stored in locations accessible to the operations team, it might as well not exist.
  - Ensure accessibility of:
    - O&M manuals
    - LOTO plans
    - Drawings
    - Software backups
    - Spare parts lists
    - Startup baseline sheets
    - Troubleshooting guides
    - Training documents and video recordings

## Key Long-Term Operation and Ownership Questions:

- **PM Schedules**
  - Are those identified PM tasks being done on schedule? Who is responsible for ensuring that happens?
  - When a part is replaced or maintained (blower oil or belts being changed, for example), where is the information documented and how does it update the maintenance schedule? (This is where CMMS software can be very valuable for tracking and schedule setting.)
  - Is the part re-ordered for inventory when one is removed from stock by maintenance?

- **Performance Monitoring & Management**
  - Are the machine performance tests being performed and documented?
  - Are the data trend dashboards being reviewed and compared against commissioning baseline performance?
  - What is the plan if performance degradation is observed? Do you have the expertise to analyze root cause, or do you need to maintain a relationship with your supplier for assistance in these situations? You may wish to consider occasional performance audits by the supplier to tap into their subject matter expertise.

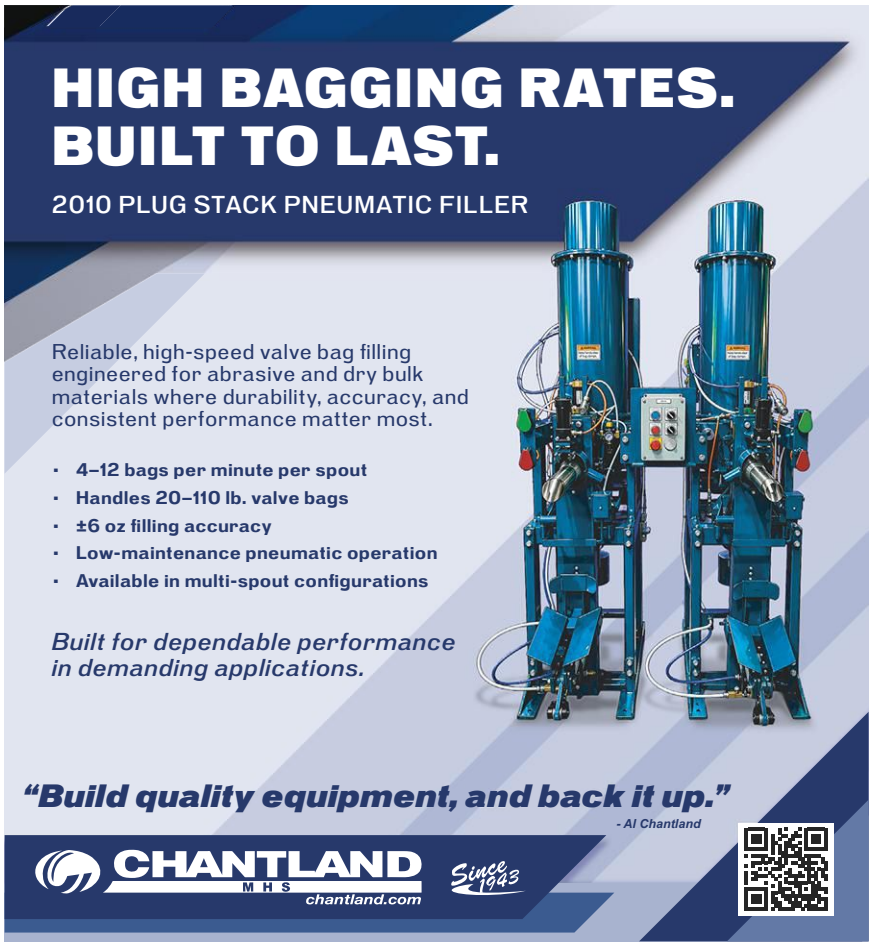
- **Knowledge Retention**
  - Maintain a deep understanding of the system by consistently conducting the machine performance tests and reviewing operating trends.
  - It will be normal, however, to have new team members join your operations group while others will move on to other duties, likely requiring regular retraining.
  - Review the recorded training documentation occasionally, and certainly when new team members join.
  - Consider having your system supplier re-host the system training at intervals that make sense for your team.

**Common Failure Pattern**

1. System starts well
2. Production pressure rises
3. Small adjustments made
4. PM delayed
5. Baseline forgotten
6. Efficiency declines
7. OEM called only after pain

**Better Pattern**

1. Startup baseline captured
2. Ownership assigned






3. PM launched
4. Data reviewed
5. Issues corrected early
6. Supplier stays engaged
7. Asset improves over time

As automation continues to evolve, there are even more sophisticated tools "in the works" to help deploy lifecycle planning.

I was recently at an automation partner network conference where our vendor was highlighting their strategic plan for rollout of new developing software solutions. They showed "digital twin" representations of plant floor processes, coupled with smart "on machine" sensors and components, "edge" data platforms, and AI-enabled human machine interfaces (HMIs) that all tie back to a central maintenance management system that can automatically monitor system performance and predict maintenance needs as (or before) they emerge.

Given the fact that pneumatic conveying systems often have a useful life of 30 years or more, we are likely going to have to be stewards of existing equipment "the old fashioned way" for a while still, but for companies who wish to proactively drive system performance and optimize total cost of ownership, investigating some of these emerging tools should be a priority, and a point of consideration when planning new installations.

## Conclusion

As industrial processing systems — including pneumatic conveying systems — become more sophisticated and automated, maintaining them is less about "wrench turning" and more about monitoring performance and intervening before things deteriorate to unacceptable levels.

A well planned and executed lifecycle ownership plan will ensure that you can move from the unplanned failure pattern on the left below to a better pattern on the right that ensures a more reliable production environment and a much better cost of ownership of the system. As the saying goes, "If you don't plan time for maintenance, your equipment will plan it for you."

## Case Study

Just last week I was called to a customer site to help troubleshoot a critical system that had stopped working for a client (approximately 2014 original vintage). The client maintains a very large and well-run operation, with most of the recommended lifecycle management tools in place. Just a couple of missing pieces, however, led to an equipment outage.

> "This was not a documented process the plant was familiar with."

The customer operates a vessel that vacuum loads a material from two silos (using a venturi as the vacuum generator) and then pressure "dilute" conveys it at a controlled loss in weight (LIW) manner to a downstream process. The conveyor had ceased to properly vacuum load the material. The client had performed a preventive maintenance rebuild of all the valves and solenoids on the vessel but could not restore reliable operation.

Upon arrival, I was able to perform an offline "machine performance test," which quickly identified the root cause of the problem. Unfortunately, this was not a documented process that the plant was familiar with, as it had not been considered or documented as part of their PM schedules.

The venturi was activated to draw vacuum in the vessel, but it failed to do so. A vacuum reading was taken where the vacuum plumbing connects to the top of the tank. This successfully read -12 in Hg as intended. The cause was determined to be a worn airlock that was no longer capable of providing the vacuum seal at the bottom of the vessel.

The client had a robust spare parts inventory, so a replacement airlock was available. Upon restart, the system performed as designed, and "as commissioned" performance was restored.

Upon re-commissioning, some of the machine settings were found to be "less than optimal." This was a case where knowledge retention was lacking. The team was re-trained, and the important concepts and machine settings were documented in the trip report.

In keeping with lifecycle planning, while on site, we also performed an offline "machine performance test" on another downstream conveyor. This test identified a failed load cell on the vessel. Again, the robust spare stocking program was successful because the client had a replacement in stock, which we installed and calibrated.

This example serves to demonstrate how some simple planning and preventive maintenance checks can head off major performance problems and improve system reliability.




*Scott Schmid is president of Cyclonaire. Schmid has more than 30 years of pneumatic conveying experience. Since joining Cyclonaire (York, NE) in 1995, he has held key leadership roles in engineering and operations, driving innovation and excellence in the bulk material handling industry and has served as the president of Cyclonaire since 2015. Schmid is known for his deep technical knowledge, strategic vision, and commitment to developing talent and advancing pneumatic conveying technologies across a wide range of industries. For more information, call 402-362-2000 or visit cyclonaire.com.*

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