CUSTOM POWDER SYSTEMS.
THE CONTAINMENT COMPANY

INTEGRATED CONTAINMENT SYSTEMS.

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Containment Blending

Overview:

The concept is simple. The same Intermediate Bulk Container (IBC) that is used for shipping and storage is also used for blending. A typical tumbler/blender consists of a cradle and a pedestal support. The cradle is the structure that holds and rotates the entire IBC. The cradle is either single or tandem supported by a pedestal base and is skewed l5° to 30° on the rotational axis. This arrangement holds the IBC level with the floor for loading and produces the blending angles required by the IBC during rotation. This angle puts the straight wall sections at continuously changing opposing angles throughout the revolution. This action produces a cross-flow effect that homogenizes the batch.

The majority of tumble/blenders in use today are stand-alone units that are loaded by means of a fork truck. A small but growing percentage of units load the IBC's from floor level by a pallet jack or are wheeled into the unit if the IBC is mounted on casters. The following is a typical scenario of how containment blending is accomplished in a stand-alone installation:

The operator fills the IBC with ingredients in correct proportions. The IBC may be put in storage or immediately loaded into the tumble blender. Once loaded, the operator selects the duration of the blend cycle and presses the start button on the unit. The blender then rotates the entire IBC for the predetermined interval and signals the operator upon completion.

Growing in demand are tumble/blenders that are integrated into a fully automated system. The following is a typical scenario of containment blending system integration:

The IBC is retrieved from storage and is typically filled at an automated filling station. It is then transported by AGV or conveyor to the blender and is automatically loaded. It is then blended, unloaded, and transported to storage or to an IBC discharge station.

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Benefits of Containment Blending

Containment blending offers the following advantages over conventional blending equipment:

1) Total product containment.

2) Zero clean up required on blender.
Container tumble blenders easily accommodate different batch formulations because the product contacts only the IBC allowing immediate product change over and zero blender clean up.

3) Reduced blend times in most instances.

4) Less ingredient segregation.
Eliminates the need to remove the batch from the transport and blending container. Batch transferring by nature is a process that tends to segregate ingredients.

5) Increased product containment.
Less product transfer results in reduced chance of spillage or contamination by airborne substances.

6) No cross-contamination.
The product never contacts the blender and does not require transfer to and from the blending container.

7) Increased process flexibility.
An infinite number of product formulations can easily be blended in the same unit because the blender never contacts the product.

8) Conducive to automation.

Containment Blending - Cont.

Designing a Containment Blending System
Successful blending depends on the following factors:

1)**IBC Fill Level**
The IBC should typically be filled from 50% to 80% of its maximum “waterfill" capacity. Ideally a 65% fill volume should be targeted. A 65% fill volume allows room in the IBC for the blending action to occur yet does not unnecessarily waste IBC capacity.

2)**IBC Design**
This design is basically a rectangular box with typically a 42" by 48" base dimension. The ideal height proportion is in the range of 1.3 - 2 times the widest base dimension. The 42" by 48" base configuration is the most common although other base sizes can be successfully blended as long as the width-to-length base proportions are within 25%.

3)**Hopper Type IBC's**
Hopper Type IBC's are also well suited to containment blending. The guidelines in design are the same as those for side door IBC's except for the height proportions. The upper side wall of the IBC should be a minimum of one-half and a maximum of two times the height of the hopper section. Also, the IBC is best if it is symmetrical (i.e., bottom center discharge). Keep in mind that even if the IBC proportions do not precisely fit the guidelines put forth here, good blending will still most likely occur.

4)**Batch Size**
Typical batch sizes range from less than ten cubic feet to eighty cubic feet and over. Blend quality is generally not affected by batch size providing the IBC is properly designed to the intended batch volume.

5)**Blending Speed**
The blender's rotational speed is a variable that impacts both blend time and quality. The inevitable question asked by those purchasing new tumble/blenders is at what speed should the unit turn their product. The manufacturer can approximate a speed range but due to the various combinations of bin size, design, and batch ingredients it is best to determine the ideal blending speed by performing full scale or laboratory testing. One indicator of excessive blending speed is the presence of a thumping sound every half revolution. This indicates that the product is becoming airborne and impacting on the opposing wall of the IBC. Optimal speed is achieved when the product in the IBC flows in a continuous "wave" pattern.

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With some experience, this flow pattern becomes easily recognizable. Since the product flow can not easily be seen in a product environment, a quarter scale lab blender with a transparent bin is used to predict the full size blend speed and the level of blend quality that may be achieved with each specific formulation. Users that have various batch formulations or continually change their formulations generally have purchased a lab blender scaled to their full size unit for this purpose.

6)**Blending Duration**
The determination of the proper blending time of a batch is another variable that is important to calculate and is best determined by empirical testing. This setting is found by blending a fill scale batch and sampling blend quality at frequent intervals until the batch is fully homogenized. One need not blend longer than is required because in rare instances the ingredients may tend to segregate back out after a homogeneous blend has been achieved. In most blending applications the blend cycle time is between four to twelve minutes.

ONCE THE ABOVE FACTORS HAVE BEEN DETERMINED BLENDS ARE VERY CONSISTENT AND ACCURATELY REPEATED

Product Characteristics

Products suitable for containment blending generally, but not necessarily, require the following characteristics.

1)**Close Specific Gravity**
Ingredients with close specific gravity tend to require shorter blend times and produce superior blend results.

2)**Similar Relative Particle Sizes**
Ingredients with similar particle sizes tend to require shorter blend times and produce superior blend results.

3)**Moisture Content**
High moisture powders when blended with low moisture powders tend to adhere to themselves and form into balls. These materials may require special preparation prior to or during introduction to the IBC or require an intensifying mechanism integral to the IBC. Good blends are easiest achieved when blending dry powders with dry powders and moist powders with moist.

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SUMMARY

Whether your blending application is industrial, chemical, food, or pharmaceutical, containment blending offers a fast, clean, efficient means of preparing homogeneous blends that remains unparalleled by other blending systems.