

SHAPA

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**ARE YOU
USING THE
RIGHT CONTROL
METHOD?**



Louise Smallwood,
General Secretary, Solids Handling &
Processing Association (SHAPA)

DRIVING ENGAGEMENT, INNOVATION AND INDUSTRY RESILIENCE

SHAPA QUARTERLY ROUNDUP – SPRING 2026

As we progress through 2026, the pace of change across the process and bulk handling industries shows no sign of slowing. From shifting market dynamics to the increasing importance of digitalisation, sustainability, and skills development, our sector continues to evolve - and with that evolution comes both complexity and opportunity.

Over recent months, one of the most encouraging themes across SHAPA's activity has been 'engagement'. Whether through our events programme, training workshops, committee discussions, or digital communications, there has been a renewed appetite for collaboration and knowledge sharing. In an environment where many businesses are navigating uncertainty, this willingness to connect and contribute is particularly important.

Our regular communications through weekly email newsletters, LinkedIn updates, and direct member engagement have highlighted just how much is happening across the Association. From technical insights to member news and industry commentary, these channels have become an essential way of keeping our community informed and connected. Importantly, they also provide a platform to showcase the breadth of expertise within the SHAPA membership.

A key focus area for us has been ensuring that SHAPA remains relevant and responsive to the needs of modern industry. This is reflected in the variety of topics we are now covering - from traditional bulk handling challenges through to emerging priorities such as cyber resilience, digital marketing, and workforce development.

Our Winter General Meeting held in February brought together technical presentations and market insights, as well as an expert input on cyber security, an area that is increasingly critical for industrial businesses. Delivered by the West Midlands Cyber Resilience Centre, the presentation was extremely well received by delegates on the day and signposted members to free of charge support in bringing their own cyber security policies and procedures up to standard.





Training and professional development continue to sit at the heart of what we do. Feedback from members consistently reinforces the value of practical, accessible learning opportunities. Our 'Introduction to Bulk Handling' course will run again in 2026, as well as our popular Marketing Workshop which is taking place in May. This variation in topics reflects the broader skillsets now required across our industry. We are also placing greater emphasis on encouraging member involvement in delivering these sessions, ensuring that knowledge is shared peer-to-peer wherever possible.

Alongside this, our events programme continues to provide valuable opportunities for networking and collaboration. In-person meetings have taken on renewed importance. There is clear value in bringing people together - whether to discuss technical challenges, explore new ideas, or simply strengthen professional relationships. These interactions are often where the most meaningful conversations happen.

From a market perspective, the picture remains mixed. Insights gathered through our business barometer and ongoing member discussions point to a sector that is navigating uneven conditions. While some areas are experiencing steady demand, others are facing slower order intake and increased pressure on margins. Enquiry levels, in many cases, do not always translate into committed projects, and financial challenges, such as delayed payments, continue to impact cash flow across the supply chain.

However, it is equally important to recognise the resilience of our sector. Many businesses are adapting by diversifying their offerings, refining their customer engagement strategies, and investing in innovation. There are clear opportunities in areas such as sustainability, process optimisation, and advanced materials



We would like to thank all of the members who submitted nominations for this year's awards, the entries were all of a very high standard.



handling, and SHAPA members are well positioned to lead in these spaces.

Innovation remains a defining strength of our industry. This is something we are proud to celebrate through our annual AGM and Solids Handling Industry Awards. The 2026 event is taking place on 29th April in Swindon and promises to be a highlight of the year, bringing together the very best of our sector to recognise achievements across a wide range of categories - from technology and safety to sustainability and skills development. These awards not only showcase excellence but also help to set benchmarks for the industry as a whole.

We would like to thank all of the members who submitted nominations for this year's awards, the entries were all of a very high standard. We'd also like to congratulate all of the members



who have been shortlisted for an award - Russell Finex Ltd, Guttridge Ltd, Hoverdale, Woodcock & Wilson Ltd, Genesis Process Solutions Ltd, Ebro Valves, Fike UK, ISF York, Thames Side Sensors, Baker Perkins, Promtek, Boss Products, Gexcon and Polimak Process Technology.

We'd also like to thank our sponsors; without their support we wouldn't be able to host such a fantastic event. Thanks to our overall sponsor RHF Fans and also to DMN Westinghouse for sponsoring our drinks reception. Thanks too to Nerak, Thames Side Sensors, Ebro Valves, Fruitcake Marketing and Process Industry Informer for sponsoring some of our award categories.

Another significant milestone for SHAPA this year is the launch of our [new website](#). This has been a major undertaking, designed to modernise how we present ourselves and how we serve our members. The new platform has made it easier to access information, register for events, and stay up to date with industry developments. It also reflects a broader shift towards more dynamic, real-time communication, something that has become increasingly important in today's fast-moving environment. Members have been given control over their own member listings pages as well as given the ability to upload their own news articles. All events and meetings will now be published on there and registration for events will all be made directly on the website. It truly is a central hub for the Association and the wider industry.

Behind all of this activity is the continued commitment of our Council, committees, and members. Their input shapes the direction of SHAPA and ensures that we remain aligned with the needs of the industry. While we recognise that maintaining engagement, particularly in committee work, can be challenging, we are actively exploring new ways to encourage participation and make involvement as accessible and rewarding as possible.

Looking ahead, our priorities are clear. We will continue to strengthen our role as a hub for knowledge, connection, and representation within the solids handling sector. We will expand our training and events offering, enhance our communications, and ensure that SHAPA remains a strong and credible voice for the industry.

Perhaps most importantly, we will continue to foster the sense of community that defines SHAPA. In a specialised and often complex sector, the ability to share experiences, support one another, and work collaboratively is invaluable. It is this collective strength that enables us not only to respond to challenges, but to shape the future of our industry.

We would like to take this opportunity to thank all our members and partners for their ongoing support and engagement. Your contributions, whether through attending events, sharing expertise, or simply staying connected, are what make SHAPA such a dynamic and effective organisation.

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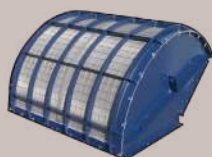
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The Atex CO detection system uses advanced carbon monoxide (CO) sensors to detect early stages of powder combustion before a fire or explosion can be ignited.

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Ajax Equipment works with Croston Engineering to enhance Soda Ash Handling

Solids handling specialist, Ajax Equipment, has supplied leading powder systems supplier and integrator, Croston Engineering, with a screw conveyor for transferring soda ash. The stainless steel screw conveyor is part of the first phase of a project to increase production.

The new screw conveyor will collect powder from Croston's system, which includes a cyclone filter, and transfer the material to an Ajax diverter valve while allowing two existing screw conveyors from Ajax Equipment to continue to utilise the diverter valve.

"Ajax were very professional and provided excellent support to us during this challenging project. This installation also



had the added complication relating to difficult site access constraints. We are delighted that installation was successful, and the screw conveyor is operating as designed and will certainly utilise Ajax's skills and experience for projects of this nature in future," said Antony Leyland, director / project manager, Croston Engineering Limited.

Commenting, Lewis Shaw, senior technical sales engineer at Ajax Equipment, said, "Ajax have worked with this plant on a number of projects and so we were happy to return with Croston Engineering. Handling soda ash is challenging, but we have developed a very good understanding of the material and application over the years through measuring fine properties and extensive experience."

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The Modu-Kleen downdraft dust collector developed by Dynamic Air is an automatic self-cleaning dust collector that offers significant advantages over conventional dust collectors with regard to performance, efficiency, filter access, energy, noise, maintenance and space requirements.

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By Javier Martin,
Explosion Protection Designer
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EXPLOSION PREVENTION AND PROTECTION IN SPRAY DRYERS

One of the most common processing operations in the pharmaceutical and food industries is the heating of a solution (slurry) or wet powder to remove moisture and produce a solid, dry product. The purpose of drying is primarily to facilitate product handling, such as the encapsulation of pharmaceutical tablets, to enhance shelf life through better preservation, and to achieve economic benefits by reducing the weight and volume of the final product for transportation.

The vast majority of solid organic materials, whether naturally occurring or industrially processed, when present as dust or in bulk form, pose a potential explosion hazard if the conditions defined by the explosion pentagon are satisfied. These five conditions can be summarized as follows:

1. The dust particles are typically smaller than 500 μm (micrometers).
2. The concentration of the dust cloud is above the Minimum Explosible Concentration (MEC)
3. An atmosphere containing oxygen is present.
4. An effective ignition source exists.
5. All of the above conditions occur simultaneously within a confined vessel.

The paradox that drying process units face is that when the purpose of evaporating the solvent from the solid is accomplished, is when the solid has the highest sensitivity to being ignited, and therefore, cause a deflagration. The next graph shows a curve confronting MIE Minimum Ignition Energy of several organic products in relation with the moisture content within the solid.

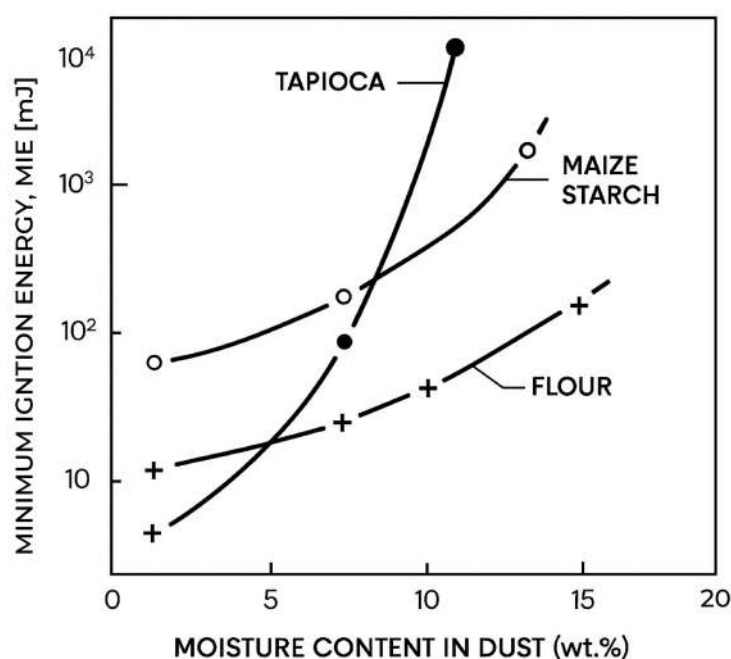


Figure 1. Influence of dust moisture content on minimum electric spark ignition energy (MIE) for three dusts. (based on an image from Laar, G.F.M. van, and Zeeuwen, J.P.: On the Minimum Ignition Energy of Dust-Air Mixtures. Archivum Combustionis 5 (1985))

As illustrated by the graph, lower moisture content reduces the energy required to ignite the solid, thereby increasing the likelihood of a deflagration event. Among the various heating and drying units used in industry, the spray dryer is the most prevalent. It is considered the flagship technology in the process industries, particularly when high-throughput continuous operation is required.

The spray dryer is primarily designed for the injection of wet product and hot air at high pressures, atomizing the liquid into fine droplets. These droplets are then dispersed into a large drying chamber, where process temperatures can reach up to 200 °C.

Typically, the product has a residence time of only a few seconds and is dried before reaching the chamber walls to prevent buildup. A filtration system, such as a cyclone, a dust collector, or a combination of both, recovers the dried product fines and separates them from the air stream. In some cases, a vibro-fluidizer is installed beneath the main drying chamber; its vibrations prevent the newly formed powder from agglomerating as it cools.

In terms of explosion protection techniques available for spray dryers there are basically two: *Explosion Venting* and *Explosion Suppression*, both are typically combined with Chemical Explosion Isolation due to the large interconnection piping diameters.

Explosion Venting

Explosion venting has long been established as the classical mitigation strategy for protecting spray dryers and remains widely used due to its relative simplicity and cost-effectiveness. However, practical implementation can be constrained by the typical indoor installation of spray dryers. While ductwork can be employed to safely discharge flames and pressure outdoors, building structures often pose challenges, as walls may be too distant or inaccessible for vent ducts. Given the importance of maintaining high temperatures and minimizing heat losses, most drying operations are conducted indoors, making the use of ductwork essential whenever explosion venting is applied.

Standard calculations for explosion venting areas, according to NFPA 68 and EN 14491, conservatively assume that the drying chamber is fully occupied by a dust cloud at optimum concentration under relatively high turbulence. Empirical measurements across a variety of spray dryer configurations, however, indicate that only portions of the drying chamber typically contain a flammable atmosphere, and within these sections, dust concentrations and turbulence levels are often below the assumed optimum. Consequently, venting areas derived from international standards may often exceed what is technically required for effective protection. The German VDI 2263 provides comprehensive guidance on this matter.

Explosion Suppression

Chemical explosion suppression combined with explosion isolation represents the most advanced methodology for explosion mitigation in spray

dryers currently available. Over the past decades, this technology has evolved significantly and has gained widespread recognition in the industry due to its high reliability and proven effectiveness.

Suppression systems operate on the principle of ultrafast detection of incipient deflagrations. When a potential explosion is detected within the spray dryer chamber, the signal is immediately transmitted to the explosion protection controller. The controller's algorithm then instantaneously triggers the HRD (High Rate Discharge) suppressors. These suppressors are pre-charged with a suppressant agent, commonly sodium bicarbonate, and pressurized with nitrogen at 900 psig (62 barg). Upon activation, the suppressant is rapidly injected into the drying chamber, quenching the explosion at its earliest stage by absorbing the heat of combustion. As a result, the internal pressure, referred to as Total Suppressed Pressure (TSP), remains below the design pressure of the spray dryer, preventing structural damage and averting catastrophic failure.

Furthermore, chemical suppression systems installed in the interconnecting piping prevent explosion propagation and mitigate the risk of destructive secondary explosions.



Fig 2. Fike Explosion Suppression system on a spray dryer system.

Risks associated with Spray Dryers

The typical risks associated with spray dryers have been extensively reported over the last decades. Among the possible causes of accident, we can list; electrostatic discharges, failure to control the process temperature, auto-ignition, hot work and smouldering. The latter has caught the attention of operators for being an unknown phenomenon and a real threat in some specific processes.

Smouldering, and insidious risk

All organic and combustible materials exhibit a critical temperature above which spontaneous



The vast majority of solid organic materials, whether naturally occurring or industrially processed, when present as dust or in bulk form, pose a potential explosion hazard if the conditions defined by the explosion pentagon are satisfied.

ignition can occur. Two key parameters are essential for operators of drying systems to understand; the minimum ignition temperature in a cloud (MIT_c) and the minimum ignition temperature in a layer (MIT_l). These parameters are intrinsically linked to the risk of explosions and fires within drying equipment. Consequently, operators must ensure that ignition sources are minimized and process temperatures maintained with adequate safety margins to prevent these hazards. Smouldering is a slow, incomplete, flameless combustion process that generates carbon monoxide, carbon dioxide, and water vapour, accompanied by heat release.

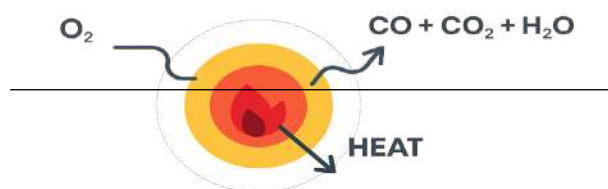


Figure 3 Smouldering chemical reaction.

This phenomenon is particularly prevalent in powdered milk and infant formula, especially in spray-drying systems, and typically progresses through two well-defined phases:

In the first phase, the product adheres or agglomerates in sections of the dryer that exhibit higher moisture content, such as the area surrounding the injector.

In the second phase, the heat supplied by the dryer causes the agglomerated product to overheat, leading to the onset of **smouldering**, which in turn can give rise to an **open flame**. This open flame acts as the initiator and primary cause of a fire or explosion, particularly since the dryer chamber contains airborne powder.

Aware of the risks associated with smouldering in spray dryers, and in accordance with VDI 2263

recommendations, **carbon monoxide detection systems** are employed, such as Hóbré **CO monitoring system**. This system primarily detects smouldering via CO measurement ports located at various inlet and outlet points throughout the air streams. Readings are centralized in a control unit, which compares the measurements and triggers alarm signals if smouldering is detected. Systems of this type have proven to be the most effective and reliable method for preventing fires and explosions in spray dryers.



Figure 4. Hóbré CO monitoring system on a spray dryer.

Bulletproof Protection for Spray Dryers: Venting, Suppression & Carbon Monoxide Control

Fire and explosion safety in spray dryers requires integrating effective mitigation and prevention measures. Traditional explosion venting is cost-efficient but often limited in indoor applications. Modern chemical suppression systems provide rapid, reliable explosion control. However, prevention remains the most critical aspect of dryer safety. Smouldering, a slow and hidden combustion process, is a major ignition source. It often occurs in high-moisture zones, leading to fires or explosions. Early detection of smouldering is essential to avoid catastrophic incidents. Carbon monoxide (CO) and moisture monitoring systems, such as Hóbré systems, are highly effective. They provide real-time alerts, allowing operators to act before ignition occurs. Thus, CO detection stands as the most reliable preventative safeguard for spray dryer operations.



About the author

Javier Martin holds a B.S. in Chemical Engineering and is currently a Ph.D. candidate in Engineering, specialising in Risk Analysis. With 18 years of experience as an Explosion Protection Designer and Applications Specialist at Fike, he brings deep expertise in combustible dust hazards and advanced knowledge in prevention and mitigation techniques. He is also a European Committee for Standardization member CEN/TC305/WG 2.

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A key advantage of the GUC-C Controller is its versatility and scalability. One unit can manage multiple conveying lines, supporting various process modes and configurations. This reduces equipment costs and simplifies automation setup, while its flexible design allows users to expand their system as needed. The controller supports a wide range of sensors and actuators, ensuring optimal performance and safety for every application.

The GUC-C features high-speed signal processing and advanced control algorithms, achieving maximum efficiency and reliability even under demanding process conditions. Its intuitive HMI offers multiple language options and standard/expert modes, accessible via local display, tablet, remote browser, or integration with higher-level automation systems. With full support for IoT connectivity and predictive maintenance, the GUC-C is ready for tomorrow's automation challenges.

Data integrity and process safety are built in. The controller's configurable user access system, secure logging, and direct signal processing ensure compliance and traceability. Software can be updated, making the GUC-C a future-proof investment.

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By Kurt Naugler,
Sr. Consulting Project Engineer
at Jenike & Johanson

SEGREGATION OF BULK SOLIDS:

A HIDDEN DRIVER OF INDUSTRIAL PROCESS UPSETS AND FAILURES

1. Introduction

Bulk solids segregation is an issue that routinely impacts almost every industry where solids are handled. Many solids processes will have steps where the material being handled has a wide distribution of particles, or is a blend, and the uniformity of the material is critical to downstream processes or the resulting product. Segregation causing a lack of material uniformity can lead to nonconforming product, quality concerns, and even process upsets due to flow stoppages, or chemical imbalances.

When evaluating a process, it is important to consider what aspect of material uniformity is important. Is it critical for a material to have consistent particle size, particle shape, or density? Or is flowability, chemical composition or even colour the most important aspect? The principal concern for each situation may be different, but engineering decisions should focus on the impact to product and process performance. Minimising the effect of segregation on these key factors can be vital to the success of a solids handling process.

Segregation of a material is defined as the separation of particles into distinct zones by particle size, shape, density, or other physical characteristic (Maynard, 2012). It is often looked at as a competing phenomenon with the common processes of mixing and blending. Where mixing and blending are

used to achieve a uniform distribution of multiple components, segregation can have the opposite effect.

These competing effects often lead to difficulty in troubleshooting process problems that are observed as caused by non-uniform materials. When such an observation is made, the first area to investigate is often the bulk mixer or blender.

Experience has shown that while an insufficiently blended material will have negative consequences, the blending step of most processes is done well and can be quickly validated. Many organisations have robust blending design knowledge and capability to validate sufficient uniformity, but the capability to troubleshoot and pinpoint root cause of a segregation problem is not as common. This is due to a wide range of both process steps that can cause segregation, and the number of different segregation mechanisms that can have a negative impact on the material being handled.

2. Impact to Industrial Processes

As a new process is designed, or changes are made to an existing facility, material or blend properties are selected to serve as a design basis to ensure systems and equipment operate as intended. When segregation occurs, resulting material properties may differ greatly from the original design basis and cause unforeseen challenges with

achieving design production rates, avoiding need for manual intervention, or meeting product quality specifications.

A common result of segregation is surges of material containing high concentration of fine or coarse particles reaching sensitive portions of the process train at varying times. Even if the material is a single component, and chemical composition does not change, fine and coarse fractions can have drastically different flow properties (Naugler, 2023). If segregation causes a slug of fines to reach the outlet of a storage vessel, or a critical intersection of a transfer chute, higher cohesive strength and friction properties of the fines can lead to buildup and eventual blockages. Buildup alone can cause challenges with material processing, and blockages often result in complete process shutdowns and unplanned downtime.

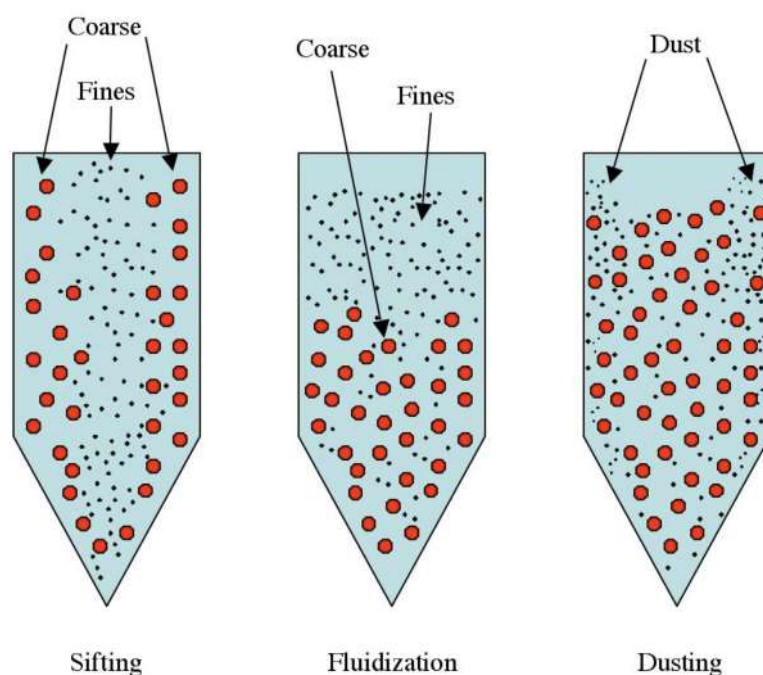


Figure 1 - The most common segregation mechanisms: Sifting, Fluidisation, and Dusting.

In addition to the potential for complete process stoppages, fluctuations in the particle size of material being handled (due to segregation) can impact other bulk properties such as bulk density and permeability. Each of these will impact process control for mass flow rate uniformity and ultimately result in weight variations for downstream processes or even the final product.

When handling a mixture or blend of multiple components, segregation has a significant impact on bulk material composition, which is often a critical quality metric for both in process checks and analysis of each unit product. Product failures have been attributed to segregation of blend components in industries ranging from pharmaceutical, nutraceutical, and food where recipes and resultant compositions are closely controlled by regulatory bodies, to industries such as cement, glass, roofing, etc. where variations lead to unacceptable fluctuations in product strength, clarity, longevity, or other quality metrics.

3. Common Segregation Mechanisms

Which mechanism a bulk material may segregate by is due to a variety of factors. First, it is a function of the material itself. The physical and chemical properties such as particle size distribution, particle shape, electrical charge, and cohesion have a direct impact on how a material will be impacted by segregation.

Next, the forces induced on the particles within the bulk material will dictate what mechanism of segregation is most prevalent. These forces could be the result of air flow, vibration, gravity, and impact of

particles on equipment surfaces.

Finally, the fill and flow sequences of process vessels determines the opportunity for segregation to occur. The difference between continuous and batch processes, as well as how material flows into and out of vessels assists in determining the cause and mechanism of observed segregation.

While research has identified and documented numerous unique segregation mechanisms, they can be boiled down to or associated with the three most common: sifting, fluidisation, and dusting; see Figure 1.

In sifting segregation, finer particles concentrate in the center of the pile while coarse particles avalanche to the outside or periphery. This creates a side-to-side form of segregation where the composition of material on the edges of a pile is different than that of the material in the middle, as shown in Figure 2.

Fluidisation and dusting segregation are related to how particles of different sizes, densities, or morphologies interact with air, or process gas, within a handling system. In fluidisation segregation, the finer, lighter particles raise to the top of a fluidised bed, while the heavier, coarser particles settle towards the bottom of the bed. Dusting segregation is characterised by fine and ultra-fine particles remaining entrained in air currents and settling towards the top and side of surge vessels.

It is important to note that depending on the material particle size differences, particle density, air currents, and processing steps, one or multiple segregation mechanisms can occur.

Figure 2 - Sifting segregation from pile formation: stuffing mix



4. Evaluation of Segregation Risk

Testing for segregation can be broken into two distinct approaches: in-process and laboratory testing. In-process testing requires the use of sampling at different points of the process to evaluate where and what level of segregation is occurring. This type of testing also requires that a blending validation has been completed so the starting, or reference, level of blend uniformity is known. From there, sampling at different points of the process and careful evaluation of those samples will give the most accurate picture of segregation.

Accurate sampling is a science in and of itself, and not the focus of this discussion, but there are "golden rules" that should be adhered to where possible. First, sampling solids at rest should be avoided and samples should instead be taken from a moving stream of material. Second, the full moving stream should be sampled and obtaining material from only a portion of the moving stream should be avoided (Allen, 1990).

Following sampling, it is important to ensure that any division prior to analysis does not introduce bias. There are numerous approaches to sample division, with spin riffing being one common approach to minimise introduction of sample bias.

If a process is not yet in operation, is being scaled, or sufficient in-process sampling is not possible, laboratory testing is a valid approach to evaluating material segregation. It can also be coupled with in-process testing to assist in root cause analysis of existing segregation problems.

Standardised test procedures and equipment have been developed to evaluate the propensity for materials to segregate by the mechanisms described above. ASTM D6940 describes a test procedure for evaluating sifting segregation and ASTM D6941 focuses on fluidisation segregation. The test setup for these methods is shown in Figure 3. Each of these methods applies forces to the material being tested in order to provide the opportunity for segregation to occur. Following application of these forces, the sample is divided to evaluate the extent of segregation. Results from testing can be correlated to an existing, or proposed, process to identify the risk of segregation and where the most impactful changes can be made (Pittenger, Purutyan, & Barnum, 2000).

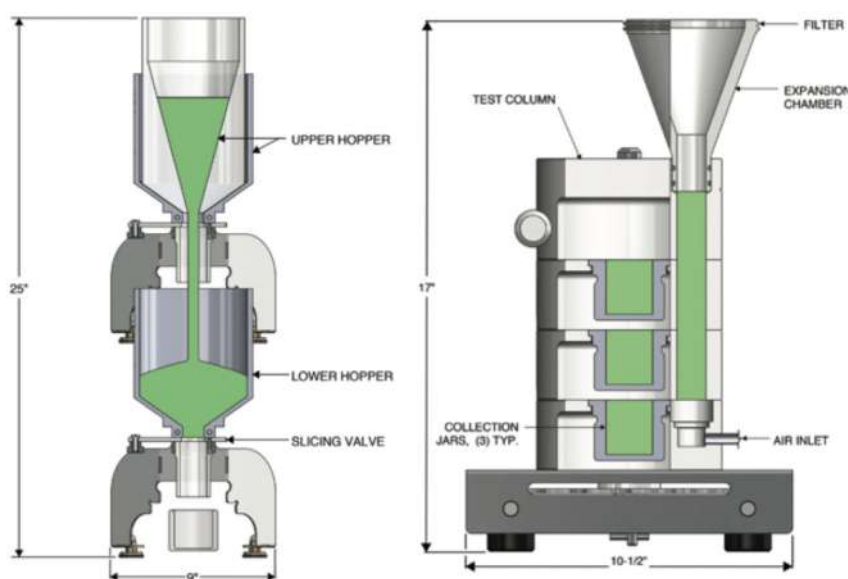


Figure 3 - ASTM D6940, Sifting Segregation (left) and ASTM D6941, Fluidisation Segregation (right) test setups.

5. Potential Solution Paths

Evaluating a segregation concern in your process should be approached like any other bulk solid handling problem. First, if the cause of segregation is not known, root cause analysis will be important in pinpointing the areas of the process or pieces of equipment that will have the most impact. Root cause analysis should include a robust sampling plan in addition to evaluation of segregation potential through laboratory testing. Ability to couple results from in-process sampling with test results will be important in defining segregation mechanism and thus, the best approach for minimising the impact of segregation.

Once root cause has been identified, there are three general areas that can be adjusted to solve the segregation problem: the material, the process, and the equipment.

Material:

While chemical composition of a material or blend being handled is often set and cannot be adjusted, there are some processes where a simple change to the material can minimise segregation. Most highly segregating materials are free flowing. This characteristic is helpful in ensuring reliable flow of the material through process equipment but can contribute to higher segregation potential. Adding moisture, or making other adjustments, to increase the cohesive nature of a blend may minimise how much segregation occurs without any changes to the process or equipment.

Other material changes that can assist in minimising segregation include adjusting the particle size of the components or granulating the blend. A mono-size blend is much less likely to segregate by the mechanisms that rely on particle size differences between components, and granulation can be used to ensure that each individual particle has the desired composition of the blend (Williams, 1976).

Process:

Each time material is in motion or is transferred between pieces of equipment is an opportunity for segregation to occur. Designing a robust process with the minimum number of transfer steps of a blended material will reduce the number of opportunities for segregation to occur. To accomplish this, it is important to locate the blending operation as far downstream as possible.



Utilising in-bin blending or other processes to move blending closer to the end-product or packaging operation can assist in eliminating transfer steps where segregation occurs. While not often possible, dosing a blend during the packaging operation guarantees that each unit package will have the desired composition of the blend (assuming this process is in control).

Preventing stagnant zones in continuous processes reduces the opportunity for a region of high fines to concentrate at the boundary between the flow channel and stagnant material. If funnel flow cannot be avoided, ensure sufficient level is maintained in the vessel so that the fines layer does not enter the process except for in an upset condition where variations are acceptable.

Splitting of streams to different downstream processes or between multiple lines should be done in a way such that there are no differences created between the material concentrations in each stream. For example, a stream of material on a chute surface may segregate with the fines percolating to the bottom of the stream and coarse particles rising to the top. If such a stream is split horizontally, the bottom layer will have a high concentration of fines.



Segregation causing a lack of material uniformity can lead to nonconforming product, quality concerns, and even process upsets due to flow stoppages, or chemical imbalances.”

Equipment:

When changing the material or process is not practical, adjustments can often be made to the equipment itself to minimise the impact of segregation. Side-to-side segregation can often be overcome with use of a vessel that operates in mass flow by ensuring material from all locations within the vessel are discharged whenever the outlet is activated. In a similar vein, further decreasing friction of the material on the hopper surface or using a vessel with steeper walls can decrease any velocity gradients that exist. Providing uniform velocity across a full material bed further ensures that the material is recombined at the outlet and any side-to-side segregation within the vessel is minimised.

Similarly, avoid using eccentric hoppers because they create large velocity gradients and will preferentially discharge from specific locations within the material bed. Symmetric hoppers and chutes will reduce this potential for segregation.

Care must also be taken when designing a piece of equipment with multiple outlets. For hoppers, each outlet should be located at the same radial distance from the hopper centerline. To minimise segregation,

the system should only be operated when all outlets are open and discharging material at similar rates.

Equipment should also be designed to minimise the interaction of fine powders with air. Drop heights should be reduced along with volume of displaced air. For powders that are sensitive to fluidisation or dusting segregation, proper ventilation of the equipment is vital.

6. Conclusions

Many bulk processes involve handling of materials with wide distributions of particles or components. While initial blending steps are often performed adequately, material segregation in subsequent process steps can have a negative impact on downstream processes or the end product. The three most common mechanisms for segregation include sifting, fluidisation, and dusting. When approaching a problem related to segregation, it is important to first understand the root cause of segregation through both in-process and laboratory testing. Once the root cause is understood, most segregation problems can be solved through careful changes to the material, the process, or the equipment.



About the author

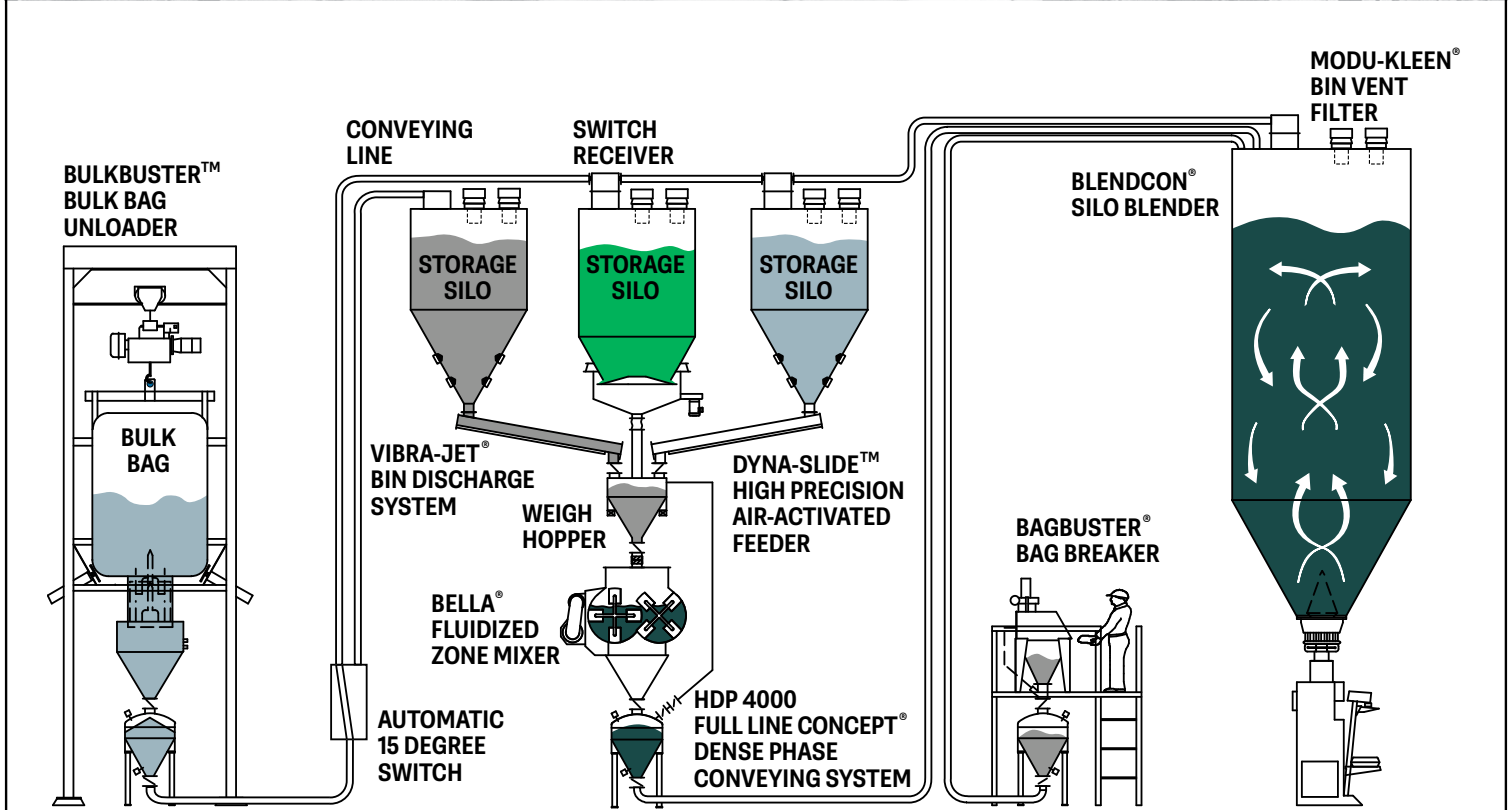
[Kurt Naugler](#) is a Sr. Consulting Project Engineer with Jenike & Johanson focused on process development and design of bulk material storage and handling equipment to meet client and end user product specifications. His focus is on those industries with strict performance requirements that can be impacted by changes to raw material and product or blend composition through the full process train. He has successfully completed projects and implemented equipment or systems across several industries including pharmaceutical, chemical processing, food & beverage, glass, roofing and more. Kurt holds a B.S. in Mechanical Engineering with a focus in Materials Science from Worcester Polytechnic Institute and an MBA from the University of Massachusetts Amherst.

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SOLUTIONS ***that Power Success***



Who We Are

We are a leading provider of custom solutions for the handling of bulk materials for processing businesses across various industries. Dynamic Air has over five decades of expertise in designing and manufacturing pneumatic conveying systems and equipment for handling dry bulk solids.

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In feed milling, our customers know exactly what they're doing.



(L-R) Iain Scott, Managing Director,
Simon Mancock, Project Manager,
David Hukins, Project Manager

They have carefully developed formulations, precise ingredient ratios and proven processes that produce consistent, high-quality feed. Every blend is a formula refined over time.

At ISF, we take the same approach.

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- A genuine passion for delivering results

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On another project, we increased mill throughput from 12 to 20 tonnes per hour, a 60% uplift, while reducing changeover times and maintaining full regulatory compliance. That kind of result comes from understanding the whole process and knowing exactly where the gains are waiting to be found.

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Anyone can fabricate metal. But engineering a solution that increases throughput, reduces downtime and fits seamlessly into an existing process requires something more.

When our customers bring us a challenge, we don't just ask what needs to be built. We ask what needs improving.

Yes, we design. Yes, we manufacture. Yes, we install. But what we truly deliver is clarity, efficiency and measurable improvement. That's the difference between supplying equipment and engineering a solution.

Built on Long-Term Relationships

In a sector as specialised as feed milling, trust takes years to build. That's reflected in the fact that 95% of our work comes from repeat customers, many of whom we have worked alongside for decades. Those relationships are the result of turning up consistently, solving problems properly and treating every project as if it matters. Because to our customers, it does.

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A formula is only as good as the people who apply it. We run a structured apprenticeship programme in partnership with York Sixth Form College, pairing new talent with experienced engineers who pass on practical, process-specific knowledge you can't learn from a textbook. It's an approach recognised with SHAPA's Innovation in Training and Development Award in both 2023 and 2024.

Succession planning sits at the heart of our strategy. The expertise our customers rely on needs to be here for the long term.

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Bella XN Mixer

FAST, HIGH CAPACITY, GENTLE MIXING

The Bella fluidized zone twin shaft paddle mixer by Dynamic Air achieves fast, high-capacity, low shear, precision mixing of either dry bulk solids or liquids with solids. Regardless of particle size, shape or density, materials are mixed with a fast, efficient, and gentle action with typical mixing times of 15 to 30 seconds. A weightless zone created by low-speed counter rotating paddles generates very low friction without shear. This makes it ideal for abrasive products and fragile products that cannot tolerate rough handling. Even flakes or spray-dried bodies remain intact.

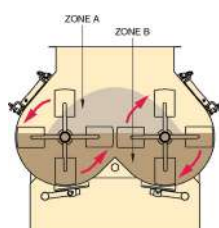


Figure 1

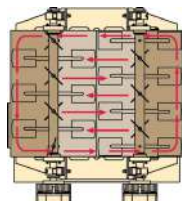


Figure 2

The Bella mixer consists of twin drums which have two counter-rotating agitators with specifically angled paddles. They overlap at the center and completely sweep the entire bottom of both mixer drums and allow it to be started under full load (Figure 1). The material in the mixer moves in a horizontal counterclockwise direction at the perimeter while simultaneously moving both left and right in the center (Figure 2). The material in Zone B (Figure 1) is in its normal gravimetric state as it is being moved and disbursed.

In Zone A, a weightless zone is created which effectively lifts the ingredients to an almost weightless state allowing them to move freely and randomly, regardless of particle size and

density. Thus, the two zones' interaction becomes highly efficient as every particle moves rapidly to a highly homogeneous mix, the key to the Bella Mixer mixing technology for fast, precise mixing.

The Bella mixer is available in stainless steel for food applications. Custom sizes, finishes and materials of construction are available upon request.

[Read more here](#)

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MIXING IN THE PREMIER LEAGUE – JR BOONE AND TARMAC TOPSPORT



John R Boone has supplied a continuous mixer that has revolutionised production speed and quality for Tarmac's Topsport sports pitch reinforcement blend, combining low-density polypropylene fibre, sand and carefully selected topsoil.

What do Everton's Goodison Park, Shrewsbury Town and Carlisle United football pitches, Ascot Racecourse and the Guards Polo Ground have in common? Along with the training grounds of Manchester United, Manchester City and Bolton Wanderers, they all feature Tarmac's Topsport reinforced sports surfaces. Now, a John R Boone continuous Delta Blade mixer ensures that Tarmac consistently delivers the precise blend required for each project.

The challenge of mixing lightweight fibres with sand and soil

Topsport is produced at Tarmac's Eaton Hall quarry in Cheshire. The process involves combining a small, carefully metered percentage of polypropylene fibre with quarried sand. For some blends, selected topsoil is added to create a "complete mix."

The polypropylene fibres are approximately 50mm long with very low bulk density. They arrive highly compressed on pallets and often form clumps that must be carefully "combed" into the mixer. By contrast, the sand and topsoil are significantly denser, making the materials challenging to blend uniformly.

Achieving a high-quality, homogenous mix was critical. Previous mixing equipment limited product consistency and restricted market opportunities. Tarmac also identified potential to expand production capacity, which required a high-throughput, high-shear mixer capable of blending three very different materials effectively.

The solution: a Delta Blade continuous mixer

John R Boone's solution was a continuous plough-type HDBM mixer, equipped with a patented

Delta Blade and high-speed cutters. This configuration quickly breaks up agglomerated fibres, thoroughly fluidising all components and ensuring even distribution throughout the mix.

Material is fed from the top of the mixer, passes through the high-speed cutters, and moves along the full length of the mixer. An adjustable weir plate controls residence time, allowing output to match production requirements - typically around 40 MT/hr.

To guarantee performance, JR Boone tested all combinations of fibres, sand and soil using its in-house test mixers. This ensured that every blend could be produced to specification before installation on site. The long aspect ratio of the mixer provides the high-shear environment needed to achieve complete homogeneity across materials of widely varying density.

Results and impact

The new mixer has significantly improved product quality and consistency at Eaton Hall. Its high-speed Delta Blade design ensures that fibres, sand and topsoil are fully integrated, while the adjustable weir plate allows Tarmac to match throughput to production demand.

With increased production capacity and reliable blending, Tarmac can now deliver Topsport reinforcement across more pitches and sporting venues throughout the UK, meeting growing demand while maintaining stringent quality standards

Topsport reinforced surfaces are now supporting high-wear sports pitches from football to polo, ensuring durability, performance and safety. With the John R Boone Delta Blade mixer at the heart of production, Tarmac continues to provide high-quality, consistent blends for every application.



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A photograph of industrial machinery in a factory setting. The machine is processing bright orange pumpkin pieces. A large blue roller is visible, and the pumpkin pieces are being conveyed and weighed. The machinery is made of metal and has various components like rollers, belts, and structural frames. The background shows other parts of the factory and some overhead structures.

Weighed and
dosed discharge
of pumpkin
pieces

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LiW (Loss-in-Weight) with V-shaped trough for high-precision weighing



Laboratory LiW (Loss-in-Weight) system for weighing additives

When it comes to the reliable processing of bulk materials, precision and efficiency are key to success. Modern systems must deliver more than simple material transport – they need to intelligently connect processes and optimize them sustainably.

AVITEQ is an established provider of solutions for bulk material handling. Building on decades of experience in conveying and screening technology, the company has expanded its portfolio to include vibration-based weighing systems—enabling fully integrated solutions that extend well beyond conventional material transport.

These systems not only convey and separate material flows reliably, but also weigh and dose them continuously and with a high degree of accuracy. For operators, this translates into improved process reliability, more consistent performance and measurable efficiency gains across the value chain.

Whether handling sensitive food products, abrasive granulates or more challenging materials such as fibres or pharmaceutical powders, the systems can be tailored to specific requirements. Technologies such as differential dosing weighers allow for gentle, gravimetric dosing, while linear weighers combine precise weighing with a consistent feed into downstream packaging and processing lines.

“Our customers benefit from integrated system solutions that not only stabilise processes, but contribute to their long-term optimisation.”

Combined with low-maintenance drives, hygienic design and ease of cleaning, as well as global service support, these solutions provide reliable performance in day-to-day operation.

KEY BENEFITS

- High dosing and weighing accuracy
- Gentle handling of sensitive materials
- Reliable throughput with efficient performance
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- Hygienic design and straightforward cleaning

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AVITEQ

BFM® FITTING SNAP-IN CONNECTORS INSTALLED ON FLOUR LINE TO SIMPLIFY MAINTENANCE

The Challenge

BakeAway is a UK-based company that has been manufacturing high-quality dough for pastry, pancakes, pizza, and cookies for over 15 years. The site runs 24/7 and produces up to 1.8 million units per week. An integral ingredient handled on site is flour, which they utilise 10,000 tonnes of each year.

As part of the production process, flour is transported from weigh heads into mobile mixers across four different lines. Fabric sleeves were used to connect the two pieces of equipment on each line, for the flour to drop through.

Each sleeve is approximately two metres long and was ordered from the OEM. The sleeves required replacing every six months, creating an unnecessary recurring cost. Often, lead times were long, and delays were common.

The fabric sleeves were attached to the mixers and weigh heads using jubilee clips. Due to the requirement of tools, when lines were disconnected for the weekly clean, the Hygiene team relied on the Engineering team to remove the sleeves.

Moreover, it would take around 20 minutes to disconnect each sleeve. A scissor lift was needed in order to access the top of each sleeve, which required an IPAF and work at height permits.

The Engineering team leader was looking for a more efficient solution to the problems faced as a result of the current sleeves. In particular, they were looking for a sleeve/connector that would last longer to help mitigate some of the supply chain issues they were facing. Having heard of BFM® fitting before, they contacted UK distributor ProSpare to enquire about installing the system on their lines...

The Solution and Improvement

The BFM® fitting system combines a unique snap-in, blue-banded flexible connector with specially formed steel spigots. Connectors are designed to standard diameters and lengths in a comprehensive range of sizes. Lengths start at 80mm, then range from 100mm up to 6000mm in 50mm increments.

BakeAway selected one of the lines for a trial run with a model of mixer that allowed the team to install a BFM® lipped spigot,



1850mm BFM® connector with stainless steel support rings

via a quick-release clamp, without the need for welding. Spigots were installed in conjunction with a Ø300mm x 1850mm long Seeflex connector. Four stainless steel support rings were specified to keep the connector "open" when the vacuum was experienced during loading, helping ensure unimpeded product flow.

There are no jubilee clips needed for BFM® fitting flexible connectors. The snap-band inside the cuff of the flexible connector provides outward pressure, sealing the connector perfectly into the corresponding spigots. Crucially, for the staff at BakeAway, this means the Hygiene team can now disconnect the connectors with ease when cleaning the lines, rather than relying on the Engineering team, as tools are no longer required.

Additionally, the fabric sleeves would take 20 minutes to remove when cleaning the lines. With BFM® fitting, the connector can just be snapped out from the bottom spigot, only taking five seconds. Over the course of the year, this has saved the Engineering team over 16 hours, and once all lines are converted, it could be

+60 hours saved every year. This is valuable time that the Engineering team can now direct to working on other areas around the plant.

Furthermore, whilst the fabric sleeves required replacing every six months, BFM® fitting has been in operation for over a year and is still performing well. In this application, BFM® fitting has achieved payback in under 7 months. For BakeAway, BFM® has provided not only a safe and hygienic solution, but a cost effective one too.

The Engineering Team Leader told us:

"BFM® fitting is fantastic, it's so easy to use! It has even improved the extraction system on the mixer, which is a massive bonus. The whole team is really happy with how it is performing and keep asking me when the other lines will be converted."

For more information, contact ProSpare Ltd - UK distributor for BFM® fitting:

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SMART HANDLING OF AGGRESSIVE MEDIA: UWT SENSORS MONITOR IBCS FROM THE OUTSIDE



The IBC fill level is detected non-invasively from the outside

Safe storage and reliable monitoring of caustic soda in a dairy application

Smaller dairies often need effective cleaning solutions without investing in large stationary tanks. One practical approach is the use of IBC containers for disinfectants such as caustic soda (NaOH). These containers allow the medium to be diluted and directed into the CIP/SIP system to remove fat residues from pipelines. A key advantage is that the fill level can be monitored entirely contactless – directly through the plastic wall of the IBC.

Benefits of IBC storage

- Direct connection to dosing pumps without manual transfer
- A dosing station that allows safe dilution and controlled feeding
- Handling is simple: empty IBCs can be quickly exchanged and returned to the supplier
- The UN-approved design features tight screw caps and protective cages, meeting international requirements for storing and transporting corrosive media

This setup eliminates the need for large stationary tanks and provides smaller plants with a flexible, safe, space-efficient and more sustainable solution in terms of handling and resource use.

Reliable measurement from the outside

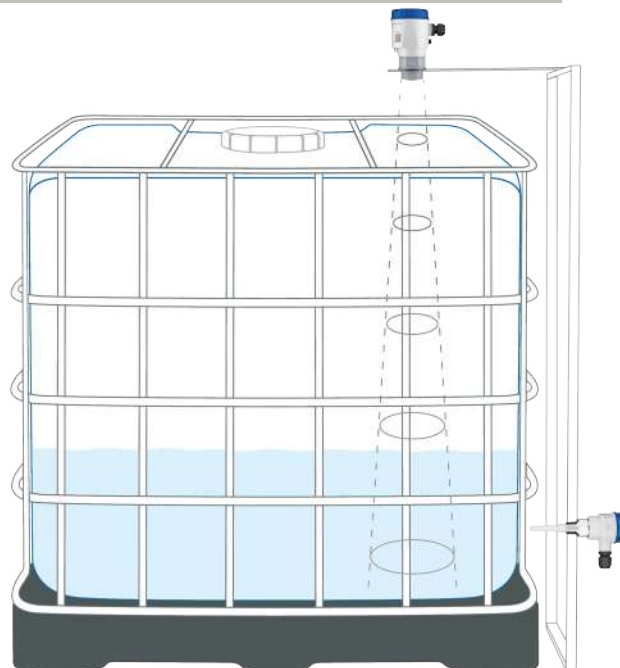
To ensure safe monitoring, a stationary measuring point was set up at the IBC storage location. Here, UWT sensors track the fill level entirely from outside the tank – avoiding any contact with the caustic medium.

Continuous level measurement

The NivoRadar® NR 7100, a free-radiating 80 GHz FMCW radar sensor, is mounted vertically above the container. Its narrow 8° beam angle provides accurate and reliable results through the plastic tank wall.

Point level detection

For added safety, the Capanivo® CN 7120 capacitive sensor is installed externally at a low point next to the IBC. It functions as an empty detector and signals when the container needs to be replaced. Its sensitivity can be adjusted via a potentiometer, allowing the device to adapt to different liquids if required.



External installation ensures safety and flexibility

Since both sensors are mounted outside the IBC, they remain completely protected from contact with caustic soda. This design significantly extends service life and ensures safe operation over time. Additionally, it offers flexibility,

as different cleaning or disinfecting agents can be used when replacing IBCs without reconfiguring the measurement system.

The combination of UWT radar and capacitive sensors provides a practical and reliable solution for handling aggressive media in smaller plants. External installation helps safeguard the instrumentation, while the use of standardized IBC containers makes the system both flexible and easy to manage for various cleaning and disinfecting applications.

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The free-radiating NivoRadar® NR 7100 detects the fill level



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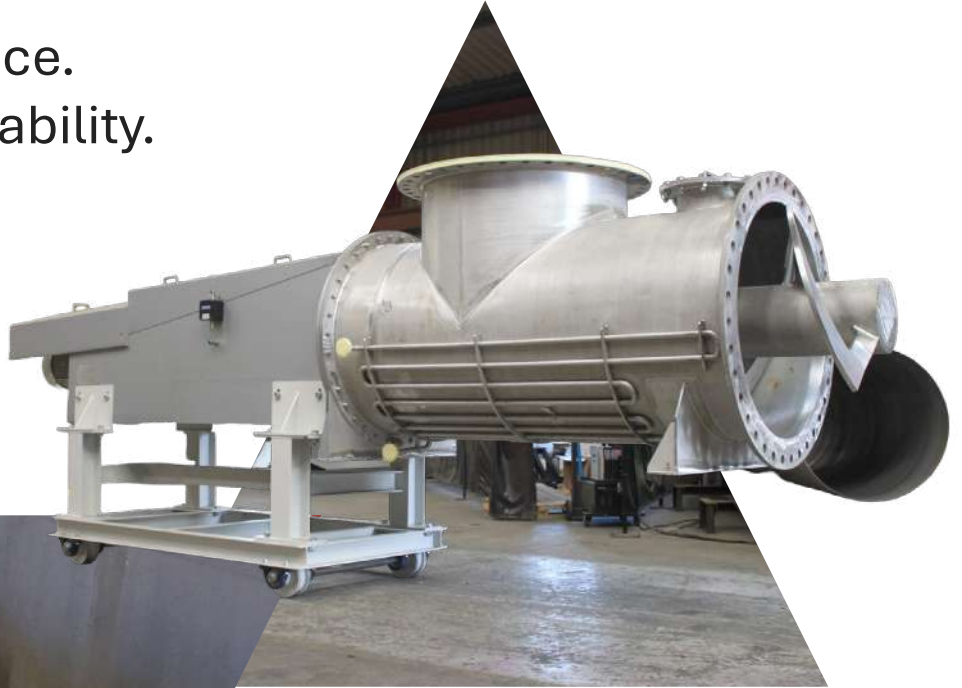
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By Daniel Abrahamson,
Applications Engineer
at Volkmann UK

ARE YOU USING THE RIGHT CONTROL METHOD?

**HOW LEVEL SENSORS CAN BRING GREATER CONTROL AND
AUTOMATION WHEN COMBINED WITH VOLKMANN UK PNEUMATIC
VACUUM CONVEYING**



When it comes to pneumatic vacuum conveying, engineering the right control measure for the process is critical. Greater control and automation over material transfer will boost production efficiency, remove bottlenecks and help avoid unnecessary downtime. Automation remains a key talking point when visiting sites, with manufacturers seeking a consistent and controlled process.

With pneumatic conveying systems control is typically achieved by 1 of 3 things, or in some cases, a combination of the three - manual timer settings, level sensors, or load cells.

Manual control

The most basic method of control is through manual timer settings. For example, on VOLKMANN's pneumatic timers, the suction

and discharge settings can be adjusted manually to control the amount of product conveyed per cycle. This offers an effective level of control and is ideal for operation in ATEX zones or for straight-forward processes handling a single material. Though, it's important to note the quantity of product conveyed per cycle may vary depending on the pickup method and the product itself- for example, when using a suction lance, the quantity may be impacted by the operator manoeuvring the lance. Using an RNT provides greater consistency as the product naturally flows to the bottom of the cone, with discharge aids available where required.

Manual control relies on the operator switching the system on and off at the pneumatic timer. Once turned on, the unit will continue cycling and conveying batches of product, until it is manually stopped - even if there is no product left in the pickup location. Likewise, the receiving location will be fed until the system is switched off. Meaning, this control method still requires an operator to oversee the process to ensure the receiving vessel is not overfilled.

This method of control only requires a pneumatic timer, meaning the system remains fully pneumatic and is safe for ATEX dust zones. Material transfer is controlled and efficient but full automation is limited as an operator is required to monitor the system at each stage.

Why consider level sensors in your process?

For greater control and a higher level of automation, level sensors can be installed at the pickup location, inside the conveyor itself, and in the receiving location. When integrating a level sensor, a more advanced control system is required. For VOLKMANN UK, this is our ET range of timers. They can accept a 24V control signal(s) from one or multiple level sensors installed in any of the following locations.

Product pick-up

For product pickup, high level or low-level sensors can be included. A low-level sensor is often the preferred method, and this will send a stop signal to the timer when the sensor is covered, indicating the need for additional product, or the end of a batch. Having this sensor included will ensure that no compressed air is wasted if the system is left running when the product runs out. A high-level sensor works in a similar way,



though this will require the hopper to be constantly full to convey product and the level will need to be maintained. In practise a high-level sensor is more commonly used to indicate when the hopper needs filling.

Internal sensor

A high-level sensor can also be used in the conveyor body to replace the suction time. This would allow the system to keep filling the unit until this sensor is covered.

Once covered, the suction cycle stops and the product is discharged. This allows for a more efficient and consistent transfer as the conveyor will fill to the max volume each cycle, meaning the transfer rate will be optimised, while moving a consistent volume of product each time. VOLKMANN UK usually recommend that this approach is implemented when various products with a range of bulk densities are to be conveyed using the same system. This enables us to maximise the transfer rate for each of the products, while eliminating the risk of overfilling the unit. Without this sensor, the control settings on the timer would need changing each time the product to be conveyed is changed.

Receiving location

Similar to product pick up, high level and low-level sensors can be included in the receiving location. A high-level sensor is selected to ensure the receiving hopper is not overfilled. It is uncommon to have a low-level sensor here by itself, but it may be needed if only small amounts of product are required in the receiving vessel to not impact the downstream process. In some cases, both sensors can be included, this is typically done when a certain level is to be maintained in the receiving location.

VOLKMANN UK's standard ET timers accept one control signal from each sensor. When multiple sensors are required, our ET advanced timer can be used. This will control 3 sensors integrated in the system simultaneously.

Choosing the right method of control

Control and automation requirements will always vary depending on the industry, requirements and budget. Level sensors offer a practical way to achieve a higher level of automation in pneumatic conveying. They can significantly improve efficiency and reduce the need for operator attention when using pneumatic conveying systems.



About the author:

Daniel Abrahamson is a qualified mechanical engineer with three years' experience at Volkmann UK. He is known for creating bespoke solutions that optimise customer processes, combining technical excellence with a strong focus on practical results. Daniel holds a first-class degree from De Montfort University, Leicester.



A regular series where our host Dave Howell discusses with industry experts the latest technologies and future insights throughout the manufacturing process industries



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