



Product Pile Management

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1. PURPOSE

This Best Practice was developed with the intent of minimizing risk and exposure for individuals working with bulk piles in warehouses. This is not meant to be an absolute guidance document for being the most efficient or the best process for product quality management.

2. SCOPE

This procedure applies to Mosaic facilities which manage product piles using a loader. While the best practices described in this procedure may be shared with resources outside Mosaic, Mosaic is not responsible for those performing work outside its control.

3. RESPONSIBILITIES

- 3.1 The Mosaic Corporate EHS Department is responsible for maintaining this procedure and for providing resources to assist facilities with training employees in best safety practices.
- 3.2 Facility Managers are responsible for the implementation of this procedure at their facilities.
- 3.3 Mosaic employees and contractors performing the work described in this procedure are responsible for understanding and practicing the associated safety requirements.

4. PILE MANAGEMENT - GENERAL

4.1 Safety:

- 4.1.1 Ensure all personnel with access to the area are properly trained, aware of the moving vehicles and work occurring in the building. As always, the safety processes, equipment and security should be relevant to the type of risks in the specific situation.
- 4.1.2 The following precautions shall be employed. Precautions in a dry fertilizer building including but not limited to those listed below:

- a. Barricade the area to prevent entry by others whenever probing the pile;
 - b. Proper personal protective equipment (hard hat, steel toed shoes, safety glasses or goggles, dust masks, etc.) and other safety precautions should always be observed;
 - c. Loader shall have an enclosed cab to ensure the safety of the operator at all times;
 - d. All safety restraints should be used by the operator at all times;
 - e. Communication devices should be easily available to the operator and tested routinely to ensure in proper working order;
 - f. Equipment should be in good working order and regularly inspected;
 - g. Housekeeping should be well maintained and aisle ways and pile approaches should be pushed and swept clean of loose material. Product driven over repeatedly is being crushed to fines and dust resulting in further product degradation;
 - h. All mechanical equipment should have proper safety guards.
- 4.2 Product should be stored in dry, clean, segregated space with regular inspections to ensure the structural integrity, housekeeping and proper handling procedures are in place.
- 4.3 Access should be controlled to limit risk to employees and others who do not have a need to be in the area of moving equipment and to ensure the security of the property.
- 4.4 Monitor product quality as it is loaded in the storage space.
- 4.4.1 Always inspect vehicles prior to unloading and monitor product at the vehicle.
 - 4.4.2 Are there any visual concerns, such as wet material, fines, aged, over-oiling, foreign material or color? If so can the product be segregated? Initial quality issues can cause material to set up over time.
 - 4.4.3 Communicate any concerns immediately to Site Management.
- 4.5 Product should be pulled from multiple angles in the pile with the loader.
- 4.5.1 Fines tend to accumulate in the center of the pile and larger granules will rotll owards the outside.
 - 4.5.2 Pulling product from across the entire face of the pile during load out ensures a nice blend of all sizes in every load.
- 4.6 Monitor pile as product is removed; any changes should be communicated to site management.
- 4.6.1 Is the product blending nicely upon load out?
 - 4.6.2 Are any quality changes noticed?
 - 4.6.3 Are there any lumps visible in the pile?
 - 4.6.4 Is there evidence of "undermining" or "cliffs" starting to appear?

5. PRODUCT SET UP - ONGOING MONITORING

- 5.1 Lumps and cliffs are noticed in the bin and product is no longer free flowing.
- 5.2 Ensure all employees, contractors and management are aware of the potential situation - warning signs should be immediately posted to notify others of the risk.
- 5.3 Prior to taking any action to correct the issue, assess the product and pile condition
 - 5.3.1 Are there significant product cliffs existing?
 - 5.3.2 How hard is the product? Can it be easily broken up or requires significant effort?
 - 5.3.3 Do larger visible lumps / boulders exist in the pile?
 - 5.3.4 How high up is the product set up? Higher than the cab on the loader?
 - 5.3.5 How much material is remaining in the bin?
 - 5.3.6 Is there evidence of undermining? This is where the bottom of the pile has been removed but product above has not, creating an overhang.
 - 5.3.7 Are the bin dynamics clearly taken into account - is there stress being created on the bin walls by the product?

- 5.3.8 What is the source and timing of the material that was loaded into the bin? Does it create different product conditions in different parts of the pile?
- 5.4 No work should occur without multiple spotters and safety plans in place.
- 5.5 Based on the condition of the pile and product, proper mitigation efforts should occur based on the situation.
 - 5.5.1 Continually inspect the pile condition and situation to ensure the safest course of action for the operator and equipment.
 - 5.5.2 If the issue is identified early, the pile can be worked immediately to begin to keep the product in free flowing form.
 - 5.5.3 If the material is easily broken up and the bin configuration and inventory allow, loader operator should be able to address the pile and force product to flow by moving it around in the bin pulling from all angles in the face of the pile -loader operator should immediately stop if any indication of undermining occurs.
 - 5.5.4 If the product is hard and set up or the loader has been unable to manage the pile, a probe attachment to the loader should be an immediate first step.

6. WORKING WITH PROBES

- 6.1 Probing a product pile is a high risk activity and measures shall be taken to avoid injury to the operator or the surrounding building structure and equipment. This procedure describes the best practices that Mosaic will use to manage product piles when the face of the pile exceeds the height of the bucket on the pay-loader (loader).
- 6.2 Probes (see example in Figure 1) should be manufactured or engineered according to the facility's specific loader specification and limits.
 - 6.2.1 The probe must be manufactured or engineered according to the specific loader specifications and limits.
 - 6.2.2 A diverter (small inverted 'V' welded to the top of the probe prior to the bucket) will move product off the probe and keep it from coming down into the cab.
 - 6.2.3 Probe should be attached on the loader via proper procedures and secured.
- 6.3 Prior to commencing probing, a thorough inspection shall be made of the probe and bucket:
 - 6.3.1 Look under and around the probe and bucket for damage and broken parts;
 - 6.3.2 Stay out of the line of fire when performing machine checks.
- 6.4 Attach the probe to the bucket by performing the following steps:
 - 6.4.1 Line up the probe with the bucket;
 - 6.4.2 Lower the bucket to clear the hooks of the probe;
 - 6.4.3 Slowly raise the bucket. This will in turn lift the probe slightly to allow the eyelets of the probe to fall into place on the bucket of the loader;
 - 6.4.4 Visually verify that the probe is in proper position.
- 6.5 Removing the Probe
 - 6.5.1 Remove the probe by reversing the steps for attachment.
 - 6.5.2 Ensure the procedure occurs on a flat surface.

7. OPERATION WITH A PROBE

- 7.1 Additional care must be taken when operating the loader with the probe attachment due to the length and weight of the probe.
 - 7.1.1 When traveling with the probe attached, keep the probe low to the ground.
 - 7.1.2 Travel as slowly as practicable and refrain from sudden steering corrections.
 - 7.1.3 A spotter shall be utilized to ensure clearance over potential obstacles or uneven surfaces.

- 7.2 Probe the product face to bring down the pile.
 - 7.2.1 Utilize the boom or bucket control to get desired height and angle of probe.
 - 7.2.2 Probe the top sides of the pile (as high as can safely be reached or as necessary by the height of the cliff). Work with the probe inward toward the center of the pile.
 - a. It is critical to avoid probing in the middle of the pile as this will cause a dangerous situation that can create lumps in the center that tend to be much larger and more difficult to manager - the pile can shift suddenly causing an avalanche type situation.
 - b. Product should be constantly addressed and cliffs should not be allowed to form that are any higher than the roof of the loader cab.
 - 7.2.3 Insert the probe just far enough to disturb the pile, then proceed in a progressive manner.
 - a. Continuously assess pile conditions and environment; do not place the loader in a dangerous distance to the cliff.
 - 7.2.4 Do not adjust the probe height while inserted into the pile, as the probe will bend easily.
 - 7.2.5 Slowly remove the probe and repeat as necessary.
 - 7.2.6 Probe should be gradually inserted only far enough to disturb the pile then proceed in a progressive manner. Always assess the pile conditions and environment. Larger lumps tend to stay on the probe as it is removed from the pile - be aware of this and avoid placing the loader in close proximity to the cliff. The probing process should be a series of several small probes and be repeated at various parts of the pile leaving a new face. Continue until safe and product is falling.
 - 7.2.7 If the probe fails to breakdown the cliffing issue, an excavator or backhoe should be brought in to address the pile, whichever is more appropriate for the environment.
 - a. The excavator should only be operated by a licensed and experienced operator.
 - b. The excavator should begin pulling product down from the top of the pile and continue until product is free flowing again.
 - c. Proper ventilation is required in the building and should be assessed prior to work and monitored during activity in the building.
 - 7.2.8 Be aware that in the event these recommended Pile Management practices fail, an alternative measure will need to be incorporated. Further actions beyond those mentioned above could place an individual and/or equipment in extreme danger.

8. DEFINITIONS

- 8.1 Avalanche: A large mass of product or material in swift motion downward in a pile.
- 8.2 Cliff/Sheer face: A very steep, vertical, or overhanging face of a product pile.
- 8.3 Pile: In this procedure is any product stored in a height greater than 10 feet (warehouse inventory).
- 8.4 Probe/Lance/Spear: A long metal instrument attached to a pay-loader to poke at a pile of product.
- 8.5 Undermining/Cavity: To wash away supporting material from under; this is a very dangerous situation.

9. REFERENCES AND RELATED DOCUMENTATION

- 9.1 None



Figure 1 - Typical probe attached to a payloader.

10. REVISION LOG

Revision Log				
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0	Initial Issue			5/11/2011
1	Health & Safety	Facility Management		9/1/2011
2	Review date past due	PMO	PMO	6/30/2021

Contact the Safety Dept. for additional information on this program.