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Bulkmatic
MEMBER OF TECHMATIC HOLDINGS

TECHNICAL NOTE

VIBRATING BIN DISCHARGERS – APPLICATION AND INSTALLATION GUIDE

1.) Application

Vibrating bin dischargers are used as an aid to assist material flow out of silos, hoppers and bins. There are a few fundamental principles that need to be applied in order for a bin discharger to do the job it was designed for. Failure to apply these principles may lead to unsatisfactory operation and in worst case premature or even catastrophic failure of the bin discharger.

2.) Sizing

The correct sizing of a bin discharger is that the inlet diameter of the bin discharger should be between one third to one half of the silo diameter. In other words if a silo has a diameter of 4m then the bin discharger should have a diameter between 1.33m and 2m. The more difficult the material flows the larger the discharger should be.

3.) Operation

Bin dischargers are **NOT** designed to control material flow and as such should not be used to attempt to limit material flow.

One very important factor to consider is that material flow should never be restricted to such an extent that the material starts to compact as a result of the vibrations. This condition happens when the outflow is extensively restricted or the bin discharger is running when the outflow is closed completely. The result of this condition is that the vibrating motor starts to work against a solid column of material with no freedom to move. The next stage is that the motor mount tears from the bin discharger. If operated under this consolidated condition the forces generated by the vibrating motor will tear virgin steel plate.

If a controlled flow is required an additional piece of equipment such as a rotary vane feeder or screw conveyor needs to be installed beneath the flexible connection under the bin discharger. As the flow out of the bin discharger is restricted the vibrator motor power setting needs to be reduced to try and match the outflow requirement. For very small feed rates out of a silo the bin discharger should be allowed to feed into an intermediate hopper unhindered and the reduced feed rate done out of the intermediate bin via additional dosing equipment. This is often not done because it is more costly to do it correctly. The result is the subsequent failure of the bin discharger from a structural point of view.

4.) Outlet configuration

The outlet of the bin discharger must be fitted with a soft flexible coupling to allow the bin discharger cone to vibrate (circular motion in a horizontal plane) without restraining the vibration. Standard flanged flexible connections used for high pressure fluid applications are not suitable for this application as they are too rigid to allow unrestricted movement of the bin discharger cone. **Under no circumstances may any additional equipment be bolted directly to the outlet** (such as hand operated knife gates etc.). Firstly these items are usually not designed to withstand the vibration motion and secondly they add mass to the system and restrain motion of the bin

discharger cone. This additional mass needs to be vibrated as well and stresses the bin discharger motor mount unnecessarily.
Ideally the “top hat” arrangement depicted in figure 1.1 should be installed at the outlet. This allows for a very flexible connection but any contact of the material against the flexible is minimised. A spital plate is supplied with every bin discharger and must be installed so that there is a facility for shutting the outlet of the bin discharger in an event of an emergency (failure of the flexible connection or failure of feed equipment below the discharger). Note that the design of the “top hat” inherently prevents material from running out of the gap that the flexible covers when the bin discharger is in rest.
The outlet diameters supplied as standard by Bulkmatic are the minimum recommended outlet sizes in order not to restrict the flow out of the bin dischargers and should not be reduced.

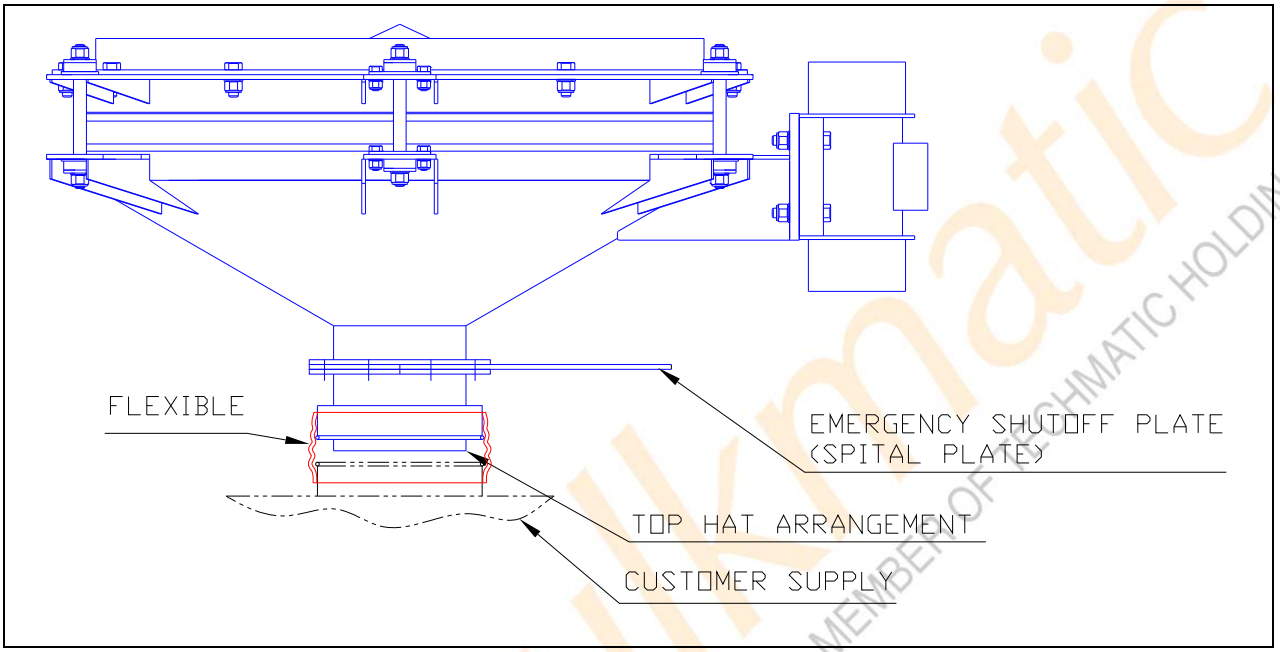

Figure 1.1 Ideal outlet connection arrangement – ordering option SPSSR

Any feed or processing equipment should be placed directly under the outlet of the bin discharger and not connected to equipment via long chutes. The biggest problem with long chutes is that normally a valve or feeder at the end of the chute will be closed or stopped first. Then the bin discharger is stopped and by the time the motor has wound down a fair amount of material has been fed into this chute. On startup the column of material in that chute has usually consolidated and settled into a solid column that is very difficult to get to move again. At the same time it hinders unimpeded flow out of the bin discharger. This may cause reduced flow rates and potentially damaged motor mounts. If a chute is unavoidable the control should be such that the bin discharger is stopped first and allowed to come to a complete standstill. The feed equipment below the chute should be run until the chute is empty and only then should the feed equipment be stopped.

5.) Bin dischargers on weigh bins

Loadcells have successfully been used on bins fitted with bin dischargers. The vibration between bin discharger and bin is effectively isolated by the bin discharger mounting arrangement. One thing that needs to be considered is that any valve or feed equipment below the bin discharger must be attached to the weigh bin above to become an integral part of the weigh bin. A flexible connection must be fitted between the bin discharger and feed equipment, valve or knife gate and a second flexible needs to be fitted below the feed equipment, valve or knife gate to isolate

the weighing bin assembly. See figure 1.2 for a typical application where the bin discharger is used on a weigh flask. The same type of arrangement can be fitted to a silo that is mounted on loadcells.

6.) Weight settings

The bin dischargers motor weights are pre-set in the factory and may need adjustment on-site during commissioning to give optimum flow of material. The best practice is to reduce the vibration as far as possible to still give the required flow of material. Both weights on the motor need to be adjusted to the same setting. If the settings of the two weights is not equal a vertical unbalance is induced on the bin discharger instead of the purely horizontal rotation. The result is noisy operation, high vibrations and potential damage to the bin discharger. See figure 1.3 of a typical error made when the weights are incorrectly re-assembled after removing one of the weights completely.

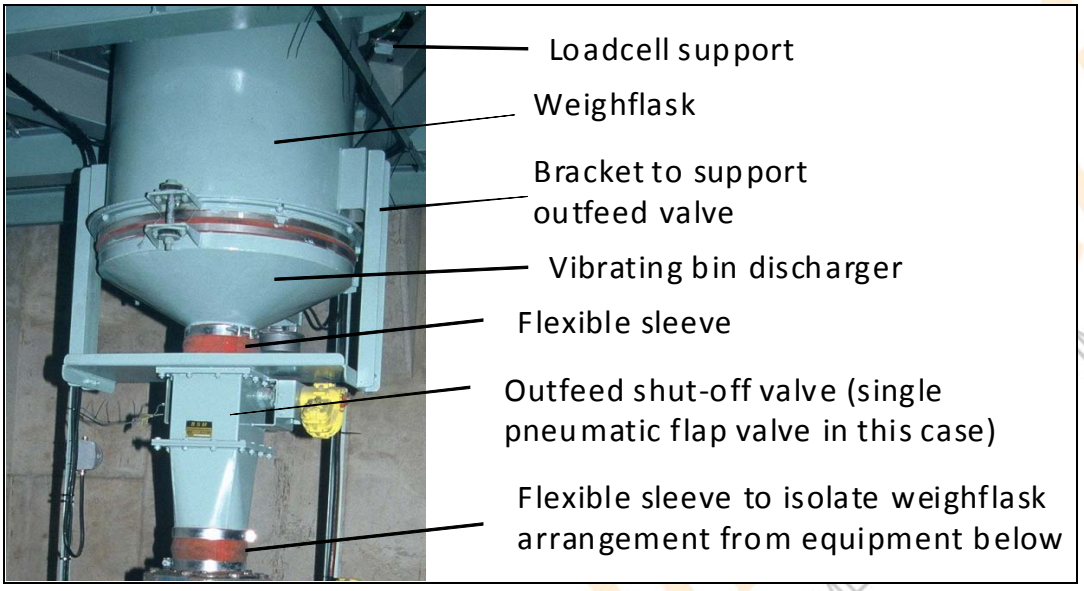

Figure 1.2 Typical installation of a bin discharger on a weigh bin

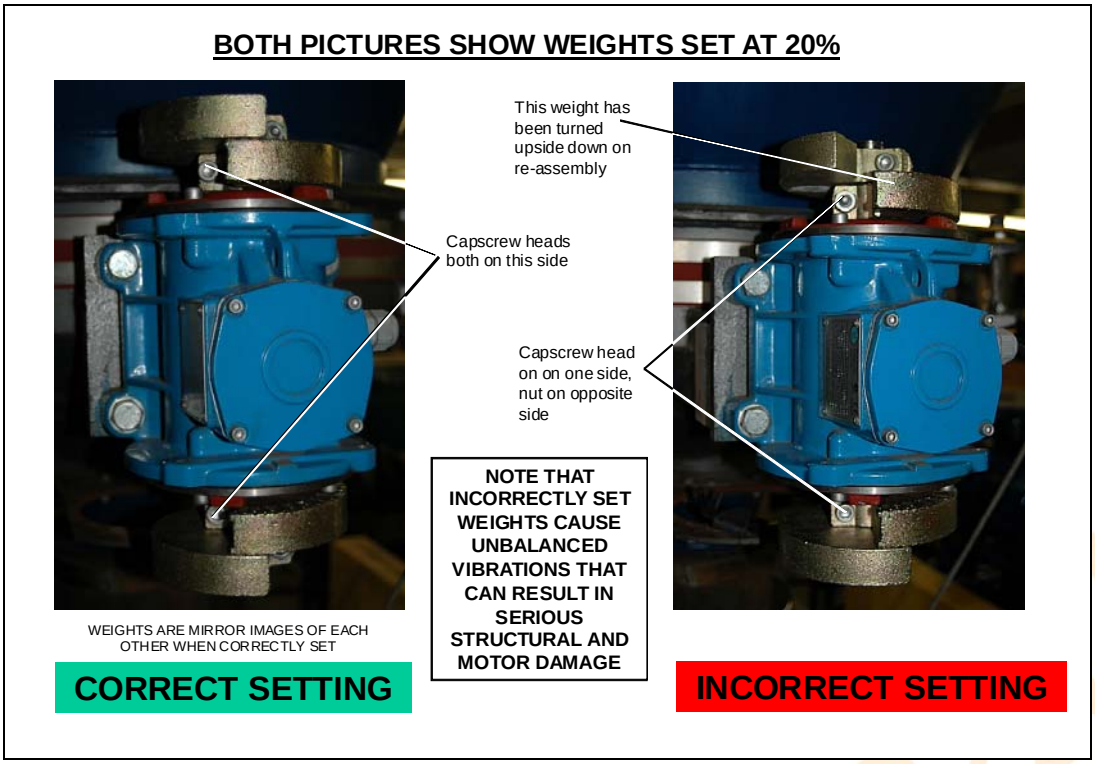

Figure 1.3 Weight settings on vibrating motor

7.) Control philosophy

The control in terms of switching the bin discharger is critical to the operation of the unit. Bin discharger motors should only be run when the outfeed equipment is operational and allows unimpeded flow out of the bin discharger. The bin discharger should be the first item switched off before any feed equipment, valve or knife gate below the bin discharger is shut off. This ensures that material is not consolidated in the bin discharger and silo or bin. On startup the feed equipment must be started or any outlet valve or knife gate opened **before** the vibrating bin discharger is switched on.

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