TROUBLE SHOOTING VIBRATORY FEEDERS

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INTRODUCTION

Most vibratory feeders function for long periods of time without attention, without maintenance and little contact is had with them by the people who are responsible for their performance.

Feeders usually feed parts into equipment of processes many times more expensive than the feeder itself. Indeed, during visits to plants, it is often found that a machine with an initial cost of $50,000 will be operating at 70% of capacity because a feeder is not putting out parts at a sufficient rate.

PROBLEMS OCCURING IN VIBRATORY FEEDERS

There are four basic malfunctions that bring attention to vibratory feeders:
1. Declining feed rate due to low amplitude. Usually this will occur gradually over a period of time.

2. A dead spot in the bowl - parts will not feed past a certain point in the bowl, even though they are moving elsewhere in the bowl.

3. Intermittent operation. The feeder will spontaneously run at excessive amplitude or possibly no amplitude without apparent cause. Included in this category is for a feeder not to work at all.

4. Noise in vibratory feeders.

DECLINING FEED RATE

There are many causes for the feed rate to decline over time. A common impulse reaction to a feeder not operating at or close to capacity is to turn the controller up. A repetitive pattern of this behavior leads to a controller turned up all the way and performance is no longer being increased. This kind of problem is best solved with a complete disassembly and retuning of the unit. However, the cause of this decline can be isolated and attributed to one or more of the following:

A cracked spring A cracked spring can cause a dead spot, however it can slow down the feeder all around. The crack frequently occurs adjacent to one of the holes in the spring and sometimes is so fine it can only be seen with a magnifying glass. Before inspection, the ends of the spring should be wire brushed or polished with emery cloth. A quick test of the spring is to throw the spring onto a concrete floor with force and usually the spring will break into two pieces if cracked.

A change in the durometer (hardness) of the rubber feet can contribute to poor feeder performance. Rubber feet can harden with age (cure) or soften or swell from environmental conditions such as exposure to petroleum based products and corrosives. The remedy is to replace all the feet.

A cut/slice in a rubber foot can lead to poor performance. Again, the foot must be replaced. Usually

the cause is a result of the feeder being dropped or picked up with a lift truck and not setting properly on the forks.

Loose feet can cause this problem. Since the feet are part of the springing system, they must be tight.

Coil Gap Too large of a gap between the coil and the armature can cause low amplitude. This adjustment will be discussed later.

A weld seam on the coil assembly can break. Usually the cause of this is operating the feeder with the armature hitting the coil. After some time, a weld will fail. Sometimes it can be re-welded, although it is be best to simply replace the coil.

Rust or oxidization between the springs and spacers indicates corrosion between the springs and spacers. This will cause low amplitude. When this is detected it is necessary to disassemble, clean, and retune the drive unit.

The absence of a shell or cover can cause low amplitude. The feeders manufactured by Automation Devices, Inc. are tuned for use with the shell in place. Removal of it, especially on some larger models, can cause a severe loss of amplitude.

DEAD SPOTS IN THE FEEDER BOWL

Dead spots usually appear suddenly, however they can develop gradually. They are always caused by some imbalance in the springing assuming that the feeder once worked satisfactorily. The presence of tooling added after factory tuning can cause dead spots and is usually noticed immediately upon operation after the addition.

Ways to Balance a Feeder:

- Counter-weights
- Adjusting the torque on the bottom end of the springs (tighten or loosen the bolts on the bottom end of the springs)
- ***IN EXTREME CASES***, add springs.

OTHER CAUSES OF DEAD SPOTS

Spring Bolts A bolt that holds the springs in position can loosen or break. Of course, broken bolts must be replaced. Caution must be taken to use only thru-hardened bolts, as the load on them is high. Case hardened or mild steel bolts will fail quickly.

A loose or a cut foot can cause a dead spot.

A broken spring can cause a dead spot. Checking for this is covered above.

The support or stand upon which the feeder sits can cause a dead spot. This is true especially if the support is light to begin with. If the support loosens in one direction and not the other it can cause several kinds of problems.

The bowl not fastened to the drive unit tight enough will cause a dead spot. This is true especially on bowls held on with three or more bolts and one of them loosens.

INTERMITTENT OPERATION

Intermittent operation is almost always electrical. Generally the symptom is that the feeder will increase its amplitude to the maximum amplitude for no apparent reason. Occasionally it will simply return to the correct amplitude again for no apparent reason or it will simply run at maximum amplitude no matter where the control is set.

The causes of intermittent operation generally fall into the following categories:

Intermittent operation is sometimes an indication that the SCR Controller is about to fail. Generally, once it exhibits inconsistencies, the controller has at most two weeks or so of operation left. Maintaining a spare controller of each type is a wise and economical policy to practice.

Also this kind of problem can occur very early in the life of the feeder, sometimes in the first month or less. It is usually easy to diagnose.

External sources can cause intermittent operation on feeders with SCR Controllers. Resistance welding, arc welding, ultrasonic cleaners, and other high frequency equipment can generate electrical noise which will affect the SCR and turn it on. It the feeder goes to maximum amplitude while the resistance welder is being cycled, it is rather easy to notice this if you are aware of the possibility of it being a problem. The point should be made, however, that the source of the noise does not necessarily have to be in the same room as the feeder. It can be on the same electrical line and sometimes be quite a distance away. It is practical to filter the noise by installing capacitors across the incoming line to the feeder. And should and often will eliminate the problem. Most controllers are designed to filter out this noise.

Rectifiers and other electronic components age with time, and sometimes their maximum performance declines over several years. It is not often that a controller is replaced because of this but it can occur if the feeder is run at maximum performance at all times. This is determined by an electrical check, and should be done by the electrician.

Another potential cause for unsatisfactory performance is low line voltage in a plant. If the feeder is operated at maximum performance, then it usually requires a minimum of 115 volts AC on the incoming line. However, in many plants this voltage may drop to below 100 volts when machines, ovens, and other large current devices are in operation. Generally, it will be noticed as these items are turned off and the performance of the feeder comes back. If this is the case, it is sometimes necessary to install a constant voltage transformer ahead of the feeder. This will keep its performance even through wide fluctuations of the input voltage.

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NOISE

The feeder itself generates a minimal amount of noise, usually not able to be heard but only felt. The only thing heard should be the sound of the feeder moving through air (which is a low hum). If it is making an undesirable level of noise, these are some of the instances that may contribute to noisy operation:
Noisy operation of vibratory feeders is becoming more and more of a problem in factories. However, many sources of noise in feeder operation can be eliminated with simple maintenance and repairs.

Noise is generated by parts hitting/clanging against each other in the bowl. Aside from reducing the number of parts in a bowl through the use of a side delivery hopper, the only other solution is to install a muffle module.

The feeder itself (empty) is making an abnormal or loud noise.

> **Noise can be generated by the base** On occasion, the feeder can appear to be noisy however, the noise can be generated by the base upon which it is sitting. Make sure the stand is conducive to the dissipation of sound through dispersion. Bracing the open spans in the stand will help transfer the noise away from audible mediums and providing a way for the noise to be "grounded".
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> **Magnet will be struck by the armature** The feeder may be improperly adjusted such that the magnet will be struck by the armature. When that occurs a great deal of noise is generated. This is eliminated simply by lowering the magnet down. The procedure for this is discussed elsewhere.
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> **Not fastened to the drive unit** Often a bowl will not be tightly fastened to the drive unit. This condition is a very loud generator of noise. In this case, it is necessary to remove the bowl and clean with emery cloth, or a flat file, the mating surfaces of the bowl and the drive unit. The reduction in noise will be dramatic.
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> **Striking stationery parts of the machine** The feeder can operate in such a way that it is striking stationery parts of the machine such as the track onto which the parts are being fed. This again is obvious and can be easily remedied.

The feeder itself generates a minimal amount of noise, usually not able to be heard but only felt. If the above diagnosis does not ameliorate the problems, consult the factory.

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OVERHAUL AND READJUSTMENT OF VIBRATORY FEEDERS

It will be presumed that the remedies for problems outlined in the section of this booklet have not worked or that you fee it is wise to overhaul and retune the feeder for a preventative maintenance reason. If the feeder is not easily accessible on its stand, it is advantageous to remove it to a solid work bench. It is important that this work bench be very sturdy so that when the feeder is tested, its optimum performance can be observed.

1. **Remove the bowl, and clean the mating surfaces between the bowl and the top casting of the base.**
   These surfaces can accumulate dirt, sometimes, and other material that will make it difficult to draw the bowl tightly down on the top casting of the base. These surfaces should be flat and clean. Using emery paper or a flat file is adequate to recondition the surface.

2. **Operating on one bank of springs at a time, loosen the springs top and bottom and remove them.**
   Both ends of each spring, as well as the spacers and mounting surfaces should be thoroughly cleaned with either emery paper, a wire brush or glass bead shot peened.

3. **Examine each spring for cracks and corrosion.**
   The cracks will always occur adjacent to the hole punched in either end, on this type of spring. Sometimes these cracks are not visible to the naked eye, and a simple test is to hit the spring on something solid (dropping it on the floor). Usually this will cause the spring to break thru.

   - Any pitted springs or spaces should be replaced.
   - Reassemble the springs and spaces in the manner in which they were prior to disassembly.
   - Draw up the screw snug.
   - Do this on each remaining banks of springs.

On larger units, model 20 and up, the bottom of the spring is sometimes fastened into a block which is in turn fastened into the base casting. In this case, if the block is removed, the reassembly requires special care. It is important when reassembling the springs to the top and bottom castings that the spring s not be stretched as they are drawn tight by the screws. Adding stresses in this fashion to the springs will limit the maximum amplitude and consequently the performance of the feeder.

When the springs are reassembled, each screw holding the springs should be drawn up to a torque of about 50 inch pounds. While it is generally not necessary to measure this, an Allen Wrench with a piece of pipe about one foot long pulled up with good strength is adequate. It is very important that the springs be drawn evenly and it is advisable to make two or three attempts to pull up the springs in each case.

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