Operations manual

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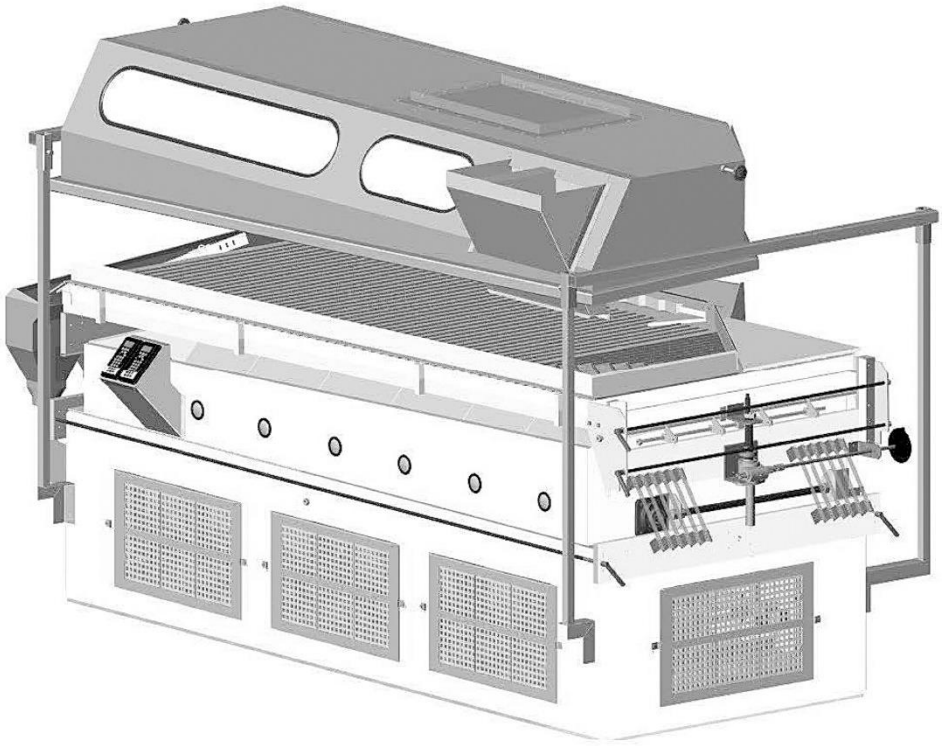

Hi-Cap Series

Gravity Separators

Version 1.01 2/7/23

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Hi-Cap Gravity Separator

Congratulations!

Dear valued customer, thank you for your purchase. Your Hi-Cap Gravity is going to perform for you for years to come. At Oliver, we are here with you every step, starting with this operation manual. This manual will find new and valuable information both for experienced and inexperienced gravity operators need to know and understand.

Please allow adequate time to read, understand, and to become comfortable with the various Hi-Cap operations. Taking the time now to learn how the Hi-Cap works will help eliminate many of the problems frequently encountered.

Remember that the Oliver Gravity Separator is not a "cure-all" for the processor's problems. The gravity separator is a specialized piece of machinery designed to separate particles of similar size that differ in specific density.

Oliver Gravity Separators should not be used as a cleaning machine to remove dust, dirt, sticks, and other refuse frequently found in harvested crops or other materials. The gravity separator is not a sizing machine. Screening machines can do this more efficiently.

Safety precautions

Important precautions for using the Hi-Cap Gravity Separator

- Always shut off and "lock-out" power when performing maintenance or service.
- Always ensure that the separator and components are electrically grounded.
- Always wear face and eye protection when inspecting or adjusting the separator.
- Never operate the separator with the air filters removed.
- Never operate the separator with the deck removed.
- Never operate the separator with missing or worn parts.
- Never operate the separator with the air chest boot removed.
- Never operate the separator with worn or damaged decks.
- Never use the deck as a table or workstation.
- Never stand on the separator.
- Always wear ear protection when operating the separator.
- Always keep separator clean and properly adjusted.
- Periodically inspect the separator for wear and correct operation.

Operating instructions

Important information about the operating instructions

This operations manual covers all Oliver Hi-Cap Series of Gravity Separators. Instructions vary and require you to reference your specific machine layout drawings and parts manual. The four models are 51, 81, 161, and 241.

The Hi-Cap Gravity Separator is a specialized piece of processing equipment designed to separate particles that are similar in size and shape but differ in weight. These particles include sticks, stems, insect damage, shriveled seed, weeds, stones, and other rejected materials for agricultural, mining, recycling, food, and other products.

Some find that gravity separators benefit recycling, mineral concentration, plastic separation, and other industrial applications. The Hi-Cap delivers its best results when used as an integral part of a processing line after the product has been thoroughly pre-cleaned and sized.

Installation

Installation is the beginning of a successful lifespan for your Oliver Maxi Cap. All Hi-Cap Gravity Separators (hear after referred to as just Hi-Cap) are operated on test blocks at the factory for 30 hours to ensure that they ship to you in perfect operational condition. We inspect the drive train, hydraulic systems, and all controls during and after the operational period to ensure that they are operating correctly. If you run into any issues during the installation process, please call our direct line (on the cover page).

Foundation requirements

A solid, level foundation is required and regarded as the single most crucial aspect of installation. Failure to properly level and secure your Hi-Cap can result in mechanical system failures not covered under warranty. When installing, note the type of flooring to which you will mount the anchors. We recommend a six-inch concrete slab, though that floor depth is not essential. If your surface is uneven, the false vibrations from the flooring can disrupt the quality of separation and cause cracking over time, which could lead to major breaks within your machine's frame. Therefore, we strongly advise your gravity separator to be firmly attached to a level concrete surface to ensure the safety and proper operation of the Hi-Cap. If you plan on anchoring to another surface besides concrete, this surface should be enclosed on top to ensure cleanest air flow through the side filters. Any surface must be able to handle the static and dynamic loads of your machine. This information is provided in your machine’s layout drawings. When securing your machine to the floor, it is recommended that you finger tighten the bolts or anchors, visually inspect for any gaps between the mainframe and the floor, fill those gaps using metal shims before fully tightening bolts or anchors. This will keep the machine structurally square, as built. Lastly, it is recommended that you apply a sealant between the bottom of the machine and the floor to ensure no dust or debris can be introduced to the fan area of the machine. Please contact the factory to speak with an Oliver representative for the best installation recommendations. Lastly,

when installing, be sure to leave adequate clearance around all sides of the machine. It is pertinent for your operator to possess sufficient space to access the machine while running your product. We recommend leaving the most available space around your Gravity table so you can adequately maintain your Maxi Cap when it is due for routine maintenance. Leaving adequate spacing will allow you to access and operate the controls quickly, open the electrical cabinet (if ordered), and remove the deck for changing or cleaning.

Handling

Your new Hi-Cap Gravity Separator provides years of maintenance-free operation if handled properly. Most damage occurs during handling and installation. Please take extra care during installation not to cause damage, resulting in additional installation costs.

The Hi-Cap Gravity Separator weighs between 6,000 and 10,000 pounds, depending on the model and accessories ordered with it. Be sure that the handling equipment is adequate for the load. While handling the machine, use appropriate lift lugs and take extra care not to damage the separating deck, the air filters, or any other machine parts.

Protecting the deck

The deck is the portion of the machine that contacts the product during separation. Take extra care not to damage it. During construction and installation, it is prevalent for contractors to use the deck's surface as a workspace or storage space for items they do not need. Please discourage this practice! The deck's design supports a relatively uniform product load over its entire surface. Storage of concentrated loads on the deck has resulted in bent or broken deck frames and damage to the wire overcovers. We recommend that a non-combustible surface, such as a sheet of 22-gage steel, be placed over the deck until the Hi-Cap is ready to be used. Do not weld anything to the machine; doing so may damage the sensitive control electronics. If it is necessary to weld or cut above the machine during installation, take extra care to prevent damage from falling debris or sparks.

Electrical requirements

Typically, motors will be installed at the factory and wired for 60 cycle, 220/440 volt, 3 phase, 1750 RPM unless otherwise specified on your order. The eccentric variable frequency drive (VFD) is voltage specific, so make sure it is correct for your voltage.

Proper direction of rotation is essential, and at least half of the problems with new gravity separators result from incorrect rotation. When your electrician wires the motor, be sure that he connects it so that it will run in the proper direction. The fan shaft, eccentric shaft, and blender shaft should turn counterclockwise when viewed from the discharge end of a left-hand machine, and clockwise on a right-hand machine.

User-supplied motor installation and belt adjustments

If you supply your motor(s), be sure that it is large enough to carry the loads for the gravity separator. Please refer to the User Supplied Motor Specifications listed below.

		51	81	161	241
Circuit size (amps)	Low	230V (10)	230V (13)	230V (18)	230V (23)
	High	480V (20)	480V (26)	480V (36)	480V (46)

		51	81	161	241
Motor specifications (In HP)	Fan	5HP	7HP	10HP	15HP
	Deck	1HP	1HP	1HP	1HP
	Blender	—	1HP	1HP	—

Our design provides bases for all motors. The factory supplies the hydraulic system motor, located at the bottom of the machine fan box, and the eccentric motor. The fan motor is at the machine's base below the feeder; the eccentric drive motor is inside the air chest, and the blender motor is directly under the blender.

While the motors are still outside the machine, install the motor shaft sheaves using the bushings provided. Place the motor on the mounting bracket, mount the belts, and align the motor by paralleling the DriveR sheave and the DriveN sheave. Adjust the belts to the proper tension and tighten the motor mounting bolts. After motor installation, check the belts for the proper tension. When belts are too tight, excessive strain is placed on the bearings,

How does a gravity separator work?

About 250 B.C., Archimedes discovered the law of specific gravity: “All bodies floating in or submerged in a liquid are buoyed up by force exactly equal to the weight of the liquid they displace.” The specific gravity of a particle is the ratio of its density to some standard substance, the standard usually employed being water with a specific gravity of one (1). In water, particles having a specific gravity of less than one will float, and particles with a specific gravity greater than one will sink.

The term “Gravity Separator” is a contraction of the proper name “Specific Gravity Separator,” a separator of particles differing in their specific gravities. All Gravity Separators use air as a weighing medium rather than water. Since air is lighter than water, the relative difference between particles of differing weights increases. For this reason, the Gravity Separator is a sensitive machine and can produce a precise separation when operated correctly.

The process of stratification

Before separating a product by weight, it must be fluidized and stratified vertically. On gravity separators, lighter particles are moved upward through the fluidized bed. Heavier particles sink downward. This action produces stratified layers with lighter particles in the upper and heavier particles in the lower layers. Stratification occurs by forcing air upward through the particle mixture so that the particles rise or fall by weight relative to the airflow. Air becomes the fluidizing medium for the process of stratification.

Figure 2 represents a cross-section of the Gravity Separator directly over a fan. A heavy, light product particle mixture fills the screen deck; the fan is off. In **Figure 3**, the fan is now “on,” and airflow is adjusted. Notice that the heaviest particles sink to the deck’s surface, and the lightest particles rise to the top, free of the surface. Proper airflow regulation is critical, or the result is a situation seen in **Figure 4,** where all particles are lifted free of the deck surface by the excess air. This process results in a boiling turbulent action and can re-mix the stratified product.

Principals of stratification

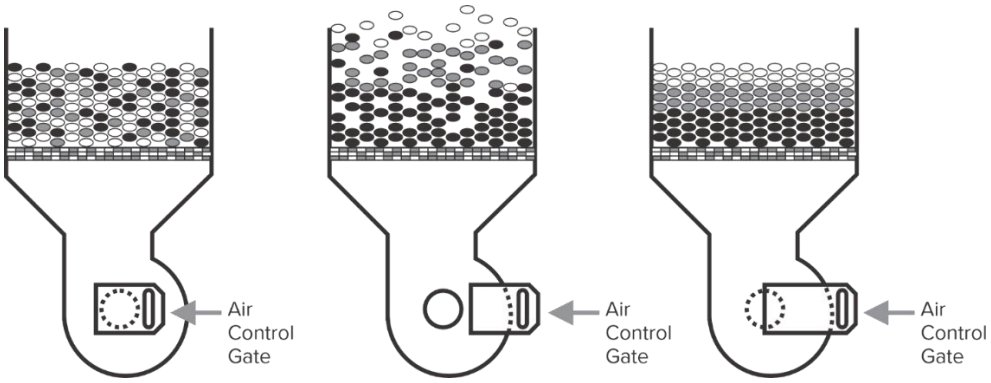


Figure 1 Figure 2 Figure 3

A particle mixture, illustrated in Figures 2, 3, and 4, falls from the feeder onto the deck. The area immediately around the feeder is called the STRATIFYING AREA. In this area, the vibration of the deck and the fluidizing action combine to stratify the product into layers. Heavier layers reside on the bottom, and lighter layers lift to the top (Figure 3). Separation cannot occur until the product becomes stratified. The size of the stratification will depend on the difficulty of separation and the processing capacity of the product. At no time should the stratification area exceed one-third of the deck surface.

The more complex the separation, the more area required to obtain proper stratification increases. For example, the stratification area is large when separating frosted beans from saleable beans because there is relatively little difference in weight. However, the stratification area is small when removing insect-damaged peas from whole peas because there is a significant difference in weight. Higher capacities likewise require larger deck areas for stratification.

Once the product is adequately stratified, the vibrating action of the deck begins pushing the heavier layers, in contact with the deck surface, toward the high side of the deck. At the same time, the lighter layers, which are at the top of the bed and do not touch the vibrating deck, float downhill toward the low side of the deck. As the product flows laterally from the feed end to the discharge end of the deck, the vibrating action gradually converts the vertically stratified layers to a horizontally graded bed of product.

Initially stratified into the upper layers, the lighter product floats downhill to the deck's light (low) side. Initially stratified into the lower layers, the heavier product is conveyed uphill toward the deck's heavy (high) side. When the product reaches the discharge end of the deck, the separation should be complete. Heavier products concentrate along the high side of the deck. Light products will be along the deck's low side, with intermediate products in the middle.

Hi-Cap – Correct flow pattern

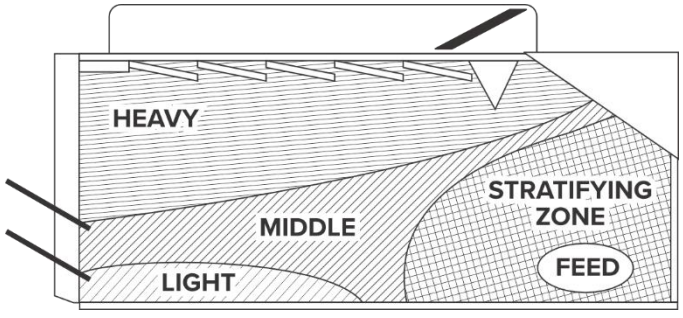


Figure 4

Figure 4 represents an ideal situation! While ideal situations are nice, they rarely occur in actual practice. Usually, the stratification area will not be clearly defined and must be assumed to occupy an area from 5 to 15 square feet around the feeder.

Figure 5 depicts the interaction between the three Forces of Separation: deck speed, airflow, and side tilt. The separation process begins immediately after the product becomes even partially stratified. Therefore, it is important to stratify the product as quickly as possible, or the lighter product may carry to the high side of the deck before the stratification process occurs. The best way to accomplish this is to use more air at the feed end than at the discharge end.

The discharge from the gravity separator is a continuously graded product ranging from the heaviest particle on the high side of the deck to the lightest particle along the low side of the deck. In many separations, the distinction between heavy and lighter particles is not visible to the unaided eye. In this case, periodic testing for weight per test volume (weight per bushel or cubic foot) at various points along the discharge would be necessary to determine if the process achieved the correct separation and desired results.

In practice, this continuous grade is usually broken down into three products; (1) a heavy or acceptable product, (2) a light or rejected product, or (3) a small middling product. In processing where rocks or other heavy trash might be present, a fourth product can be extracted primarily from dirt, rocks, or other heavy rejects.

Forces of separation

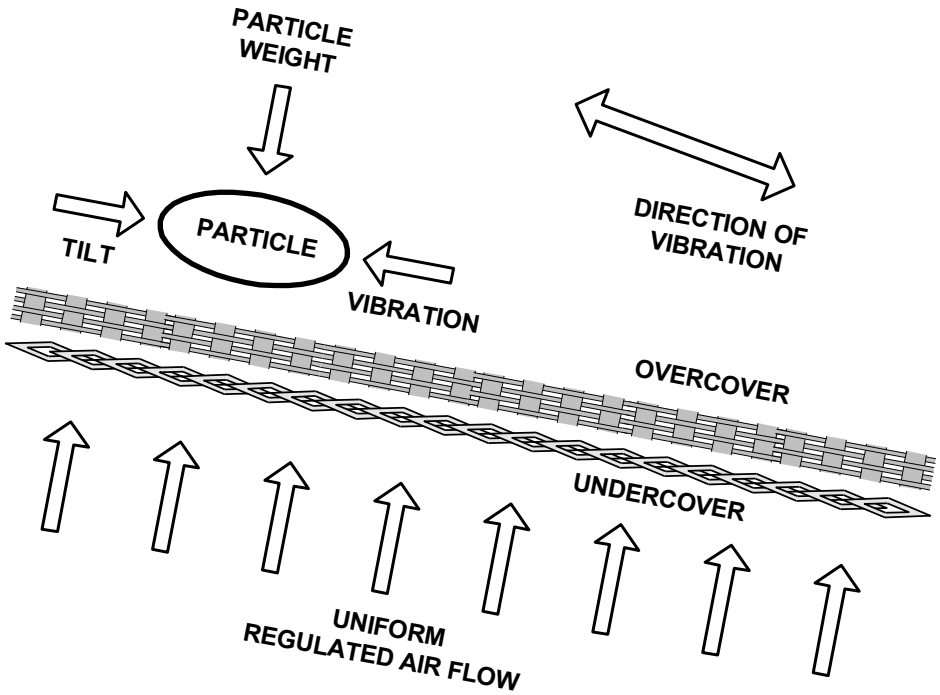


Figure 5

Oliver Steele's rules for the use of gravity separators.

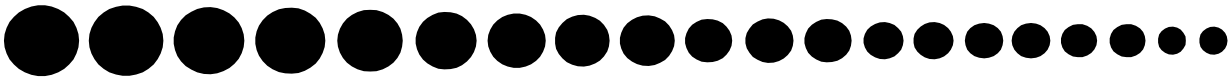
What separators can and cannot do.

RULE 1 - particles of the same size but slightly differing specific gravities can be separated.

HEAVY → LIGHT

A typical example of this would be the separation of similar size seeds, the lighter of which has been hollowed out by the insect damage or lack of development.

RULE 2 - particles of the same specific gravities but differing in size grade according to the size of the particles.



A typical example of this would be the elimination of shriveled corn kernels from whole kernels of the same density.

RULE 3 - particles with different specific gravity and size cannot be separated efficiently.

An example of varying sizes and densities occurs on every ear of corn. Depending on its location on the ear, corn comes in various sizes, small rounds, medium rounds, small flats, medium flats, and large flats. Because of growing conditions, seed weight often varies within a given size range. The separation of unsized corn gives less than satisfactory results.

Hi-Cap Controls

Before starting to operate the machine, it is necessary to thoroughly understand the controls and their location on the Oliver Gravity Separator. Proper regulation of the controls is the key to successful gravity separation. Be sure that you understand the proper use of these controls before attempting an actual separation.

Deck

The most crucial part of any gravity separator is the deck because it is the main separating surface. The Hi-Cap's deck consists of a welded aluminum frame, an application-specific undercover that develops the air pattern, and an application-specific screen or cloth overcover, the surface on which the product separation occurs. Two cutting fingers are installed on the discharge end of the deck. These are adjustable to channel different fractions of the finished product according to density. Along the heavy product side of the deck are the cutout gates. These increase capacity, as described later in these instructions. The Rock Trap is on the same deck side as the gates but closer to the feed end. It bleeds heavy trash from the machine to avoid contamination of good heavy products. Knowledge of their locations is essential, as is understanding the controls that affect the variable adjustments of the Hi-Cap operation. This topic is covered later in these instructions.

Feeder

Feeding is very critical to the operation of a gravity separator. The product should be fed uniformly with as few surges as possible. Surges, or variations of feed, will result in similar variations in quality. The Feed Control governs the amount of product fed onto the deck, **Figure 6**.

Aspirator feeder

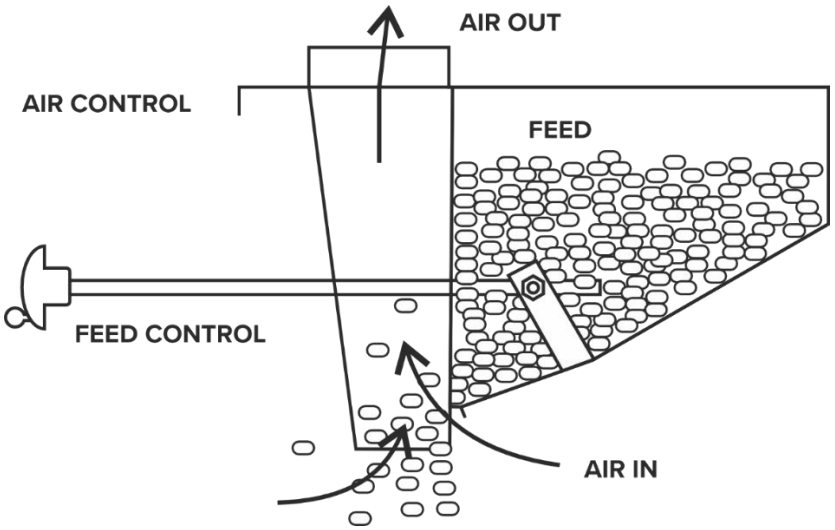


Figure 6

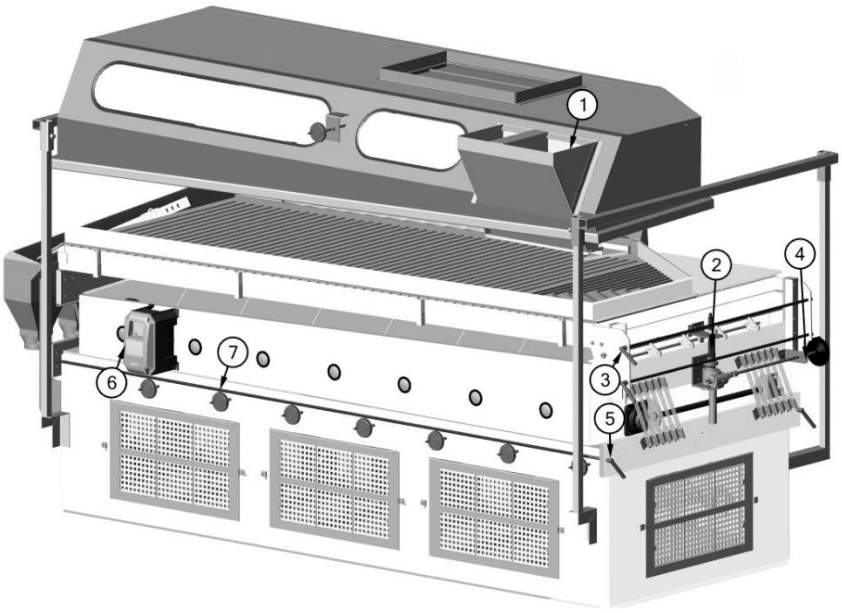
Generally, the feed rate determines the average capacity of the processing line equipment. The feed rate should be as low as possible for optimum separation without falling below the minimum feed rate, with the deck wholly covered. Typical minimum feed rates are not less than 60 percent of the rated capacity for your machine.

When starting your gravity separator, always start at a low feed rate. Adjust the gravity separator for best separation. Then increase the capacity to the desired rate. The maximum feed rate is when the product can be fed onto the deck and obtain the necessary separation.

Aspirator feeder

Unless it has a Dust Hood (optional), the Hi-Cap comes equipped with an Aspirator Feeder, as shown on page 10. We designed the Aspirator Feeder to pre-clean dust, dirt, and fines from the product. As the product falls from the feeder to the deck, surface air is drawn through the product lifting the fine dust and trash. To control the airflow, open and close the damper located on top of the feeder. Set the feeder to pull as much air as possible without removing good product. Please refer to the specifications in the Maintenance Section for air exhaust requirements. Oliver can source and provide an appropriate air system if needed.

The feeder on the Hi-Cap is opposite the discharge end on the low side of the machine. This placement provides the best stratification, separation, and operation at high capacity for most cereal grains and large seeds. However, it may be desirable to change the location slightly when operating at lower capacities on large-sized products or when working with small ones.



1. Feed rate control
2. Worm jack screw
3. Clamping knob, end raise
4. Side-tilt adjustment handle
5. Side-tilt clamp
6. Eccentric speed VFD
7. Air control knob

Figure 7: Left-hand model, model 241

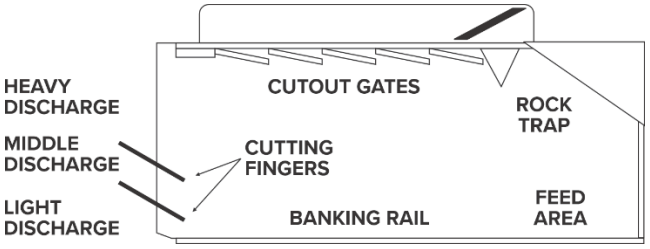


Figure 8

Operational controls

A Hi-Cap has four major operational controls; end raise (slope), side tilt, deck speed (eccentric speed), and airflow. Control the end raise, side tilt, and airflow with the hydraulic valves located in a control console at the discharge end of the gravity separator,

The five adjustments

All gravity separators have five variable adjustments that must be properly adjusted and balanced to obtain optimum separations. These are: feed rate, end raise, side tilt, eccentric speed, and air control. We will discuss the controls for each of these variables **Figure 7**.

Feed rate

The feed rate control is located on the feeder and governs the amount fed onto the separating deck. Whether standard Oliver feeders are used or another type is employed, a means of controlling the feed is essential.

The feed rate (fast or slow) should be uniform and free of surges. Surges in the incoming feed will show up in the discharge of the machine as a poor quality separation. The use of surge bins above the feeder is strongly suggested.

Generally, the average feed rate is determined by the average capacity of the processing line of equipment. For optimum separation on your Gravity Separator, the feed rate should be as low as possible without falling below the minimum feed rate at which the deck can be kept completely covered. Maximum feed rate is the maximum rate at which the deck can be fed and still obtain the necessary separation. When starting your Gravity Separator, always start at the minimum feed rate. Obtain the required separation, and then increase the feed rate to the desired capacity.

End raise

End raise is the slope from the feed end of the deck to the discharge end. This slope determines the rate of flow from the feed end to the discharge end of the deck. Greater end raise means a greater rate of flow and less exposure time for the seed. Less end raise means a slower rate of flow and more exposure time for the seed.

Quality of separation can be related to exposure time for the seed. In general, the longer a seed mass is exposed to a separating action, the cleaner it becomes.

End raise and feed rate are closely related controls. As feed rates are increased, end.raise must be increased so that the depth of material on the deck will not become too great. As feed rates are decreased, the end raise should be lowered, so that the depth of material will not become too thin and the deck will remain completely covered. The end raise control (2) is located at the feed end of an Oliver Gravity Separator. To change the end raise, loosen the clamps (3) and screw the adjusting crank up or down as required. Then re-tighten the clamps.

Side tilt

Side tilt is the difference in elevation between the high side of the deck and the low side of the deck. Increas- ing side tilt will cause the material to shift toward the low side of the deck. Decreasing side tilt will cause the material to shift toward the high side of the deck. Normally, the best separations are obtained when side tilt is set at or near the maximum steepness. However, care should be taken not to set side tilt too steep. Side tilt is too steep when material cannot be made to flow toward the high side of the deck by increasing the eccentric speed. Too little side tilt occurs when all the material moves toward the heavy side of the deck despite low eccentric speed. The side tilt is adjusted by loosening the two clamping knobs (5) and moving the side tilt adjustment handle (4) in towards the machine for more tilt and away from the machine for less tilt.

Eccentric speed

Eccentric speed and side tilt are closely related. Increasing eccentric speed will cause material to be shifted toward the high side of the deck. Decreasing eccentric speed will cause material to be shifted toward the low side of the deck. Generally, by increasing eccentric speed (which shifts the material toward the high side) and increasing side tilt (which shifts light materials back toward the low side) a more precise separation can be obtained. Too much eccentric speed can be observed when all the material shifts to the high side of the deck despite maximum side tilt being used. Eccentric speed is adjusted by turning the Eccentric speed control knob located on the side of the machine **Figure 7**. Turning the knob clockwise increases the speed and turning the knob counterclockwise decreases the speed.

Air control

Air regulation is one of the most important adjustments to be made on a Gravity Separator. The most common mistake in air control is the use of too much air. Separation is not made by "blowing" the light material from the heavy, but by using a controlled air flow to create the stratified layers that are then separated by the vibrating action of the deck. Too much air will cause a boiling or bubbling action lifting the heavier particles from the deck and mixing them with the lighter top layers. Too little air will cause the material to appear slug- gish and to pile up at the high side of the deck.

With proper air regulation, the bed of material will be almost fluid in appearance. The material on the surface should be agitated and free flowing, with the exception of the stratifying zone under the feeder. Bubbling should be kept to a minimum, allowing the vibrating deck to make the separation. It was discovered through experience that the air pattern under the deck must be varied when working with different commodities and sometimes even with different lots of the same product. To enable these corrections to be made quickly and accurately in the field, Oliver Manufacturing Company has developed and patented a system of multiple fans to supply the air for separation. Each fan is individually adjustable to enable the processor to adjust the air pattern and air column as necessary to make an optimum separation. With older single fan systems and even with the newer vacuum systems, the air patterns are preset at the factory and very little range of adjustment is available to the processor.

On Oliver's multiple fan machines, air is regulated by turning the "More Air" control knobs (7) clockwise for additional air and counterclockwise for less air. There are roughly 110 revolutions of the knob between a closed air gate and a fully opened air gate.

All the controls on the Gravity Separator serve a purpose and must be balanced with the other controls to obtain optimum separation. With this understanding, you are now ready to begin making an actual separation.

Startup and operation

Either levers or knobs to operate or adjust Hi-Cap. These adjustments require consistent monitoring by operator if product changes .

Initial starting procedures

Most adjustments take place as soon as the product is on the deck. Therefore, it is a good idea to operate the separator empty for a few minutes before attempting to make a separation. During this period, listen to the machine to become familiar with how it sounds during operation.

- Observe the ocilating action of the deck, change the speed control to make the deck ocilate faster and slower.
- Check the feeding mechanism to insure that the feed rate can be controlled. Locate the end raise screw on the feed end of the deck. Loosen the clamps and raise and lower the feed end of the deck. Feed rate and end raise must be balanced against one another to insure a uniform flow rate of material from the feed end of the deck to the discharge.
- Finally, open and close the air gates. Although this does not produce a visible effect on an empty deck, changes in air volume may be noted by holding your hand over the deck as the air gate controls are operated. The air control settings are the most important part of successful gravity operation.
- Before turning off the machine, make one final check to be sure that the fan shaft is turning in the right direction. When viewed from the feed end of the machine, all shafts should rotate clockwise for left hand gravities and counterclockwise for right hand gravities.

Separation procedures

Setup

After becoming familiar with the operating characteristics of the Hi-Cap, separation can begin. Close all Cutout Gates and the Rock Trap Gate on the high side of the deck. These settings increase capacity, and we will discuss them later. There is a minimum requirement for these adjustments step 1-4 is a good starting point before adding product to deck. a minimum raise of the end raise helps move along product across the table more efficiently.

Preset the adjustments shown in **Table 1**.

Model	Deck Cover	Eccentric Speed	Side Tilt	End Raise	#1	#2	#3	#4	#5	#6	#7
240 Ind.	10 mesh Readout	3/4 450	Max 3.5	1/2 2.5	Max 5.5	Max 5.5	1/2 3.5	1/4 2.0	1/4 2.0	1/2 3.5	3/4 4.5
240 Ind.	16 mesh Readout	3/4 450	Max 3.5	1/2 2.5	3/4 4.5	3/4 4.5	1/2 3.5	1/4 2.0	1/4 2.0	1/4 2.0	1/4 3.5
240 Ind.	30 mesh Readout	3/4 450	3/4 3.5	1/4 2.5	1/2 3.0	1/4 2.0	1/4 2.0	Min 1.5	Min 1.5	Min 1.5	1/4 2.0
240 Ind.	Linen Readout	3/4 400	3/4 3.5	1/4 1.5	1/4 3.0	1/4 2.0	1/4 2.0	Min 1.5	Min 1.5	Min 1.5	1/4 2.0
160 Ind.	10 mesh Readout	3/4 450	Max 3.5	1/2 2.5	Max 5.5	3/4 4.5	1/4 2.0	1/4 2.0	3/4 4.5	—	—
160 Ind.	16 mesh Readout	3/4 450	Max 3.5	1/2 2.5	3/4 4.5	1/2 3.5	1/4 2.0	1/4 2.0	1/2 3.5	—	—
160 Ind.	30 mesh Readout	3/4 450	3/4 3.5	1/4 2.5	1/2 3.0	1/4 2.0	Min 1.5	Min 1.5	1/4 2.0	—	—
160 Ind.	Linen Readout	3/4 400	3/4 3.5	1/4 2.5	1/4 3.0	1/4 2.0	Min 1.5	Min 1.5	1/4 2.0	—	—
80 Ind.	10 mesh Readout	3/4 450	Max 3.5	1/2 2.5	Max 5.5	1/2 2.5	1/4 2.0	1/2 3.5	—	—	—
80 Ind.	16 mesh Readout	3/4 450	Max 3.5	1/2 2.5	3/4 4.5	1/4 2.0	1/4 2.0	1/2 3.5	—	—	—
80 Ind.	30 mesh Readout	3/4 450	3/4 3.5	1/4 2.5	1/2 3.0	Min 1.5	Min 1.5	1/4 2.0	—	—	—
80 Ind.	Linen Readout	3/4 400	3/4 3.5	1/4 2.5	1/4 2.0	Min 1.5	Min 1.5	1/4 2.0	—	—	—
50 Ind.	10 mesh Readout	3/4 450	Max 3.5	3/4 4.0	3/4 5.5	1/4 2.0	1/2 3.5	—	—	—	—
50 Ind.	16 mesh Readout	3/4 450	Max 3.5	1/2 3.5	1/2 3.5	1/4 2.0	1/4 2.0	—	—	—	—
50 Ind.	30 mesh Readout	3/4 450	3/4 3.5	1/4 2.5	1/4 2.5	Min 1.5	Min 1.5	—	—	—	—
50 Ind.	Linen Readout	3/4 400	3/4 3.5	1/4 2.5	1/4 2.0	Min 1.5	Min 1.5	—	—	—	—

Table 1: Preset adjustments

Step 1

Preset all adjustments as suggested in Table 1. Be sure to fasten the clamps securely after making the end raise and side tilt adjustments. Turn on the machine. Open the feed gate slightly. Then adjust the eccentric speed, so that the material begins to move uphill.

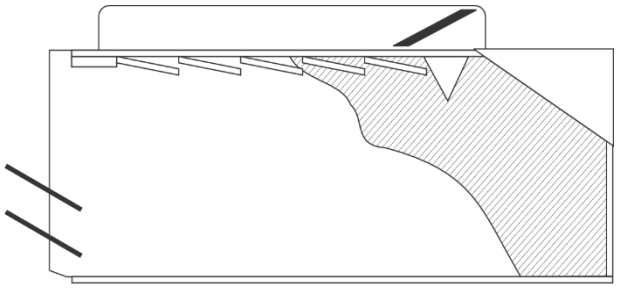


Figure 9

Step 2

Wait until 1/2 of the deck is covered. Adjust each air gate to provide just enough air to keep the material in a fluid state. Best results will be obtained by adjusting each air gate in succession, beginning at the feed end. Always wait to see the effect of an adjustment before making another.

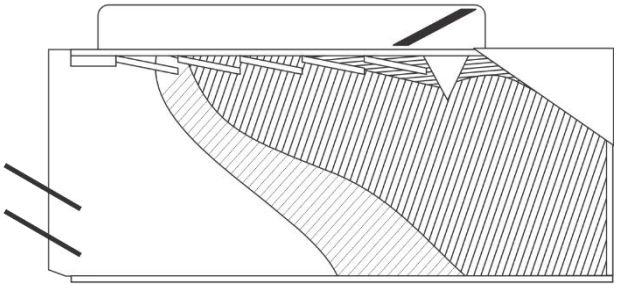


Figure 10

Step 3

If a light zone fails to appear, slightly increase the air, side tilt or end raise. After the deck is covered completely, wait a few minutes. Then readjust the controls to obtain the best possible separation quality.

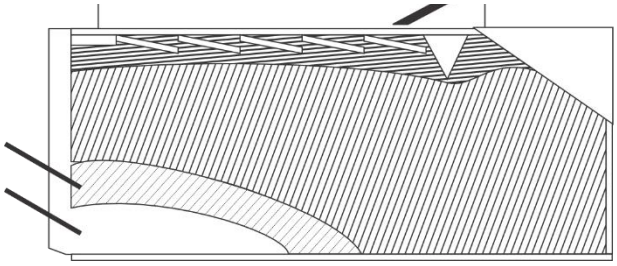


Figure 11

Step 4

After the desired separation quality has been obtained, begin increasing capacity. First increase capacity by increasing the feed rate and end raise adjustments. Capacity can be increased further by opening the cut-out gates along the high side of the deck. Readjustment of the air-flow will probably be necessary at the same time in order to maintain separation quality.

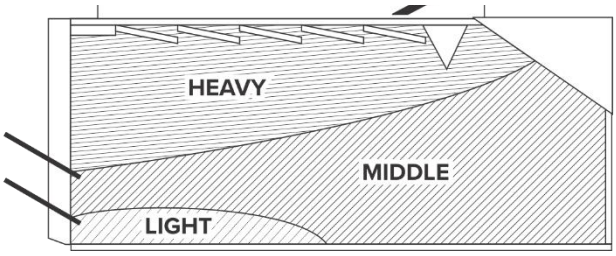


Figure 12

Starting the Hi-Cap

After becoming familiar with the operating characteristics of the machine, separation can begin. Preset the adjustments listed in Table 1 for your particular model. If your machine is not listed, use the adjustments for the machine that most resembles your own; or call the factory.

When these initial adjustments are completed, turn on the machine. Open the feeder slightly and allow a thin stream of material to flow onto the deck. After there is a small amount of material on the deck, adjust the eccentric speed so that material begins to flow toward the high side of the deck.

Adjusting the air pattern

Wait until one-half of the deck is covered. Adjust each air gate so that the material has just enough air to remain in a fluid state. Be careful not to open the air gates too much. If too much air is entering via the air gates, the material will appear to be "boiling" rather than flowing smoothly down the deck. Areas where there appears to be too little air

might be noted. This is because the deck is not completely covered, allowing excess air to escape through the uncovered portion. When the deck becomes covered, the air pattern will shift to normal.

Once the deck is completely covered, begin decreasing the air flow beginning with the last fan (the fan closest to the discharge end of the machine) working toward the feeder. In succession, cut down on the air of each fan to the lowest point where separation can still be noted. If an air gate is closed completely, leave it closed and advance to the next fan closer to the feeder.

Adjusting side tilt and eccentric speed

After a good air pattern has been obtained, move to the discharge end of the machine; and observe the depth of material across the discharge end of the deck. The surface of the material should be smooth and uniform. The depth of the high side of the deck should be 2 to 3 times as deep as on the low side. If the bed is too deep on the high side, first increase the side tilt. Then decrease the eccentric speed or slightly increase the air. All of these actions will cause the material to shift towards the low side of the deck. If the bed is too deep on the low side of the deck, first increase the eccentric speed. Then decrease the air or, side tilt. These adjustments will cause material to shift towards the high side of the deck. After making these corrections, observe the resulting separation; and adjust the air pattern, if necessary.

Adjusting the end raise

Check the end raise of the machine. If it is correctly adjusted, the depth of material at the feed end should be 2 to 4 times greater than that at the discharge end. If the bed of material is too deep, the end raise will have to be increased to cause the material to flow away from the feed end faster. If the bed of material is too thin, decrease the end raise to retain material at the feed end longer. To adjust the end raise, loosen the end raise clamp knobs at the feed end. Then raise or lower the deck using the worm jackscrew handle. Finally, re-tighten the clamping knobs securely. It is important to have the clamps tight because they support the deck carriage while the machine is in operation.

Increasing capacity

Once the separation quality required has been obtained, begin increasing capacity.

1. First increase the side tilt. This will cause the material to shift toward the low side of the deck. To correct this, increase the eccentric speed until the proper pattern is obtained again. Continue increasing side tilt and eccentric speed alternately until the side tilt is at the maximum amount where you can still maintain the correct bed depth by adjusting the eccentric speed.

2. Next, open the feed gate slightly. This increases the feed rate so the bed depth will increase. Observe the change in the material on the deck. Then increase the end raise (see above for adjusting the end raise) to compensate for the increased feed rate. Continue increasing the feed rate and end raise until

the maximum feed rate has been reached, where the machine can still maintain the required separation. The air may have to be increased slightly to compensate for the thicker bed of material. Be sure that the clamping plates are tight after each time the end raise is increased.

3. It is possible to increase capacity even more by opening the gates along the high side of the deck. Begin by opening the gate closest to the discharge end of the machine. After a couple of minutes, open a second gate.

After two or three of the side gates have been opened, the feed gate can be opened enough to compensate for the material that is being removed from the deck. As the bed of material at the discharge end becomes thinner, readjust the air, if necessary.

The number of gates that may be opened should be determined by the difficulty of separation and the end results required. The easier the separation, the more gates can be opened and the higher capacity can be obtained. Always remember that capacity and quality off-set one another. Therefore, if the separation quality does not meet standards, lower the capacity of the machine. Conversely, if the end product is better than it needs to be, increase your operating capacity.

Separation results

Many customers ask us how we can determine when we are getting the most from a gravity separator. This is an extremely difficult question to answer because not all people want to accomplish the same thing by operating their gravity. We manufacture gravity separators to make a separation based on seed density. To do this, it is first necessary that the seed must be cleaned and properly sized. Since size, shape and weight of the seed directly effect the separation, it is imperative that the seeds be classified according to size and shape before attempting to make a separation on the basis of weight.

The most positive method of testing to determine the effectiveness of a gravity is through the use of a U.S. Standard weight per bushel tester (aka measuring scale). By using the tester, determine the difference in weight between the heavy and light product. The gravity should be set to obtain the maximum weight difference between the light and heavy products.

The test weight per bushel of the heavy, middle and light fractions should be recorded along with the machine settings necessary to obtain this. Also, germination and vigor testing should be done on these fractions and the results recorded with the test weights. This gives a written record of the operation of the gravity separator and the settings necessary to obtain a separation of that product. These can be used as a reference when processing similar products in the future.

Troubleshooting

Introduction

Even the most experienced operators run into problems that they cannot solve. Often times operators expect results too soon from their gravity separators. A certain amount of time is required for the entire deck surface to adjust to the new conditions. When you make an adjustment, please wait at one to five minutes before deciding whether it has made any improvement.

Please do not attempt to operate the Hi-Cap Gravity Separator without understanding how and why it works. Your gravity separator makes a separation based on a particle's weight and its resistance to airflow. Proper adjustment of all the controls is necessary to obtain the best separation. The Hi-Cap has four major quality adjustments: end raise, side tilt, deck speed, and airflow.

Check these first

Thanks to multiple conversations with customers, we have compiled a list of common issues most generally encountered after installation and found later after operation.

Blinded decks

If there is insufficient air and the fans are running correctly, clean the deck. Clean the deck by using compressed air to blow the dirt and chaff out from the top down into the deck while the gravity separator runs. See also Cleaning Decks.

Dirty air filters

The air filters on the side of the Hi-Cap screen dirt out of the air before it enters the machine. If these screens become plugged, the fans cannot pull enough air to provide proper separation—clean air filters by removing them from the machine and gently tapping them on the floor. Alternatively, achieve better results by removing the filters and using compressed air to blow out the dirt. If you must clean filters while the machine is running, use an industrial vacuum cleaner and vacuum the dirt from the filter surface.

Inadequate foundations

The Hi-Cap is a counterbalanced machine. Still, it must be attached to a secure foundation. The foundation is probably too weak if you feel any vibration on the floor while the machine is running. Weak foundations lower the separation quality because the foundation absorbs some of the oscillating action intended for separation. Call the factory if you feel that you have an installation problem.

Operating at too much capacity

Often, slightly lowering the operating capacity will significantly improve the separation. Be careful not to decrease capacity too much. The machine's deck should be covered entirely. Capacity is usually dependent on the standards to be met and the quality of the product. Quality and capacity are inversely related. Increasing capacity usually lowers quality, while decreasing capacity usually improves quality.

Improper dust hood arrangement

Dust hoods reduce dust and dirt emissions into the plant and reduce noise levels. We have designed the dust hood and exhaust system to exhaust at least 5% more air than the machine uses for separation. Also, adequate make-up air must be available. Dust hoods and the associated air exhaust system design require expert knowledge to provide an economical and efficient system. If you equip your machine with a dust hood and feel that you are not getting proper separations, we suggest you contact the factory.

Using the wrong deck overcover

The Deck Cover is the portion of the machine that makes the separation. Without friction between the deck cover and the product to be separated, no separation will result. Therefore, select a cover that performs well with a specific product. Using the wrong cover will cause poor quality separation and insufficient capacity. Sometimes, an improper cover will cause sufficient damage to the deck that may require a rebuild. Generally, the cover should have a rough surface texture, and the openings should be as large as possible without allowing the product to fall through. Oliver offers standard decks: cloth for small grasses; 30-mesh wire for seeds the size of alfalfa and clovers; 16-mesh wire for seeds the size of wheat and oats; and a 10-mesh wire for large seeds, such as beans. A variety of special decks to meet needs are available. Contact the factory for further information.

Belt slipping

Belts commonly slip-on new machinery. New belts tend to stretch slightly and should be checked frequently during the first couple of weeks of operation. Turn off the machine and lock out the power supply to check a belt. Then apply pressure to the back of the belt midway between the two pulleys. The belt should deflect approximately 1/2 inch.

Adjustments

Adjustments are a common problem with new, inexperienced operators. The solution is usually gaining more experience. Oliver can provide onsite training for your Operators as a service. If this is of interest, please contact the factory.

Do not be afraid to adjust the machine. Make an adjustment and wait one to five minutes to determine the effect and decide if it is good. Then try something else for further improvement. If the effect is insufficient, return to the original

setting. Finally, remember to make all adjustments in small increments. It is better to approach the final setting through several small steps than to make one adjustment that might be too large.

The final pattern on the deck may vary depending on the processed product. Depending on the size of the product, we suggest the following:

Product size	Average depth
Smaller than 1/32 inch in diameter.	Less than 1/4 inch.
1/32 to 3/32 inches in diameter.	1/4 to 1/2 inch.
1/16 to 3/16 inches in diameter.	1/2 to 1 inch.
1/8 to 3/8 inches in diameter.	1 to 2 inches.

As a general rule, the product depth along the high side of the machine should be from 1 to 3 times the depth along the low side. The average depth of product at the feed end of the machine should be from 2 to 4 times the average depth at the discharge end. These patterns will not be correct for all products. However, an approximation of these conditions on the deck surface will provide an initial setup. From this point, make the necessary adjustments to obtain an optimum separation. As an additional aid in making your adjustments, we provide a chart that shows many situations that can occur and lists adjustments that will help correct the pattern, Figure 17.

End raise

End raise determines the rate at which the product flows from the feed end of the deck toward the discharge end. High feed rates require a high-end raise setting, and lower feed rates require lower settings. End raise determines when to expose a product to the separating action. Therefore, the end raise directly affects the quality of separation. Usually, decreasing the end raise increases separation quality, Figure 13.

End raise

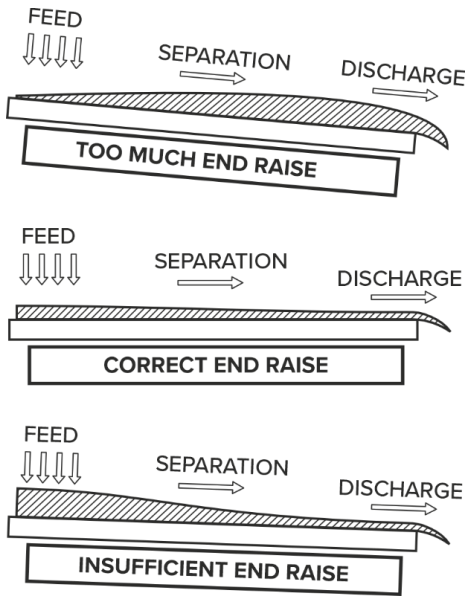


Figure 13

Side tilt

Side Tilt is the difference in elevation between the high side of the deck and the low side of the deck. Too much Side Tilt is present when the product cannot climb to the high side of the deck. Too slight a side tilt is present when the product will not float to the low side of the deck, Figure 14. Typically, set the slide tilt at the maximum height to maintain an acceptable pattern across the deck.

Side tilt

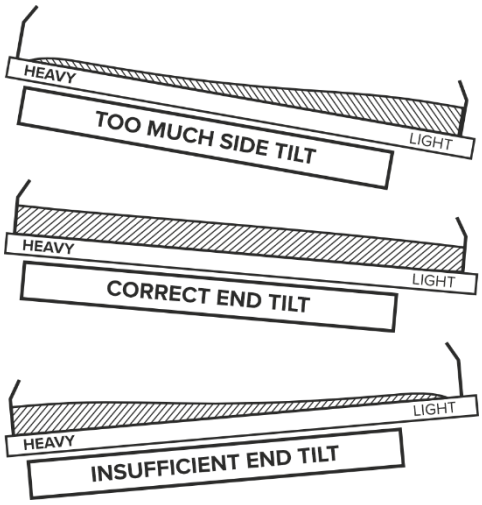


Figure 14

Deck speed

Deck Speed is the rate of vibration of the deck. The vibrations provide the agitation required so that product can be stratified, separating the heavier lower layers of the product from the lighter upper layers of the product. Deck speed and side tilt combine to get the best separation action. Too little Deck Speed will not agitate the product sufficiently to be adequately stratified. Too much Deck Speed will cause the product to flow to the high side of the deck and spill over the banking rail. Usually, with too little Deck Speed, the product will lay on the deck without moving, and the deck will quickly become overloaded Figure 15.

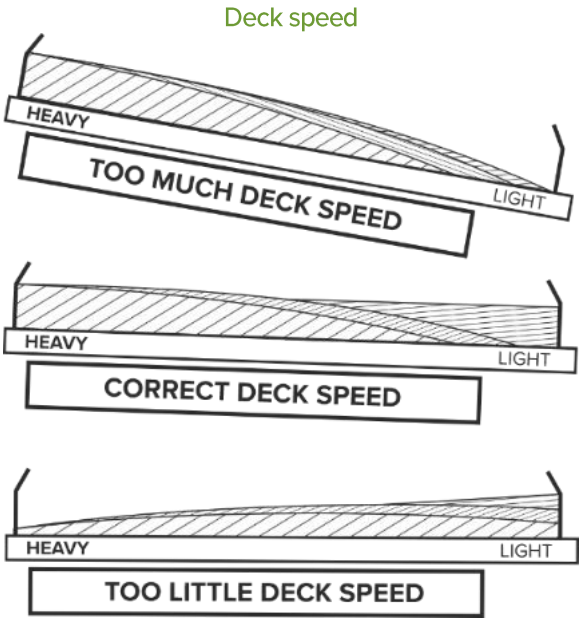


Figure 15

Note: An additional note, an overcover that is worn can also adversely affect product flow from low to high. If you have an older overcover and find that you have to keep reducing the side tilt or increasing the deck speed to drive good product to the high side, please evaluate the overcover on your deck. It may need to be replaced.

Airflow

Air is stratifying medium. Unless the product is stratified correctly, a quality separation is impossible. Too much airflow will cause a bubbling/boiling action that re-mixes the product as fast as it is stratified. Too little airflow will not stratify the product correctly. Generally, higher airflow is required in the feed area to obtain good stratification. As the product moves from the feed end to the discharge end, progressively less Airflow is required to maintain proper stratification, Figure 16.

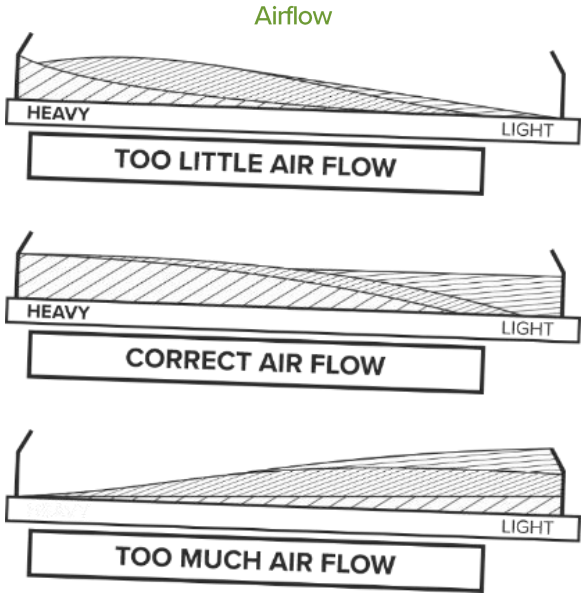


Figure 16

Feed rate

Feed Rate determines the capacity of the machine. We define the minimum feed rate as the lowest rate of feed at which an adequate cover of product spreads over the entire deck. Oppositely, the maximum feed is the highest rate of feed at which an acceptable quality separation is possible. Between these limits, separation quality generally goes down as capacity increases and up as capacity decreases.

What to do with unsuitable products

Typical issues and how to solve them

A product is rarely unsuitable for separation. Usually, a gravity separator will make some improvement in any free-flowing product. However, a gravity separator is a specialized machine designed to separate particles of varying densities and similar sizes. If the product does not fall into that classification, it probably cannot be separated on a gravity separator. Contact the factory in these situations, as we may be able to assist you with various solutions to ensure your product is similar in size with varying densities.

When making incremental adjustments, be patient and wait for your gravity to respond. The adjustments do not show on the gravity table instantly. See Figure 17 for examples of improper adjustments.

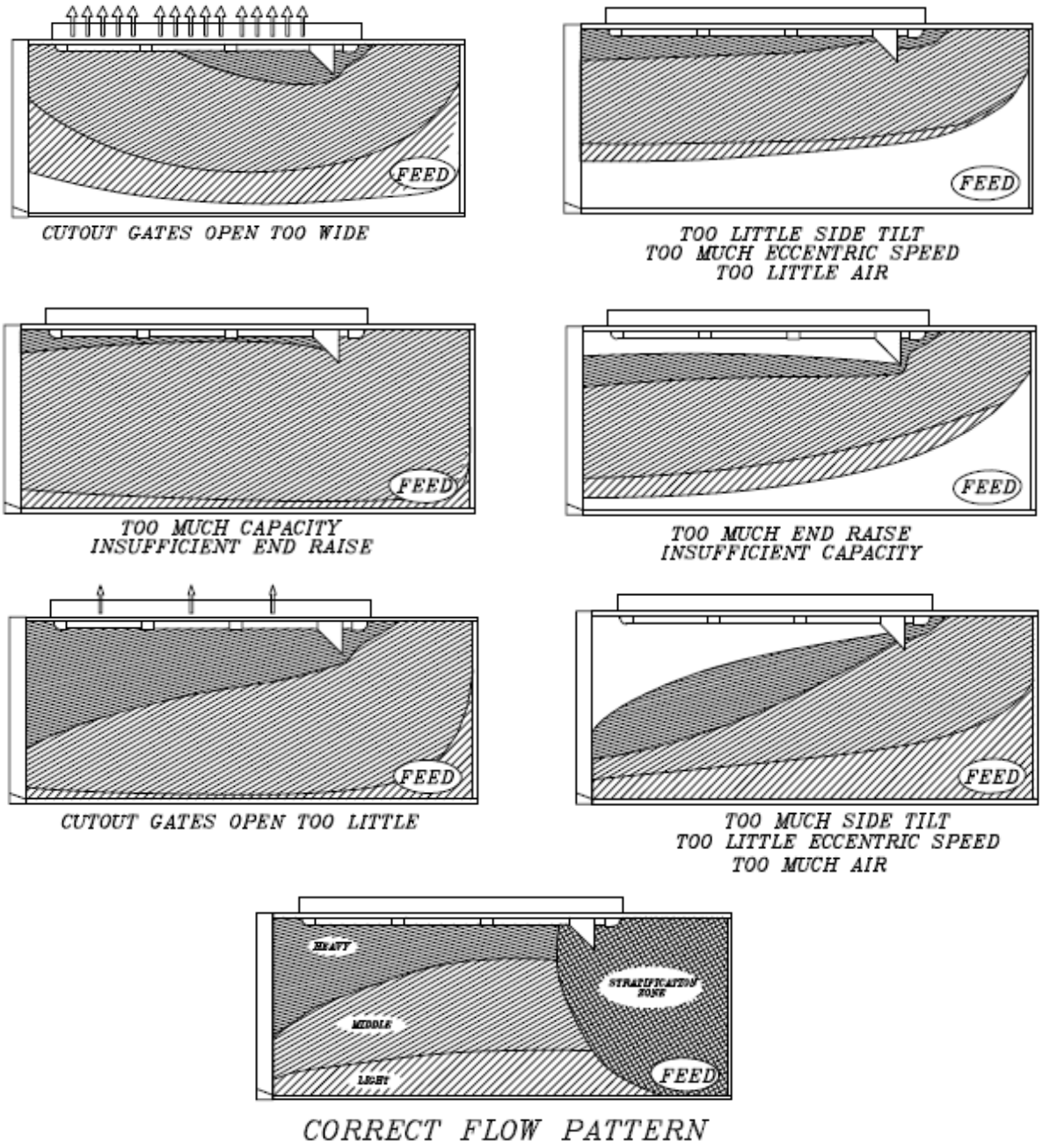


Figure 17

Legend

Heavy Middle Light Stratification zone

Maintenance

Your Oliver Gravity Separator is designed to give years of trouble-free service. However, as with all machinery, periodic maintenance is required to keep it in top condition. The following is a list of some areas that can be problems, if not periodically checked.

Decks

The deck is the portion of the machine that contacts the product and makes the separation. Maintain optimal separation by frequently checking the deck and cleaning or repairing it. Even in very clean atmospheres, dust and dirt will build up on the underside of the deck. This buildup causes airflow restriction through the deck and will eventually plug the deck completely (blinded deck), Figure 18.

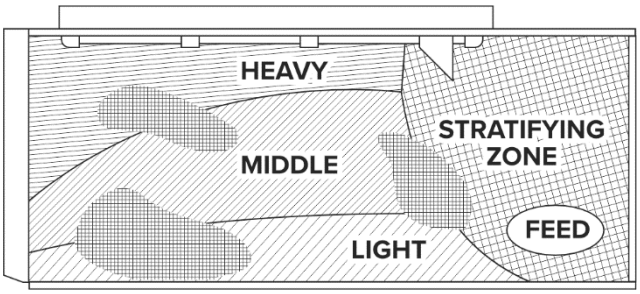


Figure 18

When the deck becomes plugged, it will be necessary to remove it from the machine and thoroughly clean it. A partially cleaned deck will become plugged sooner. To check if a deck is clean, place a light on a drop cord under the deck. If the deck is clean, you should be able to see the light through every opening of the deck cover. Contaminated areas will show dark spots and require additional cleaning.

Cleaning Decks

Cleaning a deck employs multiple techniques.

- **Try running the machine without products** for decks that aren't entirely clogged or run longer than usual on a given day. The fans will push out any unwanted dust or particles on top of the screen. (only available on Platinum-level machines).
- **It is not necessary to remove or handle the deck**. You can use a blow gun to clean the deck while in operation.
    - Sometimes with the fans running, the dust is pushed back up through the deck by the operational air and settles underneath the deck.

- Disadvantages are that the deck is not cleaned as thoroughly as when removed, and they must be cleaned more often.
- The fans push the dust through the deck.
- The dust does not settle inside the machine.

- For this purpose, we suggest a blow gun with an extended nozzle at least 48" in length. Air from the extended nozzle should be blown downward. With an extended nozzle you can clean the entire deck surface without leaning on the deck. We caution that you retain the OSHA blowing tip and install it on the modified cleaning wand to prevent any damage to your top screen.

- Lastly, if all else fails then resort to removing the deck entirely and take the time to thoroughly clean top and bottom of deck. You can do this using water or a blow gun. Be sure NOT to use abrasive or harsh chemicals when cleaning. Instead, power wash it or use alcohol.

Deck repair & replacement

Inspect your deck frequently for wear. Because decksz are in direct contact with the product being, they are subjected to abrasive wear. As a deck wears out, the surface becomes smoother, and it becomes more and more challenging to move the heavier product out from under the lighter layers. Usually, when the wires of the deck overcover become worn, it is time to repair the deck. A wholly worn deck cover increases the danger of ruining the undercover, which develops the air pattern, Figure 19.

New deck vs. worn deck comparison

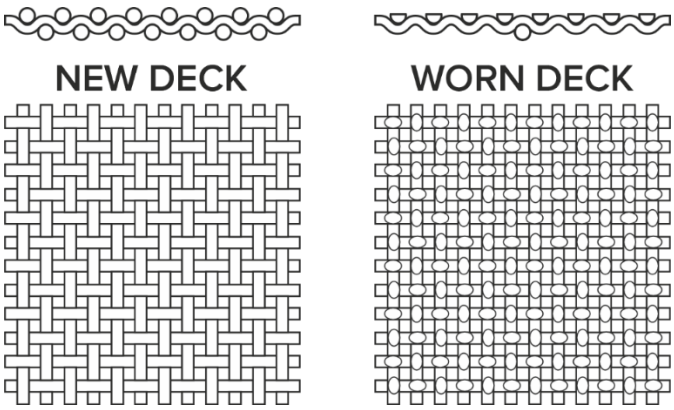


Figure 19

All decks with wire overcovers include a perforated metal undercover. These overcovers develop the air pattern, which makes the separation. If the undercover is not damaged, it is not necessary to replace it. When rebuilding a

deck, always inspect the deck thoroughly. Look at the underside of the deck and inspect each rib for cracks, dents, bends, or other problems. If the ribs are damaged, it will be necessary to tear down the deck completely to repair or replace them. Since the deck frame's construction includes high-quality aluminum, any repairs require someone experienced in working with aluminum. These repairs require in-factory attention.

We keep overcovers and undercover in stock. Should you need a replacement, you can order extra screens with our parts department and install them yourself or have one of our professionally trained staff replace them.

If you plan on a self-installation of your deck, please read the following:
When installing an overcover or undercover, it is best to place the deck on two sawhorses with a light underneath. By looking through the screen toward the light, you will easily be able to locate the ribs for fastening purposes. Always stretch the screen tightly. Tight screens give better separation results than loose ones.

Finally, inspect the deck trim, aprons, rails, and riffles; and replace what is needed. The horizontal metal pieces running across the top surface of the deck are called riffles. Riffles assist heavy particles in working uphill by trapping them behind the riffle and allowing light products to flow over. Riffles are riveted to the top of the wire overcover. The rivets should extend down into the deck ribs. If your deck has riffles, attach them over each aluminum rib precisely like the pattern supplied on the new machine.

Hydraulic system (side tilt and end raise only)

The Hi-Cap uses a hydraulic system to make deck position adjustments and baffle the air for each fan zone. This system enables you to stand in one convenient place and quickly adjust the machine. Make all adjustments while the machine is operating, and ensure proper fluids and levels are maintained.

The fan chest houses the oil reservoir and hydraulic motor-pump assembly. Keep the oil reservoir maintained at the full level. If the reservoir requires a frequent filling, this indicates a leak. Leaks will allow air to get into the system and result in the Gravity Separator's erratic or poor operation. Locate and repair leaks as soon as they are suspected to ensure proper operation.

Oil and filters

The oil reservoir resides on the bottom frame of the machine opposite the control panel. Periodically check the oil reservoir to ensure it is "full." If the reservoir requires a frequent filling, check for leaks. We have designed the Hi-Cap Series to operate efficiently for 24 months without the need to replace the hydraulic oil filter. When a new filter is required, order directly from Oliver Manufacturing.

Oil viscosity recommendations

You may use any major brand of anti-wear, non-detergent hydraulic oil, provided it meets the following viscosity requirements:

Temperature	SAE viscosity
-10 to 130 F	SW, 5W-20, 5W-30
0 F to 210 F	10W30,10W40
Temperature	SAE viscosity
-10 to 130 F	22
0 F to 210 F	46

Purging Air from the System

Air in the hydraulic system will result in erratic operation of the hydraulics. If you suspect air in your system, you must purge the system. To purge the system, operate each hydraulic control through its entire range of operation for at least five complete cycles. Cycle each control periodically to ensure that air does not build up in the system. If you cannot purge the system by these methods, please call the factory.

Bearings

To prolong bearing life, grease with 1 to 2 shots at the start of each season or every 1000-1500. Sealed bearings are installed at the factory and will give better service if they are not over-greased. A bad bearing will generally be detected by a rumbling noise in the machine or by feeling an unusual vibration. Run the machine for at least 30 minutes to determine if a bearing is defective. Then, turn off the machine and lock out the power supply. Use a temperature gun to check the temperature of the bearing, if the temperature is more than 180F, you will need to change the bearing. Normal temp is 110-130F.Touch the bearing surface. If the bearing is excessively hot, replace it. You may have anywhere from 12 to 18 bearings located inside the machine.

Dust hood and air duct

Inspecting the feed control, air control, and rods inside the hood periodically for dirt buildup on the threads is recommended. Keep the inspection windows clean to enable the operator to observe the product on the deck.

Periodically check the ducting for settling of material in low places. Also, inspect the condition of the ducting. Look for cracks and leaks. Look for areas of deterioration where the material is wearing through the pipe. Repair these areas and change the deck layout to keep these problems from reoccurring.

Inspect the exhaust fan periodically. Look for unusual wear on the interior of the fan. Check the condition of the drive belts and shaft bearings to keep your dust collection system clean and in good working order. If you are using cyclones, be sure they are clean and functioning. Check the cone of the cyclone for obstructions. A plugged cyclone will adversely affect the whole system. A good maintenance program and clean equipment will go a long way to ensure a profitable and safe operation and prolong equipment life.

Drives

If you have a master series you will have drive(s) If you have a standard you will have vari-speed. If applicable or if equipped with.There are three sets of belts and sheaves in your Oliver Gravity. They are: the main drive belts or fanbelts; the idler belt from the fanshaft to the vari-speed unit; and the eccentric belt from the vari-speed to the eccentric shaft. New machines should be checked very frequently for the first few weeks because new belts tend to stretch as they are broken in. To check belt tension, turn off the machine. Then apply pressure to the outside of the belt midway between the two sheaves. The belt should deflect approximately 1/2 inch.

The eccentric belt, from the vari-speed to the eccentric shaft, has a shaft running through it. The shaft must be removed to install a new belt. For this reason, a spare belt is installed around the shaft on all new machines. When the original belt wears out, merely remove the spare belt from its mountings and slip it in place of the original. If the second belt wears out at a time when you are processing and you do not wish to stop the machine for the length of time required to install a new belt, you can replace it with a link belt.

However, this is a temporary measure; and it is recommended that the link belt be replaced with standard V belts when it is convenient. Proper tension is maintained on the eccentric belt by the spring action in the vari- speed unit. There is no manual adjustment. If the eccentric belt slips, it is an indication that the vari-speed unit is defective.

Vari-speed assembly

The vari-speed unit changes the ratio between driving and driven pulleys so the eccentric speed can be altered. It is normal for vari-speed units to wear and should be expected. Most customers get two or three seasons of hard use before it is necessary to replace the vari-speed, depending on the usage. The life of the vari-speed can be extended, if it is operated through its entire range at least once daily. To do this, simply cut off the feed while the machine is running. Turn the crank handle so the eccentric slows down all the way. Then turn the handle so the machine speeds all the way up. Open the feeder and reset the eccentric speed to the proper level.

Replacement of the vari-speed is relatively simple. With the machine running, turn the vari-speed adjustment towards the fastest eccentric speed. SHUT OFF THE MACHINE. Roll the eccentric belt off the pulleys. Loosen the set screws and slip the vari-speed pulley off the shaft. Slip the new vari-speed pulley onto the shaft and tighten the set screws. Install the eccentric belt. Turn on the machine and set to the required speed.

Bearings

Your Oliver has several bearings to support the fanshaft and eccentric shaft. We supply sealed bearings for maximum service. However, bearings as well as any moving parts require periodical service to insure maximum life.

The most common problem on new equipment is shaft to bearing contact failure. This shows up as a loosen- ing of the bearing set screws which allows the bearing to turn on the shaft and wear a groove in the shaft. This is due to

differences in the expansion rate of the bearings and the shaft as the bearings warm up after startup. It is a more frequent problem in colder climates than in warmer areas.

Check all bearing set screws before the machine is started initially. After the machine has run 8-10 hours shut it down and check the bearing set screws before they have cooled down. After the machine has operated for 100-150 hours shut it down and make an additional check.

Even sealed bearings require occasional greasing for optimum service life. As the bearing warms up grease tends to "boil" out of the bearing. This results in a dry raceway and eventual failure of the bearing. Bearing manufacturers recommend that this grease be replaced periodically. Every **1000-1500** hours the machine should be shut down and greased. **Do not overgrease the bearings.** One or two shots of grease should be given to all bearings. Also, the bearing set screws should be checked at this time. Machines which are under extended or severe service conditions should be inspected every 500 hours and serviced every 1000 hours.

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