Operations manual

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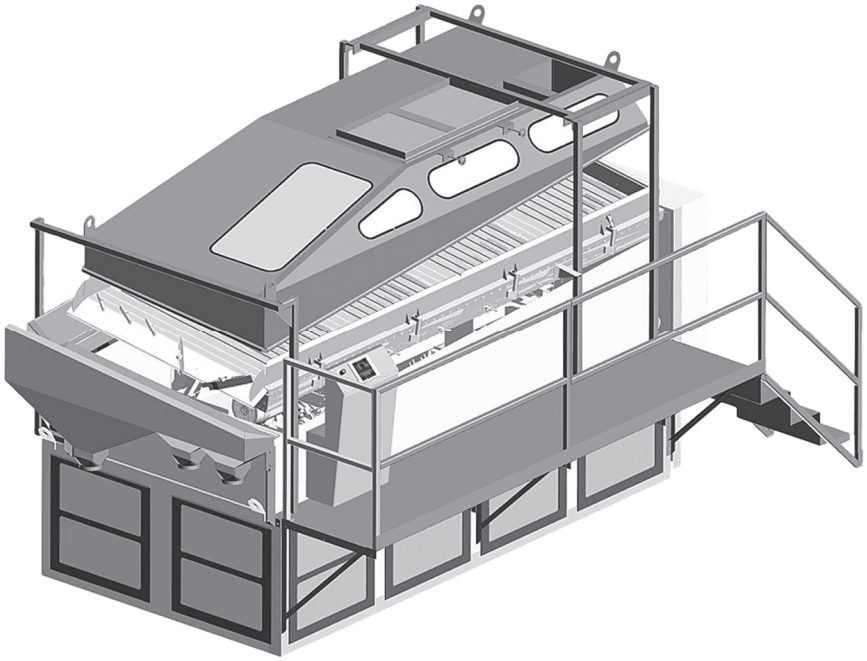

Platinum Series

Gravity Separators

Version 1.0 | 1/5/23

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	Voyager GVX Gravity Separators - Reference Manual Version I Revision Table

Section	Revision	Date
Main Section: Introduction: Installation and Functional Operation Setting up the Machine from HMI Modes of Operation	1	October 2012
Appendix A: The PanelView 800	2	October 2018
Appendix B: MicroLogix 1400 Programmable Logic Controller	1	October 2012
Appendix C: Variable Frequency Drive PF525	2	October 2020
Appendix D: Basic Trouble Shooting	1	October 2012
Appendix E: Remote Control of the Machine	1	October 2012
Appendix F: Parts	1	October 2012

Program Versions for which this Manual Version is Applicable	
Starting Revision	Ending revision
HMI: 01-20-2020 PLC: 01-20-2020	Present Revision Present Revision

Important information about the Operating Instructions

The Voyager GVX Series of Gravity Separators is comprised of three different models: GVX1040, GVX1050, and GVX1060. The primary difference between them is the number of fans that supply the air flow and the length of the deck.

The GVX1040 has three fans, the GVX1050 has four fans and the GVX1060 has five fans. The length of the deck is proportional to the number of fans.

The Platinum Maxi-Cap Series of Gravity Separators is comprised of four different models: 2400P (3 fans), 3000P With (3 fans with a wider deck), 3600P (4 fans), and 4800P (5 fans). The length of the deck is proportional to the number of fans.

The Platinum Maxi-Cap Retrofit Series of Gravity Separators is comprised of four different models: 2400U (1 fan, 3 dampers), 3000U With (1 fan, 3 dampers with a wider deck), 3600P (1 fan 4 dampers), and 4800P (1 fan, 4 dampers). The length of the deck is proportional to the number of fans.

Unless otherwise noted, the Operating Instructions apply to all three models. These instructions will be updated as required. Updated documentation will be sent to all current owners of a Voyager GVX Series Gravity Separator.

Congratulations!

You have just purchased a well-built machine that will earn substantial profits for you, if you take the time right now to understand the Oliver Voyager GVX Series Gravity Separator and how it works.

The Voyager GXV Series is the next generation of Oliver Gravity Separators. Many of the manual adjustments on previous machines are now done hydraulically and controlled by a "touch-screen" and a joy stick. Instead of changing adjustments each time for different materials, you simply store the adjustments (called a "recipe") in the Voyager GVX memory the first time you separate the material. In the future, when you need to separate the material again, simply select the recipe and all of the adjustments will be made automatically.

This manual contains new and valuable information that both experienced and inexperienced gravity operators need to read. Please take a few minutes to read the instructions to help eliminate many of the problems frequently encountered.

Keep in mind at all times 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. The gravity separator should not be used as a sizing machine. Screening machines can do this more efficiently.

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I. Introduction: Installation and Functional Operation

This manual contains several different sections. The first section will describe the installation procedure for the machine. Next, the functional operation and initial setup of the machine will be described. Then the operation of the machine in its various modes will be discussed. Finally, several attached appendices will be provided for description of related functions such as programming the PLC and HMI.

I. Installation

This section explains the installation requirements for the Voyager GVX and Maxi-Cap Gravity Separators. Your Gravity Separator will have been tested for more than 50 hours of operation at our facility to ensure the quality of the machine. Take care not to do anything that would damage it or compromise it.

I. Foundation Requirements

A solid, level foundation is required for safe and proper operation of the Gravity Separator. Vibrations from flooring can cause damage to the machine and upset the separation dynamics of the machine. A six-inch concrete slab is ideal but not essential. The Voyager is fully counterbalanced to keep external vibrations to a minimum. However, the accuracy of the counterbalancing system is affected by the weight of the product on the deck and thus is dependent on the capacity and type of product being dried. Therefore we recommend that the Voyager be firmly attached to the floor. Please contact the factory or your Oliver representative for recommendations. When positioning the Voyager, be sure that you leave adequate clearance to operate the controls, open the electrical cabinet and remove the deck for changing or cleaning.

II. Handling

The Voyager GVX Gravity Separator weighs between 4,000 to 6,000 pounds depending on the model and accessories ordered with it. The Maxi-Cap Platinum machines weigh between 6,000 and 10,000 pounds depending on model and accessories. Be sure that the handling equipment is adequate for the load. While handling the machine take extra care not to damage the deck, the air filters or any other parts of the machine. The fork tubes are designed to be used with 8-foot long forks (or fork extensions). Picking up the machine with shorter forks may damage the tubes. The fan motors are mounted on the tubes so any damage can have serious consequences for machine functionality. The machine is also equipped with lifting lugs at the corners of the mainframe which may be used to hoist the machine into place.

III. Protecting the Deck

The deck is the portion of the machine that actually contacts the product during the drying process. Take extra care not to damage it. During construction and installation, it is very common for contractors to use the surface of the deck as a work space or storage space for items they do not need. **Please discourage this practice!** The deck is designed to support a relatively uniform load of product over its entire surface. Storage of concentrated loads on the deck has resulted in bent or broken deck frames and in 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 to protect it until the Dryer is ready for to be used. **Do not weld anything to the machine as the sensitive control electronics could be seriously damaged.** If it is necessary to weld or cut above the machine during installation take extra care to prevent damage from falling debris or sparks.

IV. Electrical Requirements

The Voyager GVX and Maxi-Cap Platinum Gravity Separators comes with a complete electrical cabinet that is wired to all of the external electrical components such as the motors, hydraulic cylinders sensors, and dust hood light. Typically the only wiring the electrician installing the

machine needs to worry about is the running of the power source to the electrical cabinet. Typical voltages would be 230V and 460V, three phase, at 60Hz. Other voltages are possible, but need to be addressed when the order is placed.

Voyager GVX Series Gravity Separator Electrical Requirements						
Machine	**GVX1040**		**GVX1050**		**GVX1060**	
Circuit Size	240V	85 Amps	240V	90 Amps	240V	115 Amps
	380V		380V	60 Amps	380V	
	480V	50 Amps	480V	50 Amps	480V	70 Amps
			600V	40 Amps		

Maxi-Cap Platinum Gravity Separator Electrical Requirements				
Machine	**2400P**	**3000P**	**3600P**	**4800P**
Circuit Size	208/230V 95 amps	208/230V 95 amps	208/230V 110 amps	208-230V 125 amps
	460V 60 amps	460V 60 amps	460V 70 amps	460V 80 amps

Maxi-Cap Platinum Retrofit Gravity Separator Electrical Requirements				
Machine	**2400U**	**3000U**	**3600U**	**4800U**
Circuit Size				

Table 1: Model Voltages and Total Amp Draws

NOTE: As of November 1st 2012, the warranty covering the PLC and VFDs will become void if the electrician enters the cabinet from the top. The PLC and VFDs will suffer damage if dust or debris from drilling into the cabinet enters the air vents on the units. The electrician must enter the cabinet either from the bottom, or from the bottom of either side panel, below the vents on the VFD. Failure to do this will result in voiding the warranty on the PLC and the VFDs.

V. Clean Air Source

The Voyager GVX and Maxi-Cap Platinum Gravity Separators require a clean air source in order to keep the deck from being contaminated by dust blown in through the fans. The air chest comes supplied with air filters for a machine is that is going to be bolted down to a solid slab foundation. For those who want to use an external air filtration source, it is also possible to either raise the machine, or to suspend it over a space where the air is being pumped in. If you need consultation on how to get clean air to your machine, please call the Oliver team.

II. Functional Operation of the Voyager GVX Gravity Separator

The Voyager GVX series of Gravity Separators is a new line of gravity separator from Oliver that takes the rugged base of previous separators and adds to it quieter fans and better balance as well as a never before seen automation package that make the Voyager the Cadillac of Gravity Separators. There is no finer machine in the world.

The Voyager operates on a concept discovered by Archimedes, a Greek philosopher and mathematician, who discovered that "All bodies, floating in or submerged in a liquid, are buoyed up by a 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, which is water that has a specific gravity of one. Everything with a specific gravity greater than one floats in water, and everything with less than a specific gravity of one sinks.

In the case of the Voyager, the liquid is the air blown by the fans, and the bodies are the particles being separated. What Archimedes was getting at is that we can use air to lift the particles on the deck, and that the amount of air needed is related to the specific gravity of the particles that need to be lifted. Because air is lighter than water, there will be a greater relative difference between the particles of differing weights. That is what makes the Gravity Separator such a sensitive and precise machine.

I. The Process of Stratification

Before a product can be separated by weight the product must be fluidized and then stratified vertically. On Gravity Separators lighter particles are moved upward through the fluidized bed. Heavier particles sink downward. This produces stratified layers with lighter particles in the upper layers and the heavier particles in the lower layers. Air is used as the fluidizing medium for the process of stratification. Stratification occurs by forcing air upward through the particle mixture so that the particles rise or fall by their weight relative to the air flow.

Consider a voyager machine where product has been added to the deck, but the fans are off. The product will sit in a mixed group of lighter and heavier particles. Once air is applied, the lighter particles will start to float, and the heavier ones will stay on the deck. If too much air is applied, then all of the particles will start to float, and the particles will begin to remix. This process is shown in Figure 1.

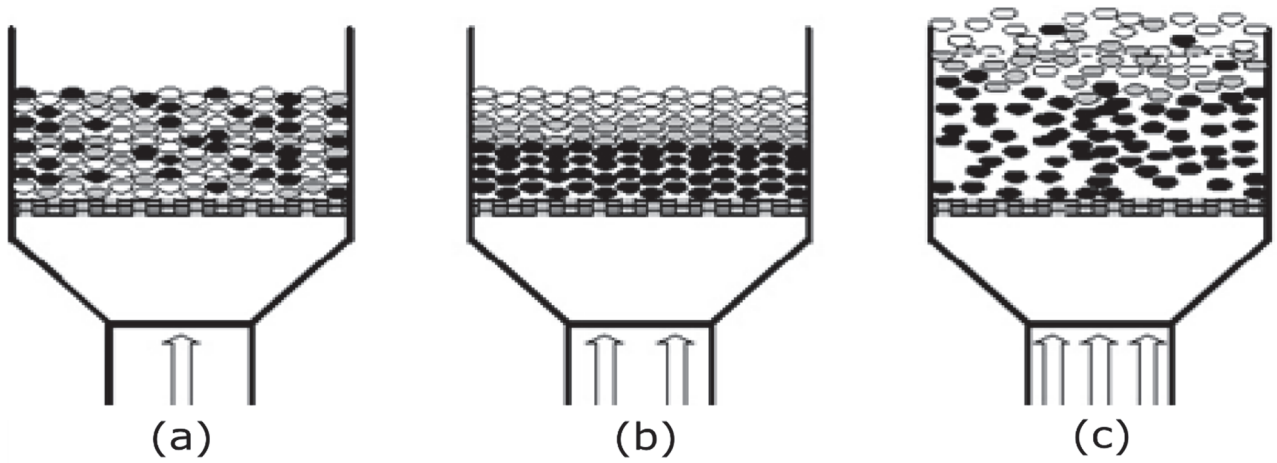


Figure 1: The stratification process (a) mixed product on deck with air off or low (b) stratified product due to air flow from fans (c) too much air flow and remixing of product.

In addition to the air causing a lifting action to the particles, putting them into a quasi-fluidic state, the deck also vibrates. The vibration of the deck helps to stratify the particles by moving the particles that are lighter from around the heavier ones. Once the combination of the two mechanisms of air flow and deck vibration has stratified the material, only then can the particles be separated properly. The area in which this stratification occurs is the stratifying area, and it should be kept as small as possible, and should never be larger than 1/3 of the deck surface. The size of the area it will take to make the stratification a success is dependent upon the product being separated and the difficulty in separating the heavier from lighter particles and how large a volume of the product is put on the deck at one time. The closer the heavier particles are in weight the lighter particles, the large the area will be.

Once the product has been properly stratified, the tilt of the deck comes into play. The vibration of the deck begins to push the heavier particles, which are in contact with the deck and each other, towards the high side of the deck. At the same time, the lighter particles, which are floating and do not contact the deck, are drawn downwards by gravity. As the product continues to move down the deck towards the discharge end, the vibration of the deck gradually converts the vertically stratified material into horizontally graded product. This process of first separating the particles into vertical stratification with air flow and deck vibration, then using the deck side tilt and end raise to complement the deck vibration to separate the particles into heavy, medium, and lightweight particles across the deck is shown in Figure 2.

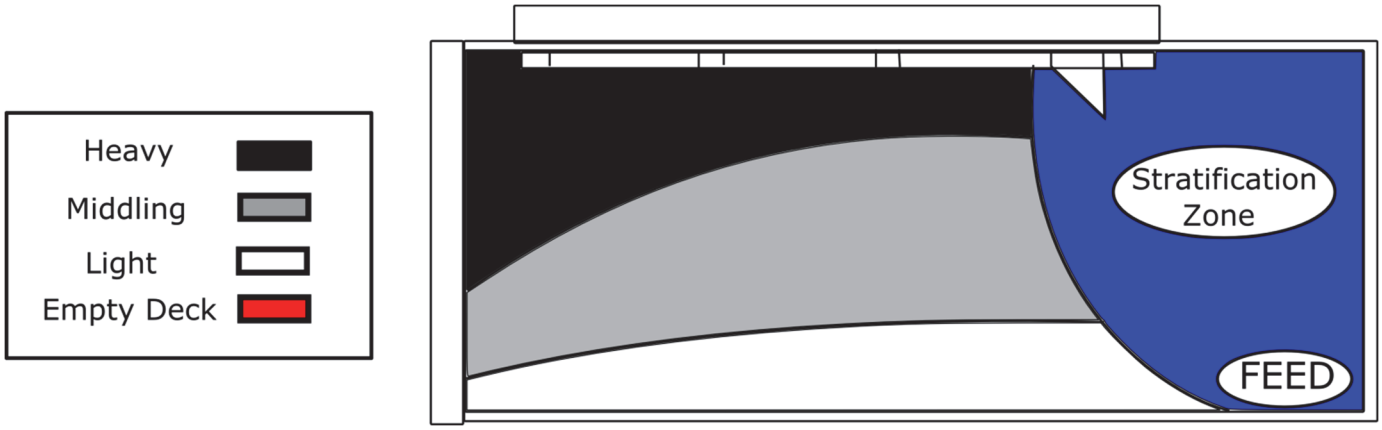


Figure 2: Stratification followed by separation of the vertical layers into horizontally separate grades as the particles travel down the deck.

Figure 2 shows a very ideal concept of what a separation will look like. Rarely is it that easy to separate the particles, and there will still be some vertical stratification even towards the end of the deck. Typically the area of stratification will not be clearly defined. It will have to be assumed to be within an area 5 to 15 square feet around the feeder.

As the particles travel down the deck, they are acted upon by three forces. The first two forces are due to gravity. Once is cause by the acceleration of gravity due to the mass of the particles, i.e the weight, and the other is due to the pull of gravity across the deck towards the downhill direction of the deck. The third force is a combination of the vibration and a resistance due to the friction of the deck opposing the sliding action of the particles in the downhill direction. These forces will interact in such a way that separation actually starts to occur before stratification is finished. This results in lighter particles being trapped and sent to the high side of the deck. This makes it important to stratify the product as quickly as possible. The best way to stratify the particles before they start to separate is by adding air flow, but not to the point of boiling and remixing the product.. The forces just mentioned are shown in Figure 3.

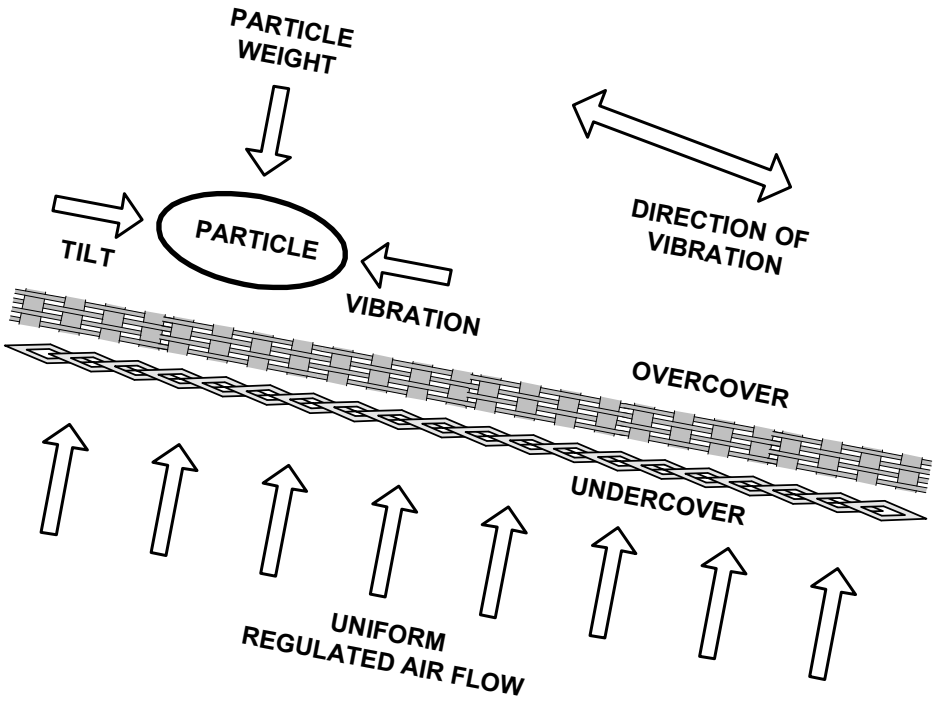


Figure 3: The Forces of Separation due to side tilt, air flow, and deck vibration.

In general the product will be separated into three categories; (1) a heavy or acceptable product, (2) a light or reject product, and (3) a small middling product. If there are other heavy trash objects or dirt, these will be separated into a fourth product.

II. What a Gravity Separator can and cannot separate

I Rule 1

Particles of the same size but differing specific gravities can be separated.

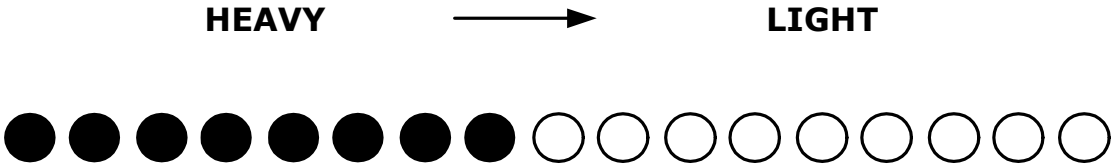


Figure 4: Particles of same size but different specific gravities

An example of this process would be the separation of similar size seeds where the lighter seeds have been hollowed out by lack of development or insects.

II. Rule 2

Particles of the same specific gravity but different sizes will be graded according to the size of the particles.

Figure 5: Particles of same specific gravity but smaller size from left to right

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

III. Rule 3

Particles differing in both specific gravities and size cannot be efficiently separated on a gravity separator.

Figure 6: Particles of differing size AND specific gravity from left to right.

An example of this would be the different size and densities of corn on every ear of corn. Some kernels are bigger and others smaller. Because of growing conditions, one bushel of corn may have a different seed weight than another bushel. Because of this, separation of kernels that have not been sized on a size right machine often gives unsatisfactory results.

III. How the Voyager Controls Separation

The main parts of the Voyager gravity table are the deck, the feeder, and the fans. Each one provides several degrees of freedom to the separation process.

I. *The Deck*

The Deck on the Voyager gives the most degrees of freedom to the separation process. Each controllable feature of the deck gives a different degree of control to the process.

The Side tilt, or the Slope of the deck between the high side and the low side, allows the product to be separated by the vibration because gravity will pull down the lighter particles while the heavier particles are forced to the high side of the deck by the vibration of the deck and the friction that resists the falling motion of gravity. If there is not enough side tilt, the product will all gather at the high side because there is no gravity to pull down the lighter particles to the low side of the deck. If there is too much side tilt, the product will not reach the high side and will all slide towards the low side. In both of the case of the tilt being too extreme, proper stratification never really happens. If the side tilt is correct, there will be a good separation as the product will stratify and then separate out properly.

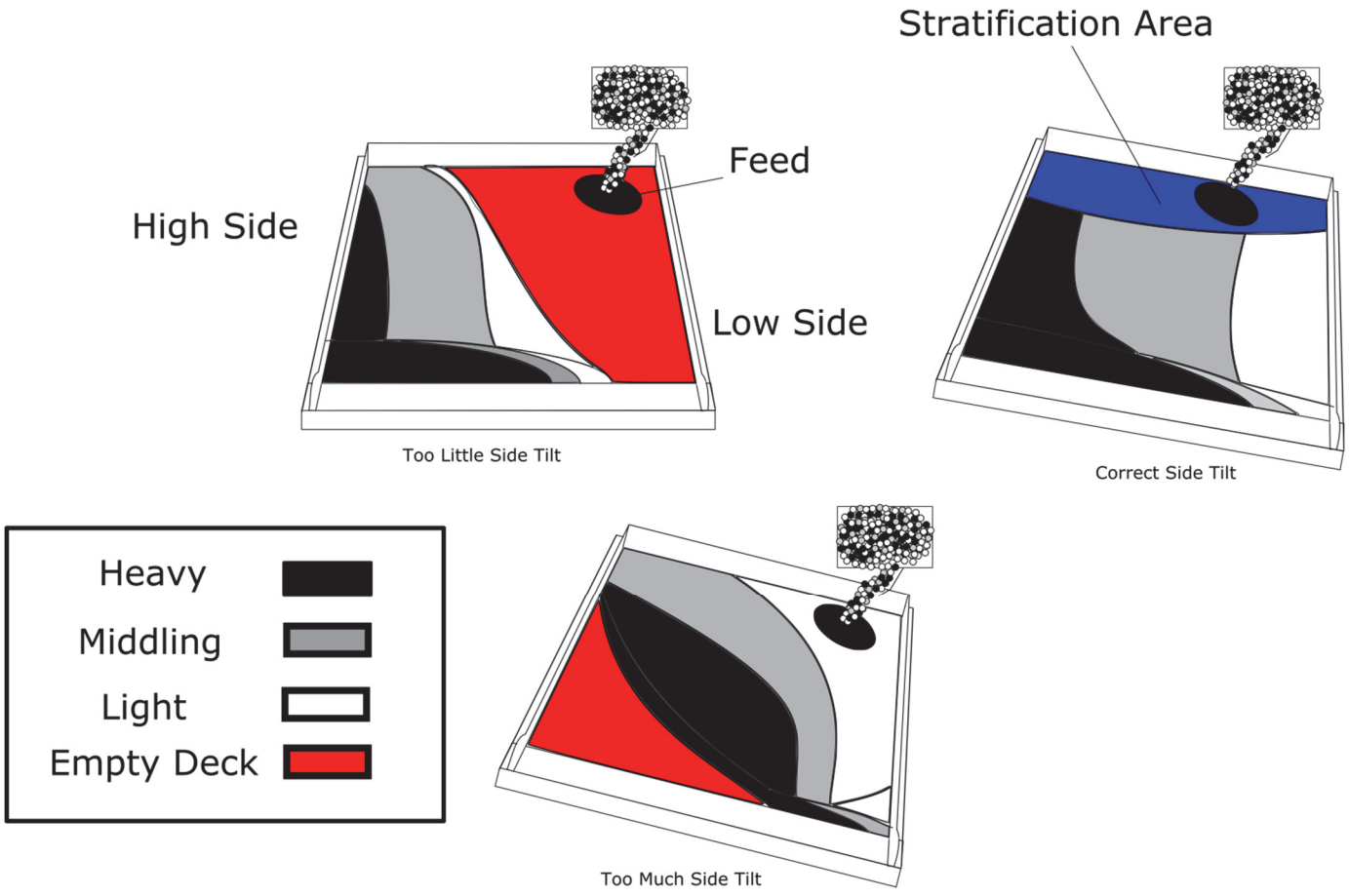


Figure 7: Different Side Tilt Positions and their effect of stratification and separation

The End Raise, or the slope from the feed end to the discharge end, controls how fast the product moves down the deck. As will be seen, this is directly related to the feed rate. If there is not enough end raise, i.e the slope is too small, the product coming in on the feed end will bunch up and stratification will not occur well. If there is the proper amount of end raise, there will be a level amount of product across the deck, and stratification will occur and then separation. If there is too much end raise the feed rate will not keep up with how fast the product is moving down the deck, and there will be no stratification or proper separation. This is illustrated in Figure 8.

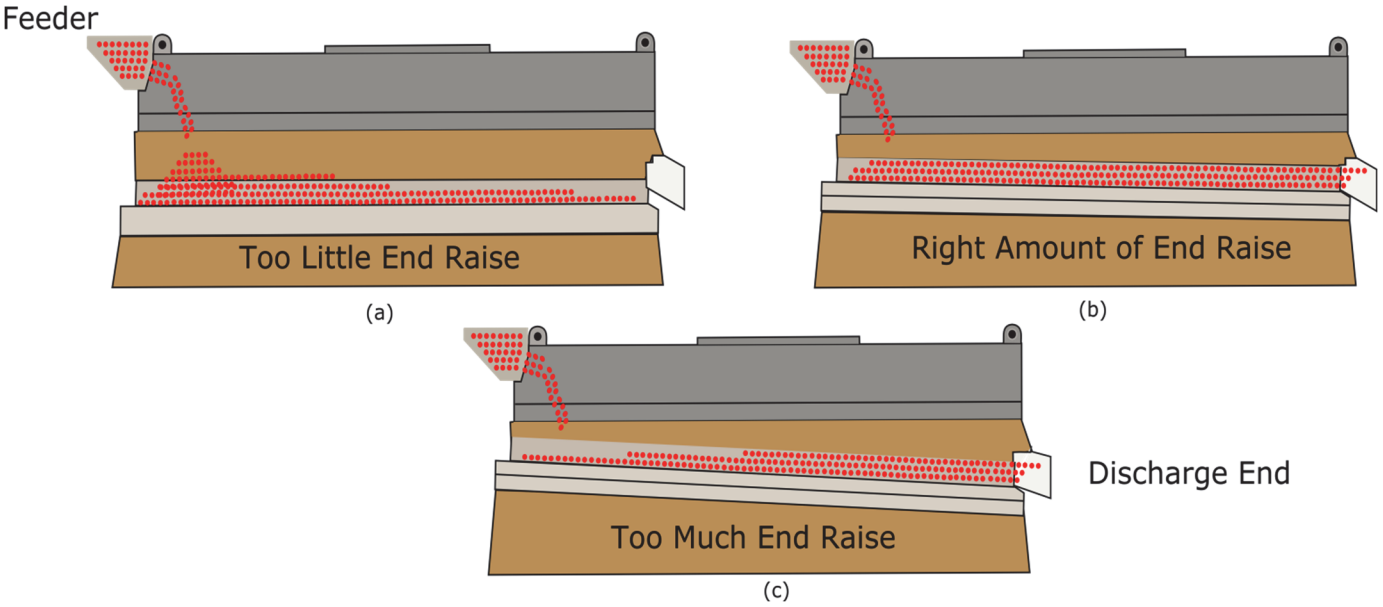


Figure 8: End Raise (a) too little end raise to keep up with feed rate (b) right amount of end raise to balance the feed rate (c) too much end raise for the feed rate to keep up with

Deck vibration/speed is tied directly to the side tilt. Like the side tilt, having extreme setting will cause the same separation issues that Side Tilt causes, but in the opposite sense. Whereas too much side tilt will allow gravity to pull the particles down to the low side of the deck, too much deck speed will send them too far to the high side. Likewise, while too little side tilt will cause the particles to bunch up at the high side and not separate correctly, too little deck speed will cause them to bunch up towards the low side. This is shown in Figure 9. The assumption in the figure is that the deck side tilt is kept constant while the deck speed is varied. The two of the them are coupled, and in reality there will not be separated effects as shown in Figure 6 and Figure 8.

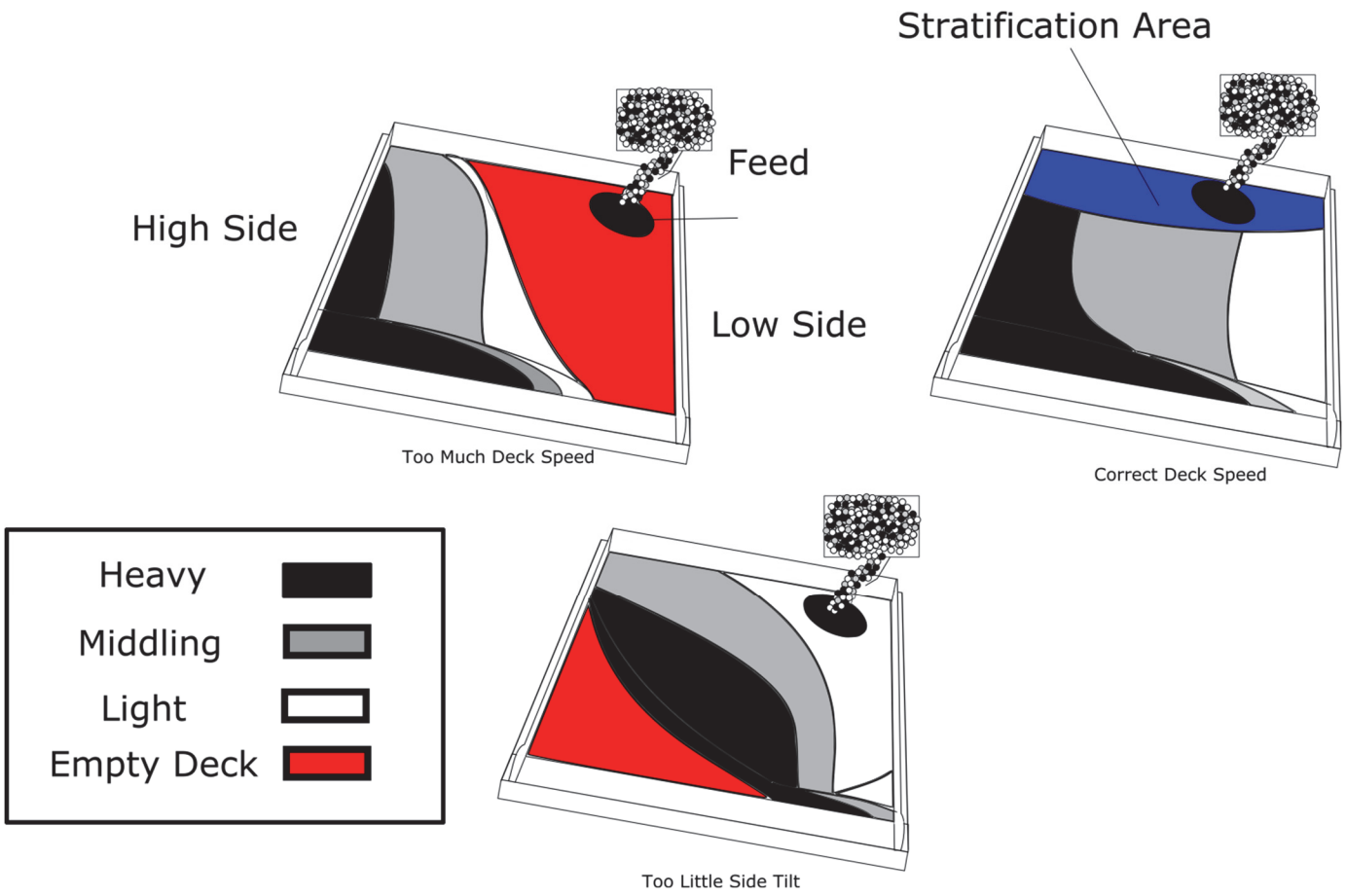


Figure 9: Effect of various Deck Speeds on separation with a constant Side Tilt

The side tilt and end raise are controlled through hydraulic cylinders and valves. The Deck vibration is controlled by the eccentric motor which is driven by a Variable Frequency Drive.

II. *The Feeder*

The Feeder controls the flow rate of seed onto the deck. It is critical that the feeder provides a continuous and not an alternating flow. Surges in the flow rate will cause non-optimal separation. The minimum feed rate is the rate that will keep the deck completely covered while also being as low as possible. This will provide the optimal separation. The feeder is controlled by either air aspiration, a vibratory type control, or by linear actuators.

III. *The Fans*

The fans push the air through the particles, putting them into a pseudo-fluidic state. Too much air and the particles remix. Too little air and the product is sluggish, piling up the particles at the high side of the deck. The Fans are all controlled independently by their own Variable Frequency Drives.

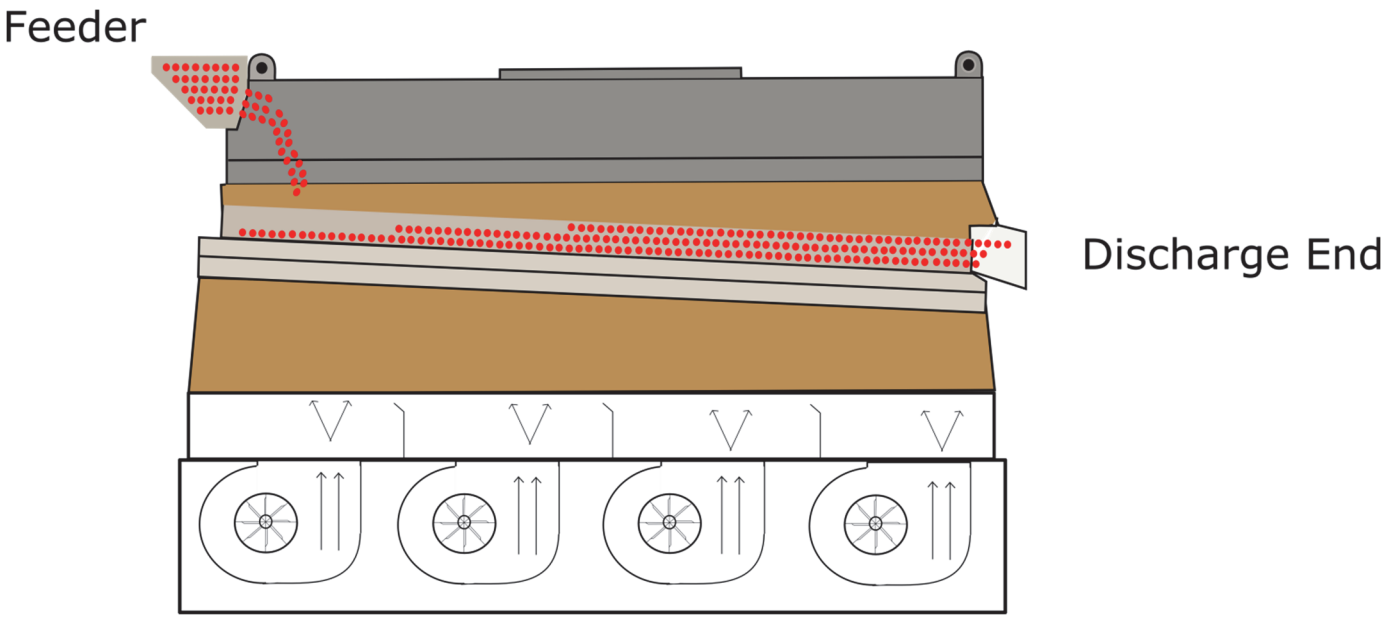
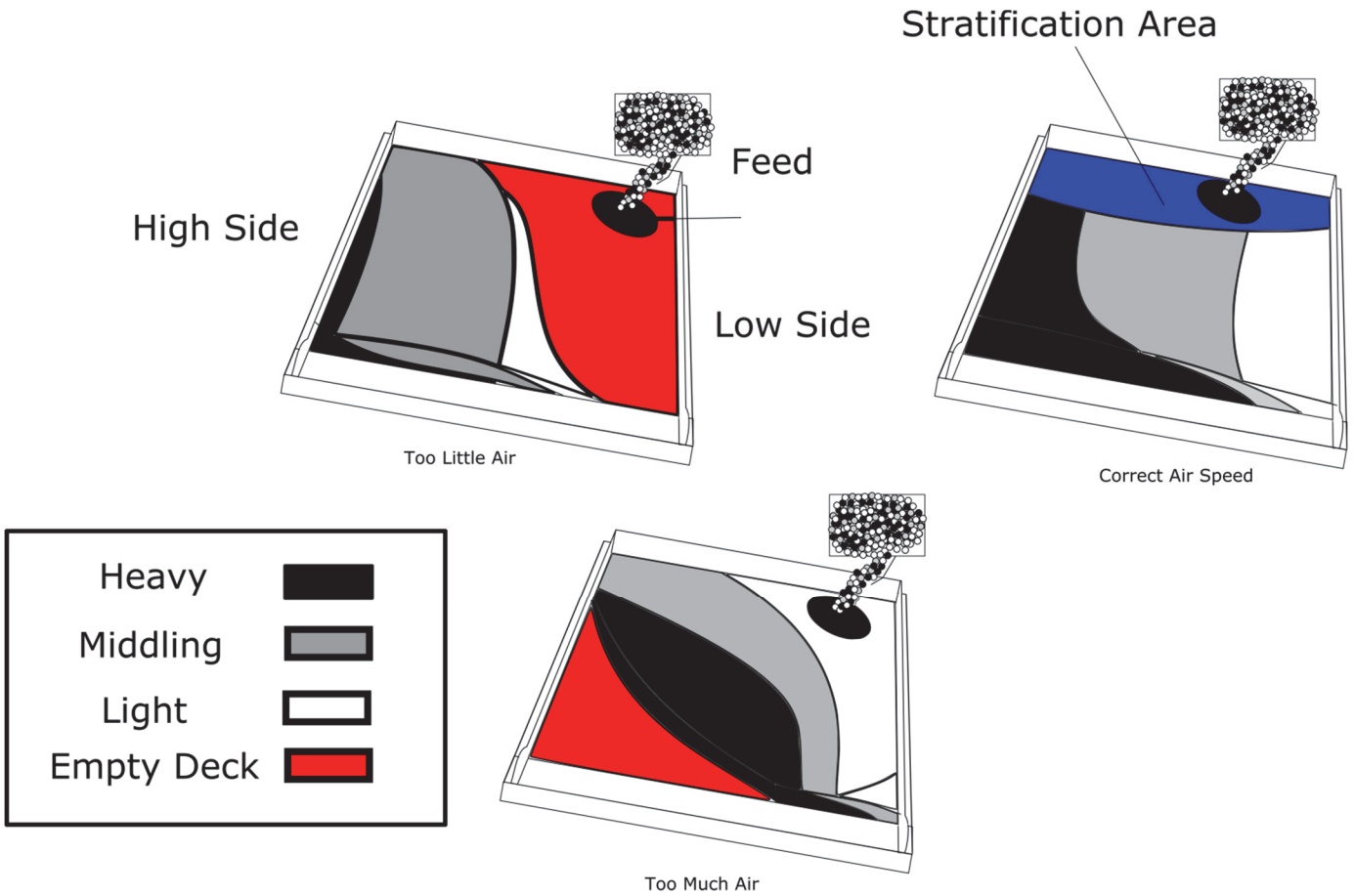


Figure 10: Air flow example Voyager 1050



-Figure 11: Effects of Air Speed on Separation

IV. Increasing Capacity with the High Gates

The high gates, also referred to as cutout gates, can also be used to increase capacity. This is done by opening the cutouts slowly and allowing heavy particles of the product to go into the blender. This will allow more capacity to be put onto the deck through the feed rate. Always open the cutout gates after a good separation has been achieved with all the other control variables on the machine. Then slowly open the cutout gates, starting with the one closest to the discharge end of the deck. You will notice, as you open the gates, that there will be a change in the air flow balance on the deck. You will have to change the airflow on the deck to balance the separation.

It is possible to open the cutout gates too far. If the gates are open too far, then the heavy particles will all leave the deck early, and the middle weight particles will tend to go to the part of the deck where the heavy particles once were, and can even go far enough over to be taken out by the cutout gate at the discharge end.

The cutout gates are designed to add a little bit of capacity to the deck. They may not be able to be opened all the way and still maintain a good separation of the product. Maximizing capacity on the deck may not be the best practice for the product you are separating. Always use the quality of separation as a gauge for hoe much capacity should be on the deck.

The cutouts are also able to be used to shift the product separation back and forth over the deck. As the heavy particles are removed from the deck, the middle and lighter particles thin out, and separation becomes easier for more difficult products. Again, as mentioned above, opening the gates too far will take product off the deck too fast, and the separation will not occur at the discharge end of the deck as it should. If not open far enough, and the capacity is increased, the heavy particles will spill over too far into the middling and light particles.

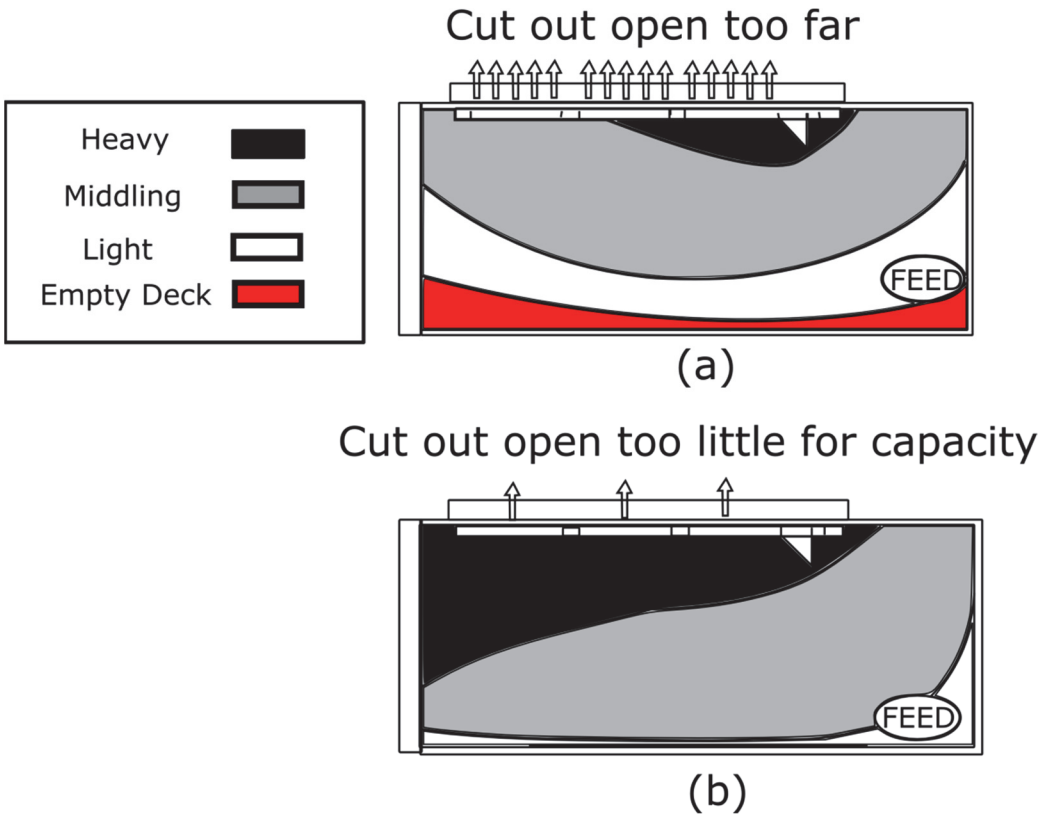


Figure 12: Cutout vs Capacity (a) cutout open too wide for capacity (b) cutout not open far enough for capacity

V. Removing Heavy foreign Materials

The **Rock Trap** is located on the high side of the deck between the feeder and the first cutout gate. The primary purpose of the rock trap is for removal of a small percentage of heavy contaminant. Initially the rock trap was designed to remove dirt and stones from edible dry beans, hence the name rock trap. However, the rock trap has proven to be effective in many products and is included as standard on all decks. Almost any heavy contaminant may be removed at the rock trap. The greater the density differences between the heavy contaminant and the good product the easier the separation.

For best results, the rock trap should be operated to maintain a continuous discharge. If the concentration of heavy foreign product is low then adjust the rock trap gate at the minimum discharge rate you can maintain without bridging and stopping the discharge completely. If the percentage of heavy foreign product is high then adjust the rock trap gate for greater discharge.

VI. Product Separation

At the discharge end of the deck are two **Cutting Fingers**. The purpose of the cutting fingers is to divide the product into the respective fractions. You make the decision where to divide your product since you know what you are trying to produce. The cutting fingers are pre-set to produce a heavy fraction, a middle fraction and a light fraction however the cutting fingers can be easily changed to handle any number of product fractions.

In a typical operation the heavy fraction is the good product. The light fraction is a reject product and the middle fraction is a middle quality product. However, in a many operations the middle or the light fraction is the desired product. Regardless of which fraction you wish to save you make the decision what to save and what to reject. Adjust the cutting fingers to produce a quality product that meets your standards. Check the results on a periodic basis to insure that you are producing the desired quality product.

III. Control Components of the gravity

The Voyager and Maxi Cap Platinum gravities are automated machine, which means that instead of having dials or mechanical devices to control the air flow, deck speed, and other components that have to be individually controlled in a mechanical way the entire process is done via a Human Machine Interface (HMI) and a Programmable Logic Controller (PLC). Oliver has teamed up with Rockwell Automation and Allen Bradley to provide the user with the best interface possible. The HMI is a small touchscreen that allows the user to input desired settings, which are then transferred to the PLC, which then uses its internal programming to run the machine. The PLC is like a small computer. It has a processor, memory, inputs, outputs, and a small display for additional controls. It is the brains of the automated machine. One additional component to the automated process is the Powerflex 525 Variable Frequency Drive (VFD). It is what the PLC uses to give exact control over all of the fans and the eccentric motor. It is critical to know and understand the difference between the three when going through the guide.

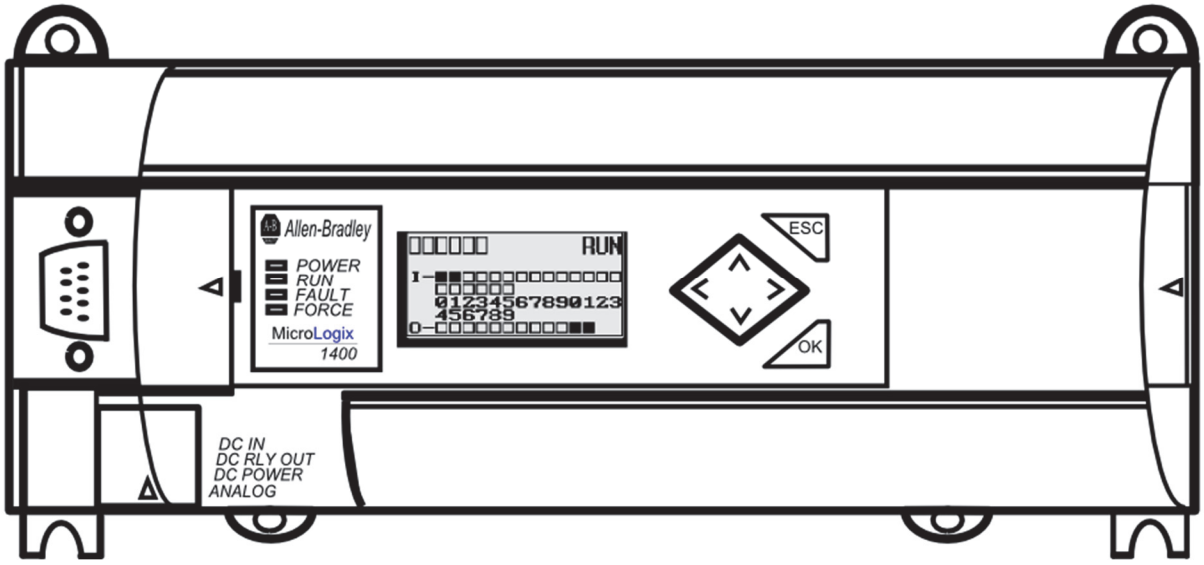


Figure 13: The Programmable Logic Controller – Micrologix 1400

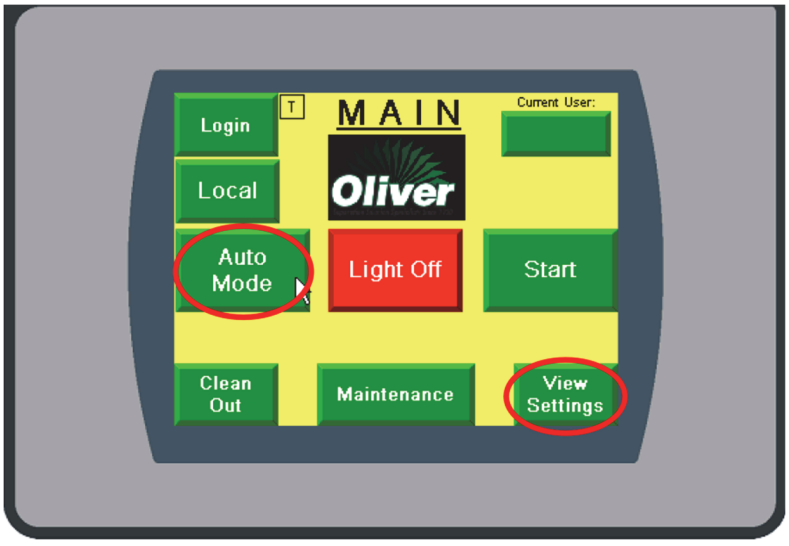


Figure 14: The Human Machine Interface PV 800

Figure 15: PowerFlex 525 Variable Frequency Drive

Important Safety Precautions for Using the Voyager GVX and Maxi-Cap Platinum Gravity Separators

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

II. Setting up the Machine from the HMI

The HMI program is designed to change the functionality of the screens to match the type of machine being used. For example, if there are only four fans on the machine, the user will not see five possible fans on the user screens. And any other functionality not specific to your machine will be hidden. Normally the HMI will be set for the correct machine at the factory, but it is possible that a user might need to use some of the screens described in this section if the machine is reprogrammed from a memory module.

I. Choosing the Machine Model and Options

The HMI program is the same for all of the Gravity Separators, including the Maxi-Cap, Voyager, and Maxi-Cap Platinum Retrofit Machines. Which machine model is selected is controlled from the Machine Options Screen. In order to access this screen, start at the Main Screen and press the Login button, as shown in Figure 16.

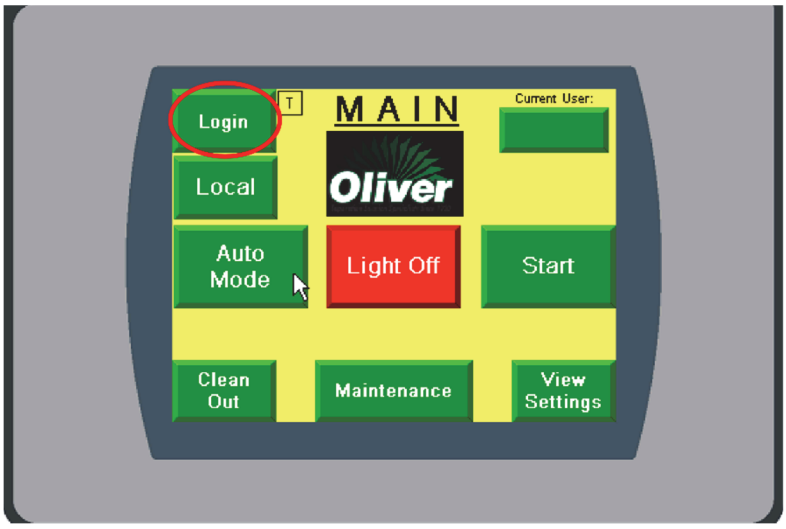


Figure 16: Main Screen to Login

This will bring the user to the Login Screen. Here the user will have to log in as the Oliver user, which has the username and password of oliver. This is shown in Figure 17.

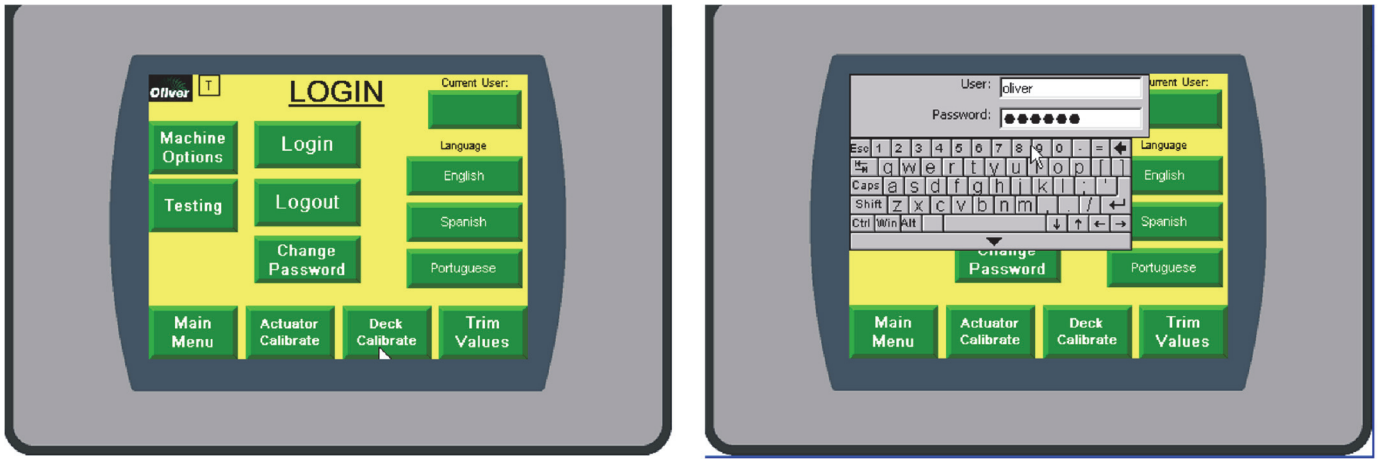


Figure 17: Login and Keyboard

Once the oliver user name and password have been entered, the username will appear in the upper right corner of the Login screen as OLIVER. Press the Machine Options button to go to the Machine Options screen once this has been done. This is shown in Figure 18.

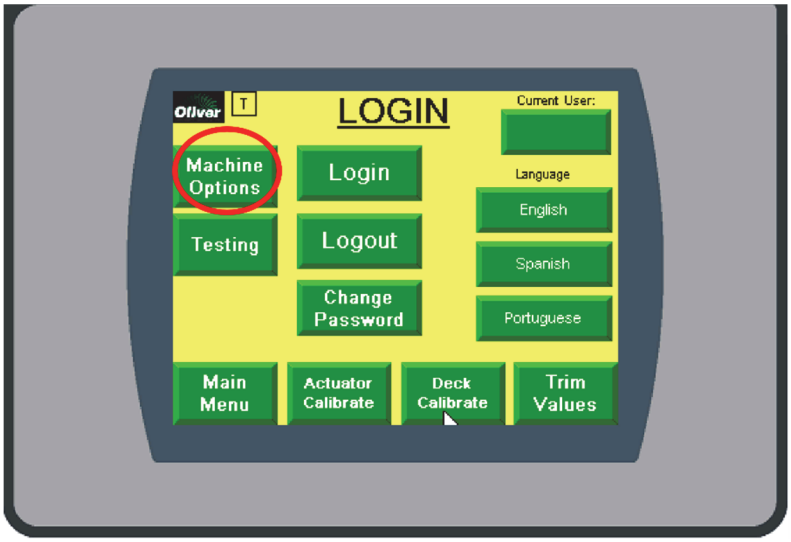
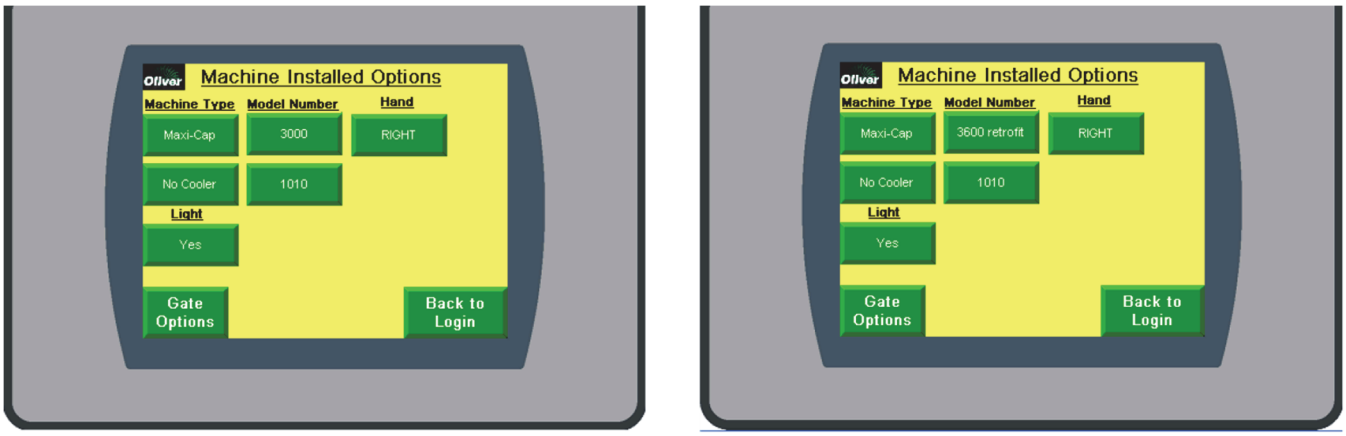


Figure 18: Oliver User proceeding to Machine Options



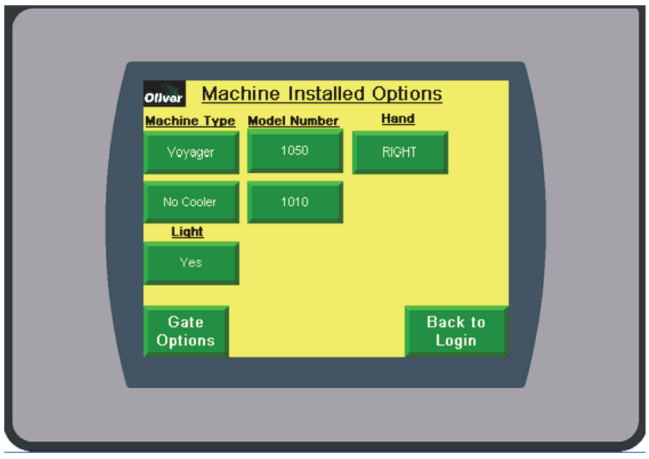


Figure 19: Voyager and Maxi-Cap Machine Option Choices

On the Machine Options screen, the Machine Type needs to be set to either a Voyager or a Maxi-Cap, depending on the gravity separator you have. . Note: On later editions of the code, the voyager and maxi-cap options will available. There will be no Dryer or Cooler options. The next step is to select the model number of the Gravity Separator.

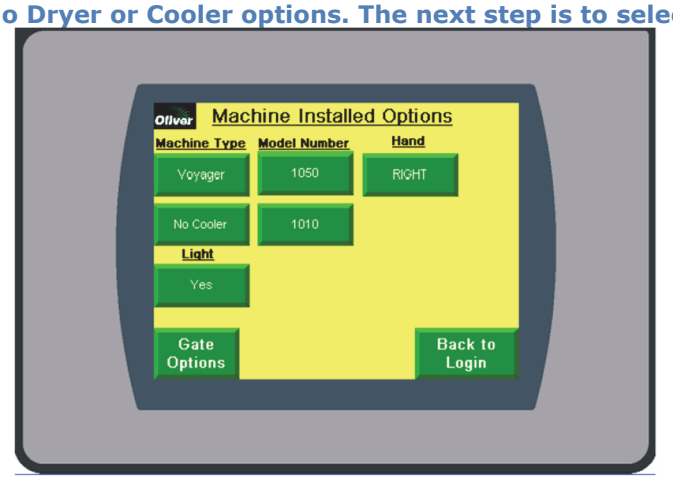


Figure 19 shows three examples of the model type and number selection; Maxi-Cap Platinum 3000, Maxi-Cap Platinum 3600 retrofit, and Voyager GVX 1050.

Once the model type and number have been selected, the other possible options to select are whether there is a light installed on the dust hood, if the machine is right or left handed, and if there are any automated gates. For the light and the hand of the machine, select the proper setting by pushing the associated button until the correct setting is selected for each option. For gate options, press the Gate Options button in the lower left corner of the screen. This will bring you to the Gate Options screen shown in Figure 20.

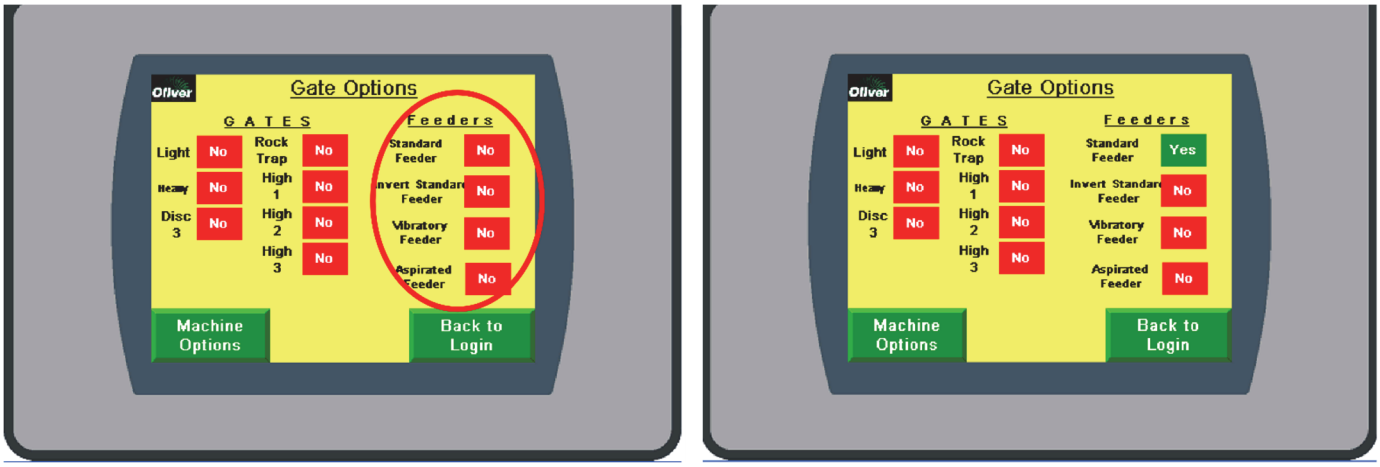


Figure 20: Selecting Gate Options

Select which Gate Options and Feeders that are available to your machine. As an example, consider the feeders on the right hand side of the left hand screen which are circled in Figure 20. If your machine come with a standard feeder, then press the red "no" button until it turns to a green "yes" button as shown on the right hand side of the right hand screen in Figure 20.

II. Calibrating the Machine

The Voyager and Maxi-Cap gravities have several options that may need to be calibrated. These include the deck side tilt, the end raise, and the various automated gates the machine may come with.

I. The side tilt and end raise calibration

The PLC on the Machine needs to know what voltages sent back from the sensors on the hydraulic cylinders corresponds to the positions on the 0 to 100% scale used to tell the deck what position to be in for side tilt and end raise of the deck. This is accomplished by going to the deck calibrate screen. To reach this screen, start by going to the Login screen and logging in if necessary. The process is described in the previous section I. Choosing the Machine Model and Options. Consult that section if in doubt regarding how to log in. From the Login Screen, press the Deck Calibrate button found in the bottom center of the screen. This is shown in Figure 21.

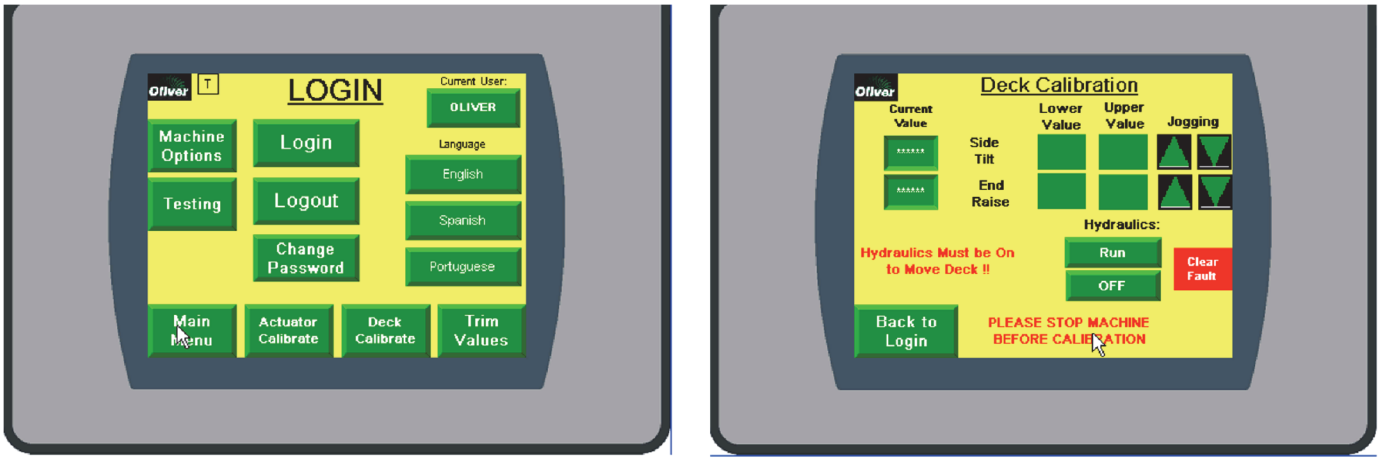


Figure 21: Oliver User going from Login to Deck Calibration Screen

The first two things to notice from Figure 21 is that the deck should only be calibrated while the machine is turned off, whether in manual mode or automatic mode and the Hydraulics must be turned on. In order to turn the Hydraulics on, press the top Green Button marked Run in the Hydraulics section. Both of the buttons will turn blue, and will go from saying Run and Off, to On and Stop. In this way the start and stop buttons, which are the top button and the bottom button, indicate the status of the machine and the action that will be taken if the button is pressed. In Figure 21, the start button will turn the machine on, and the machine is indicated as being currently off. If the start button were pressed to turn on the hydraulics, the buttons will change to what is shown in Figure 22. The start button now indicates the machine is on, and the stop button will stop the machine if pressed.

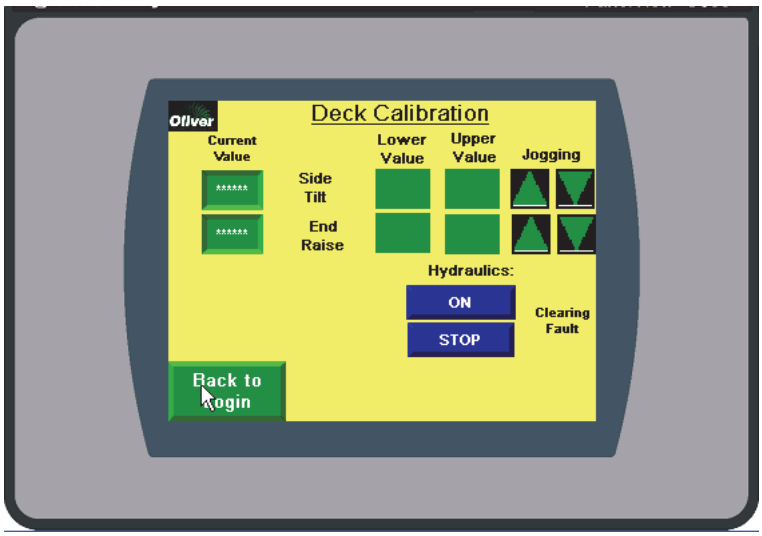


Figure 22: Deck Calibration with Hydraulics on

To calibrate the deck end raise, press the two arrow buttons on the far right. The up arrow is the one that extends the hydraulic cylinder for the end raise, and the down arrow is the one that retracts the hydraulic cylinder that the sensor is attached to. Note that the cylinder extending or retracting does not necessarily indicate the direction the deck is moving on some machines such as the Maxi-Cap platinum gravities. In other words the cylinder extending does not necessarily mean the deck is going up. Simply extend and retract the hydraulic cylinder through its entire range of motion and record the highest value and lowest value in the corresponding boxes by pressing them and entering the value. Make sure to increase the lower value by .050 and decrease the upper value by 0.050 in order to give the control system a correct window of valid positions without overshooting.

The side tilt is calibrated in the same manner.

II. Calibrating actuator components

On the Voyager and Maxi-cap machines there are several automated features controlled using Linak 35 actuators. These actuators have sensors on them that feedback the position, and just like the hydraulic sensors, calibration must be done to match the voltage up with the 0 to 100% scale. On a standard Maxi-Cap and the Voyager GVX, the actuators include any gates and the feeder. On a Maxi-Cap Retrofit, the automated gates also include the air gates in the air chest. These are automatically installed in the program when you select a type of retrofit machine.

To calibrate the actuated components, go from the Login Screen to the Actuator Calibrate Screen by pressing the button at the bottom of the screen marked Actuator Calibrate. If you aren't logged in you will have to log in. See Figure 23.

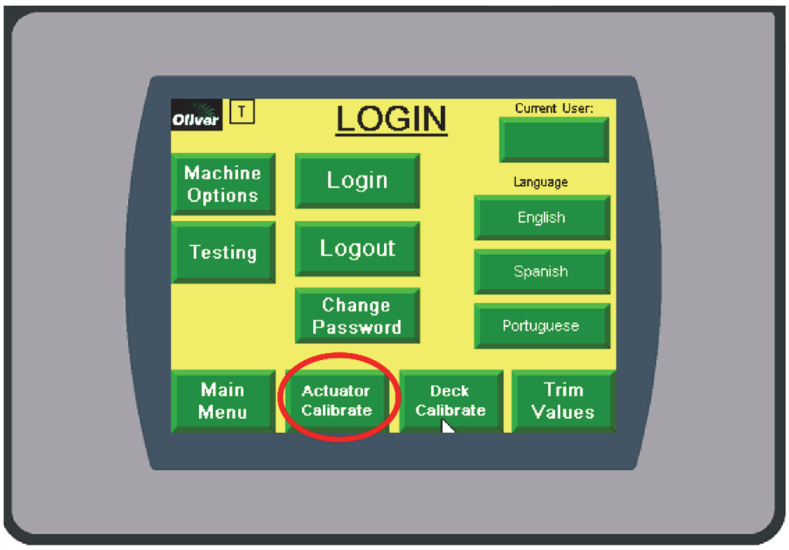


Figure 23: Login to Actuator Calibrate

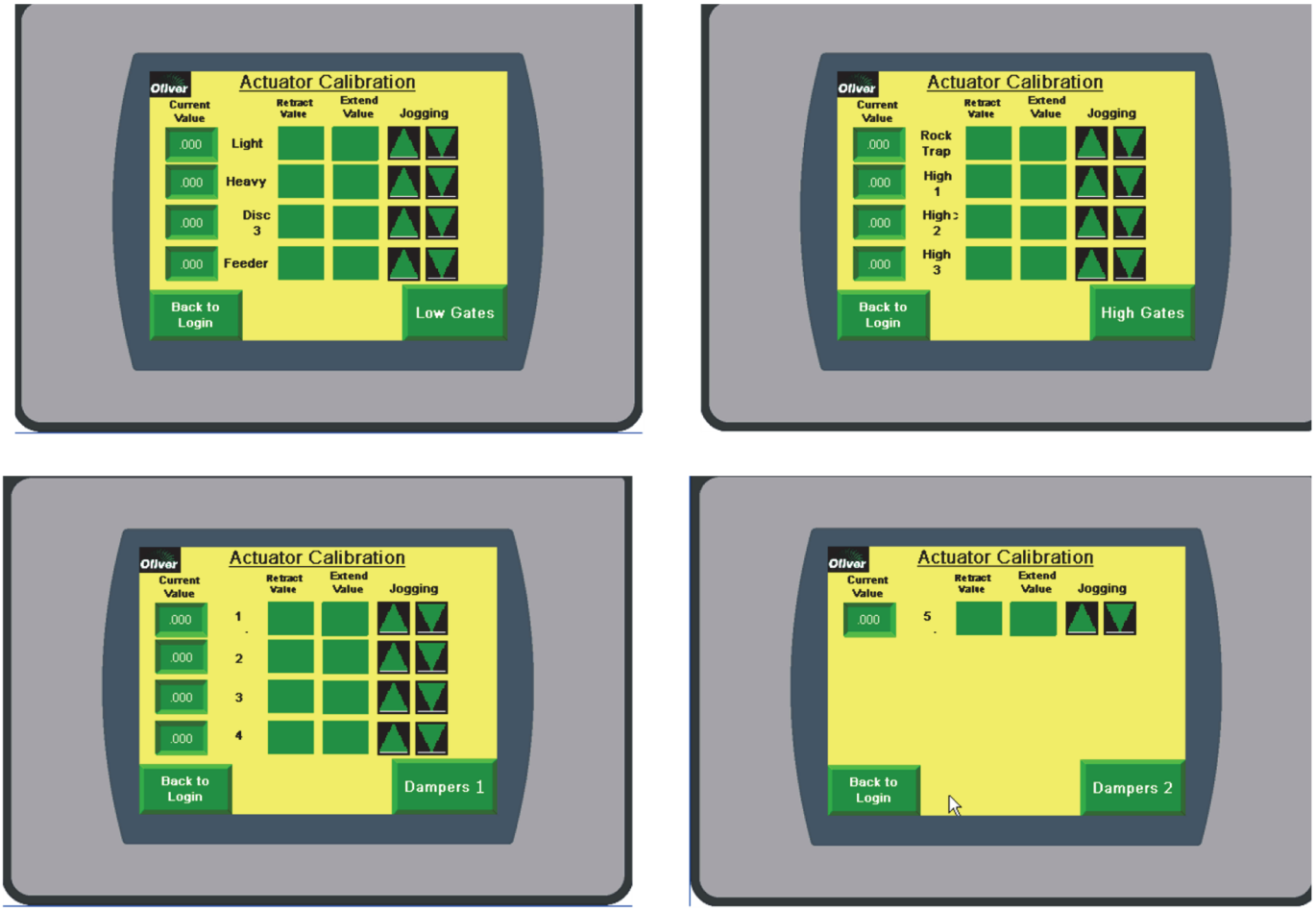


Figure 24: Actuator Calibration Screens

When you come to the actuator screen, there are 4 possible sets of actuators you might have. On a Maxi-Cap or Voyager, there are 4 low gates, which are the discharge gates and the feeders, and then there are four high gates including the rock trap and other gates along the deck. On some models none of these have been automated yet. If you have a Maxi-Cap platinum retrofit machine, there will be several dampers available as well. Which actuators you are calibrating is controlled by the button in the lower right that says either low gates, high gates, dampers 1, or dampers 2. Different gates will be visible depending on what that button says. Pushing it will control which setting it is on and which actuators are visible. Consider Figure 24.

All of the actuators are controlled exactly like the deck positions were. Press the up arrow to extend the actuator, and the down arrow to retract it. Record the highest voltage value in the right box, and the lowest value in the left box.

III. Setting the Trim Options

The Trim Values Screen is a sort of safety net for supervisors who have operators who are training and might not be fully aware of how far they should set the settings from the recipe in Automatic Mode. Maybe the operator isn't fully aware of how the settings affect the machine and its performance. The supervisor can use this screen to prevent the operators from altering the settings drastically from the loaded recipe. To get to the Trim options, go to the Login Screen and Login. This process is described in I. Choosing the Machine Model and Options. You will have to log in as the Oliver user. Once you have logged in, proceed to the Trim Values Screen by pressing the Trim Values button on the bottom right hand corner of the Login Screen, as shown in Figure 25.

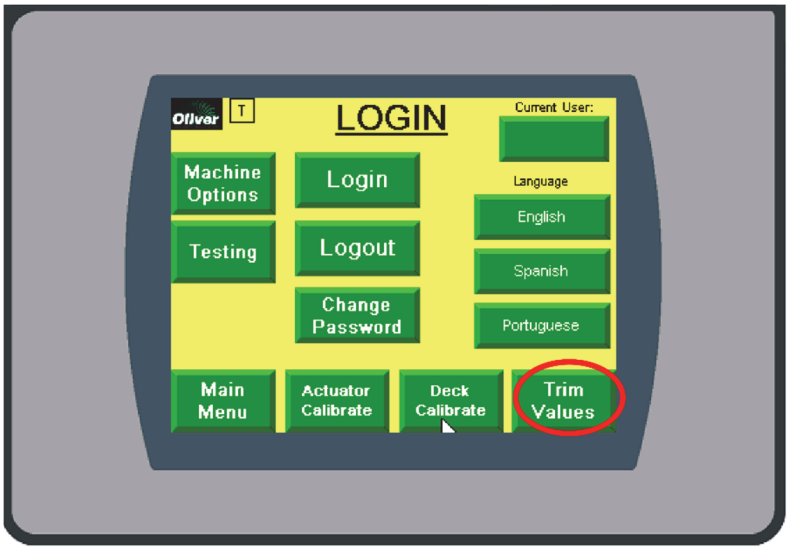


Figure 25: Oliver User Going From Login To Trim Values

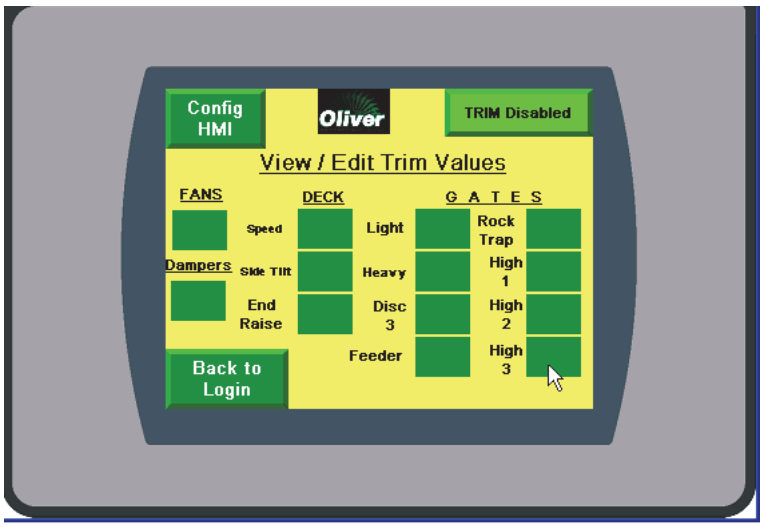


Figure 26: Trim Values Screen

Figure 26 Shows the Trim Values Screen. For each of parts of the Gravity Separator that are controlled from the HMI by entering a value on the View Settings screen, there is a Trim value. The Trim value is a bound on how far the currently loaded recipe can be altered by the user. For example, if a recipe for corn is loaded, and the recipe value for Fan 1 for corn is 55% of maximum, and you set a trim value of 5%, then the user can only alter the value on the View Setting screen by +/- 5%. In

other words Fan 1 can only be set from 50% to 60% while the corn recipe is loaded. The same thing holds true for the deck speed and end raise, except that deck speed will be in rpms, not in a percent value. For each recipe loaded the trim value dictates how far up or down each machine setting can be set once the recipe is loaded.

For a standard Maxi-Cap Platinum and a Voyager there will not be a damper value, and for a Maxi-Cap retrofit there will not be a fan value.

IV. Language Selection

The last selection that can be made for the machine is what language the HMI will display in. The HMI comes standard with English, Portuguese, and Spanish as the default available languages. This is because these are the most common languages used by our customers. If you wish to have a custom language added to the HMI, you can request one be added. To change the language, go to the Login Screen and push the button of the language you wish to use. Note that it will take a minute or so for the HMI to switch languages.

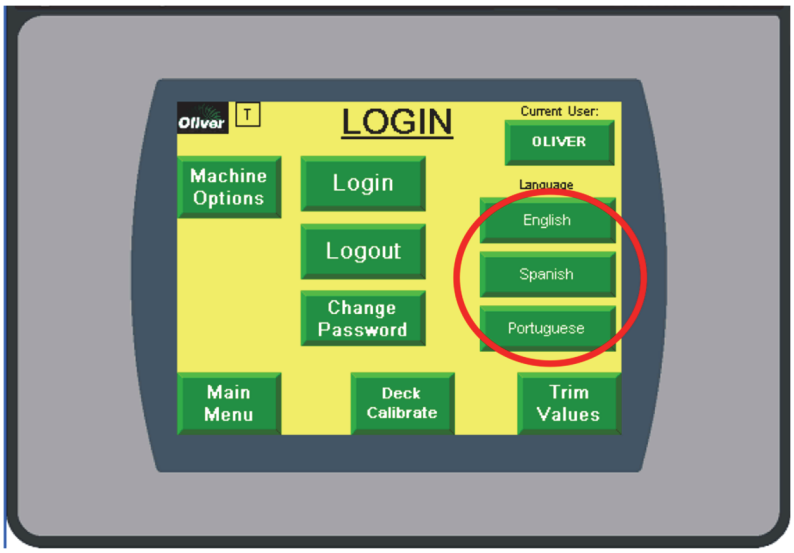


Figure 27: Selecting Languages for HMI

III. Modes of Operation

The Gravity Separator has three basic modes of operation: Automatic, Manual, and Remote. In Automatic mode, the machine is operated as a whole from a recipe or set of parameters. The Machine is started as a whole, and runs as a unit. In Automatic mode the machine can fault, meaning that it failed to operate as expected and the machine generally will stop running under these conditions. The entire unit will shut down. There are some exceptions to this, but in general the machine will not continue to function when faulted. In Manual mode, each section of the machine, for example the hydraulics or the fans, turn on separately. This mode is generally used for troubleshooting the machine, or in testing, when different parts of the machine need to be run separately. For the customer it is mainly a diagnostic tool. Remote mode is very much like Automatic mode, except that the machine can be started remotely and some monitoring can be done. This section will explore the main functionality of the Dryer in each mode.

I. Automatic Mode

A mentioned above, in Automatic Mode the Gravity Separator is run as a whole. This is typically done from the Machine Settings screen. To get to the Machine Settings Screen, start at the Main Screen, press the button for Automatic/Manual mode until it says Automatic, and push the View Settings button, as shown in Figure 28. This Machine Settings screen is shown in Figure 29.

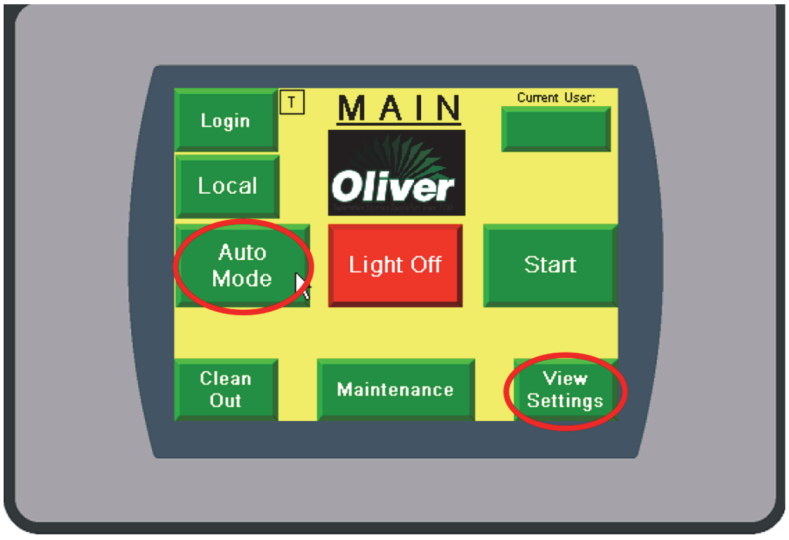


Figure 28: Automatic Mode Main Screen

I. Machine Settings

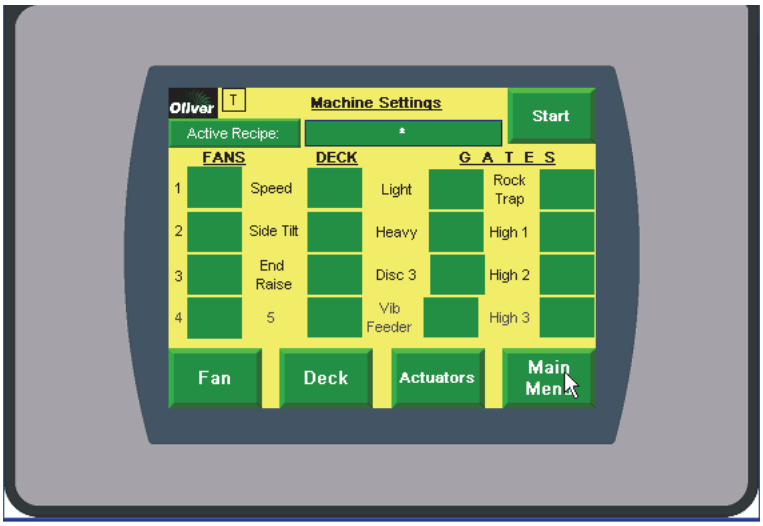


Figure 29: Controlling Auto Mode from Machine Settings

The Machine Settings screen allows for all the parameters of the gravity to be changed in one place. If desired, the settings can be saved in a recipe to be called up later. The following sections will describe all of the parts of the settings used in the Automatic mode. Note: Not all of the fans or gates shown here will be the same for every model of machine. Some have more fans than other. A retrofit machine will not have any fans shown here, and will have dampers instead. Most machines do not have automated Gates yet except for a feeder. The Vibratory Feeder will be replaced with whatever type of feeder your machine is said to have in the Machine Options screen.

I. Fan or Damper Control

Each of the fans or dampers can be controlled via the numeric entry box next to the number designation for that fan. The entry can be from 0 – 100. For example, to set fan 1 to 75% of its maximum speed, touch the box next to the label for fan 1. A keypad will appear, allowing you to change the value to anything between 0 and 100. See Figure 30. It is the same for the dampers on a retrofit.

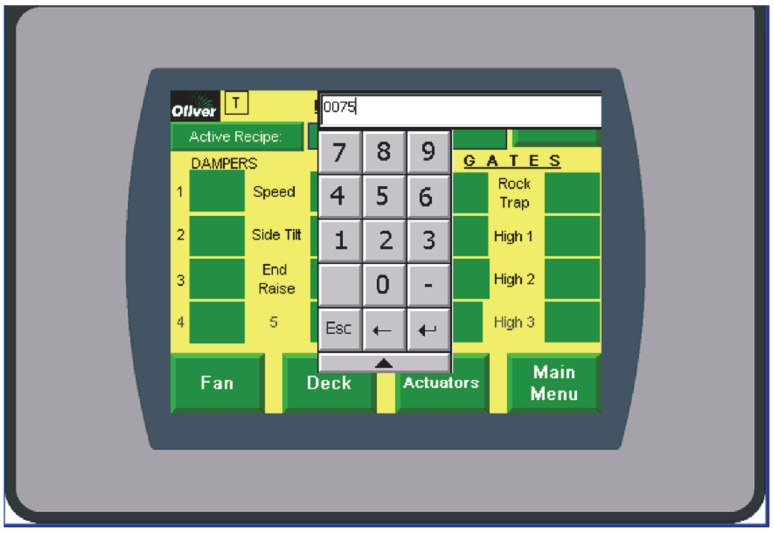


Figure 30: Changing fan 1 speed with keypad

II. End Raise Control

The deck end raise, which controls how far the deck can be sloped relative to being flat, can also be set from 0 to 100. At zero percent end raise, the deck will be flat. At >0% the deck will be negatively sloped from the feeder to the discharge.

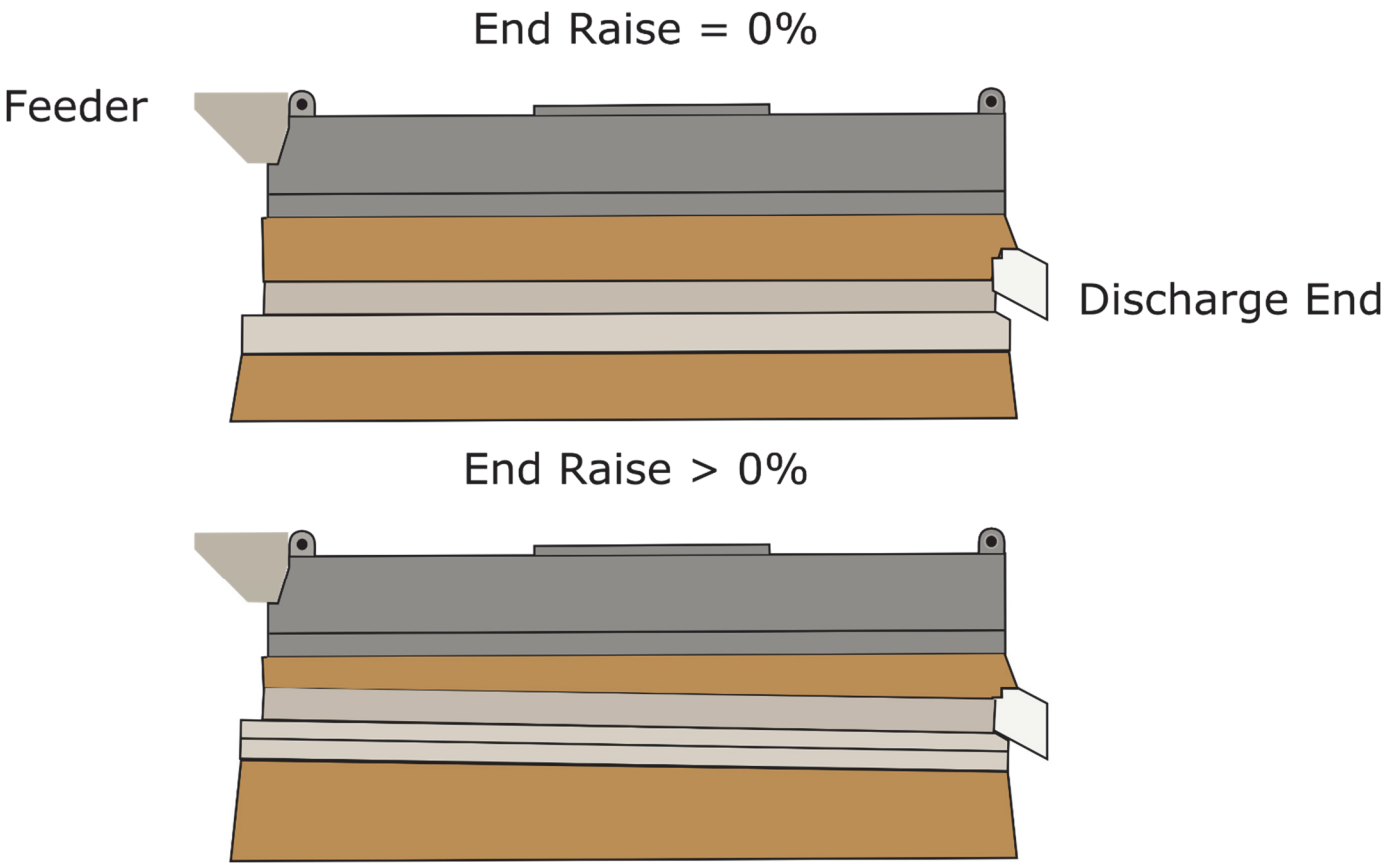


Figure 31: Deck End Raise Positions

III. Deck Speed Control

The Deck Speed parameter controls how fast the deck eccentric is shaking the deck. On a Gravity Table it can set from 450 to 600.

IV. Actuators

The actuators are like the fans in that they open all the way at 100% and close all the way at 0%. The feeder gate will close all the way when the machine is turned off.

V. Starting the Machine

Notice also that there is a button on the screen that says Start. This same button is also found on the Main screen and on the other two screens accessible from the Main Settings screen, the Deck and Fan Screens. When pressed, and the machine is not faulted, the button will turn from green to red, and instead of saying start, it will say Stop. When this happens the machine will start and automatically move to the correct position and ramp up to the correct fan speeds as given in the parameters. Hence the reason it is called Automatic mode. The whole machine responds to the settings on this screen almost very quickly.

VI. Faults

The one thing to watch out for when running the machine in automatic mode is faults. Faults occur when the machine doesn't reach the desired position of the deck in 60 seconds, when the VFD's that

drive the motors fail to respond to communication from the PLC in 60 seconds, and when a VFD reports that it has entered into various faulted states. So, how does the operator know the machine has faulted?

All of the faults but two on the gravity will stop the machine totally when in automatic mode. The two faults that won't shut the machine down are the faulting of the Deck End Raise and the Deck Side Tile. All of the faults except for the End Raise fault are faults that will impair the performance of the machine so that it will no longer be able to function properly, and cause damage to the seed almost instantly. If any of the fans fault, product could become stuck on the deck and overheat. If the Deck Speed for the eccentric drive faults, the deck may not move or move too slowly, leading to product stuck on the deck due to the quasi-fluidic state of the particles never being reached. When the End Raise faults, there is still a chance that it can be compensated for by changing the Fan Speed or the Deck Speed. That is why the machine will not shut off if the deck doesn't get where it is supposed to go. However, the HMI will still indicate there has been a fault.

If the Deck End Raise, or any other part of the machine, faults, then the corresponding number or description for the part of the machine that faulted will turn red on the Machine Settings screen. For example suppose the Deck End Raise faults, the Machine Settings screen will look like Figure 32.

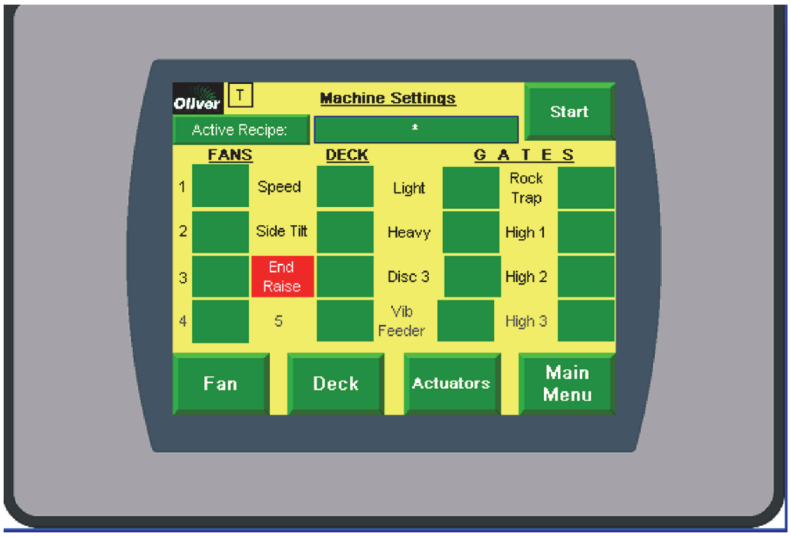


Figure 32: Deck End Raise Faulted Indicator

This will be similar for any other fault. Consider Figure 33. Here the whole machine, which includes the Deck Speed, the Deck End Raise, the Fans, and the gates, is faulted.

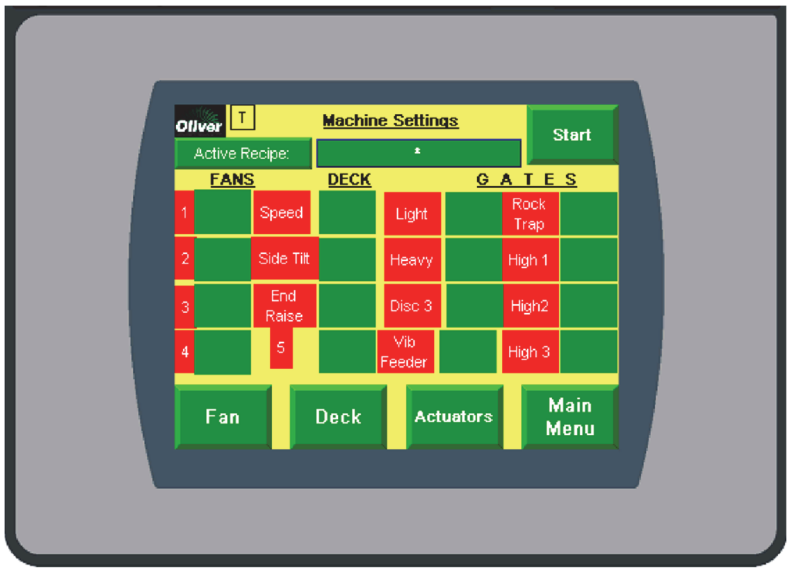


Figure 33: Entire Machine Faulted with Indicators

When the entire machine is faulted and has turned itself off, the machine will normally take the user to the Maintenance Screen. The Maintenance screen will also give the user an indication what has caused the gravity to fault and to shut off. If the PLC doesn't automatically cause the HMI take you to the Maintenance Screen, which can sometimes happen if the gravity has faulted multiple times, or you have accidently navigated away, then you will need to go there yourself. Please refer to the Section on using the Manual Mode for the gravity on instructions for navigating to the Maintenance Screen and diagnosing problems with the machine.

VII. Faulting on Power Cycling the Machine

If the gravity has had to be power cycled, or there has been a power outage, when the machine has powered back up, it will show that all of the functions of the machine controlled by a VFD are faulted. This is due to the fact that the PLC has temporarily lost communication with the VFDs as the power was lost, and due to the fact that the VFDs will themselves fault and report a power loss. In this situation, follow the directions given in the section on operating the machine in Manual Mode and navigating to the Maintenance Screen to clear the faults.

VIII. Deprecated Screens – The Deck, Fan, and Actuator screens

There are three other screens that can be reached from the Machine Settings screen. They are the Deck Screen, Fans Screen, and Actuator Screen. These are reached by pressing the Deck button or the Fan button from the Machine Settings Screen. These screens are shown in Figure 34.

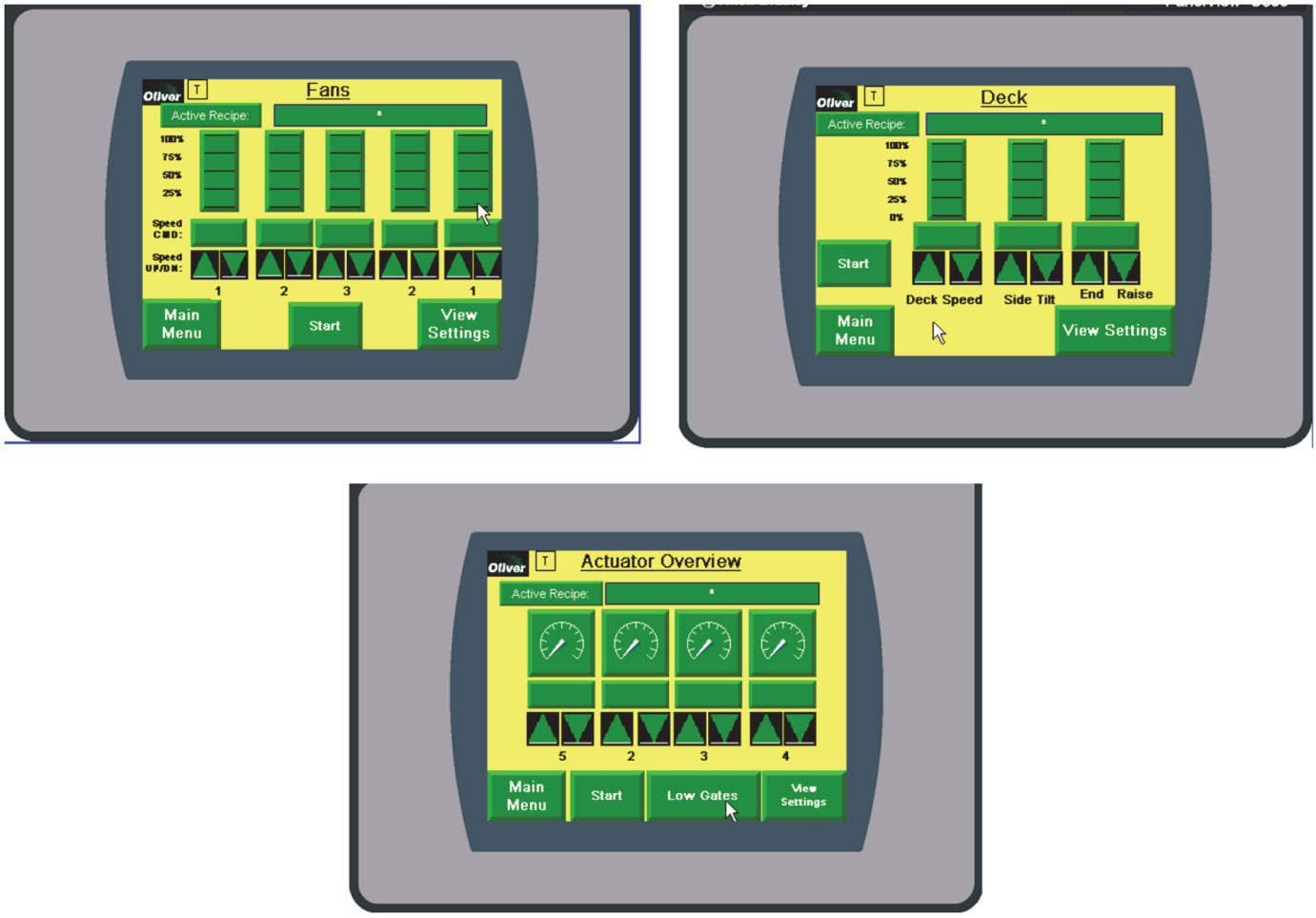


Figure 34: Deprecated Screens

These screens are used for those customers that wanted a visual graphic interface showing the percentage of the Fan speeds or Deck position or speeds. They are rather slow and unnecessary, and in the later versions of the code they will not be included. Most customers polled suggested they were unused screens.

II. Recipes

This section will illustrate how to go about changing and saving the recipes and loading a different recipe. This is one of the most powerful features of the automated machines; the ability to store and load recipes that store the entire set of user defined parameters of the machine. The first place to start for any of these tasks is at the Machine Settings Screen. This is arrived at by starting at the Main Screen and pressing the View Settings button, as shown in Figure 35.

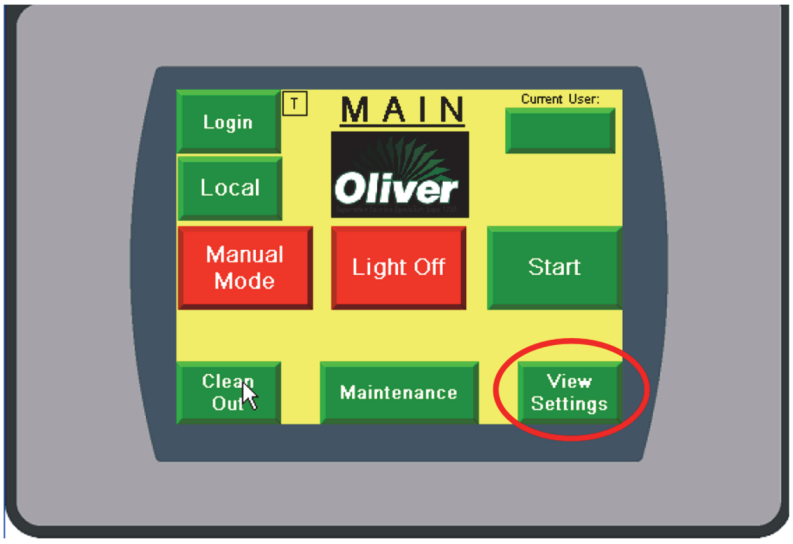


Figure 35: Going to View Settings

Once you click on view settings, you will arrive at the Machine Setting screen as shown in Figure 36. From here, click on the Active Recipe button.

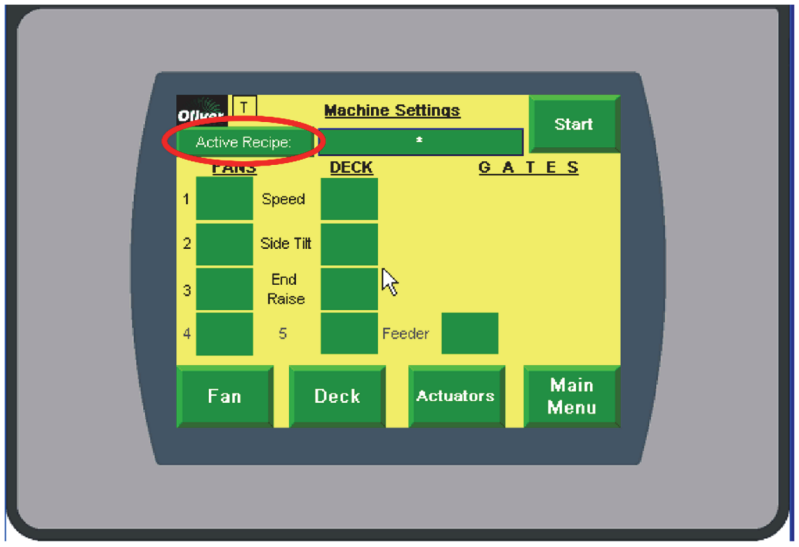


Figure 36: Clicking on Active Recipe

Clicking on the Active Recipe button will take you to the Machine Recipes screen. If you are not logged in as a user, the keyboard will come up first, requiring you to log in, as shown in Figure 37. The username and the password is oliver, with no caps.

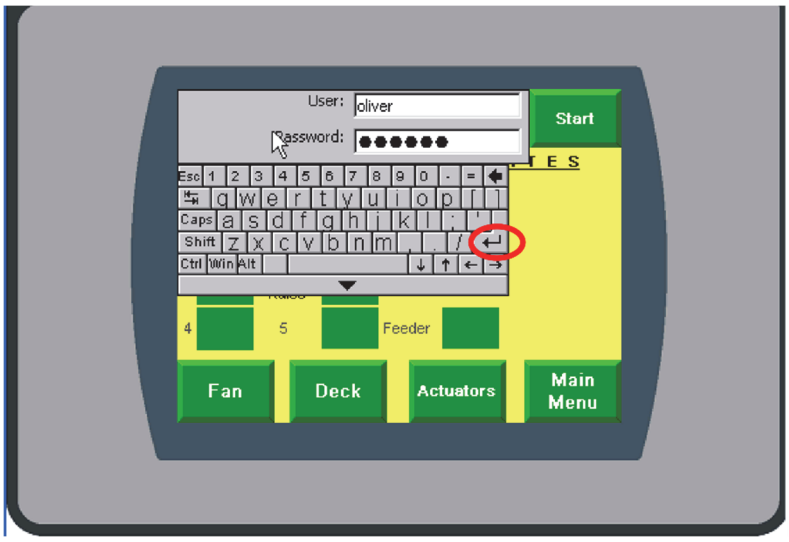


Figure 37: Entering user name and password for Recipes

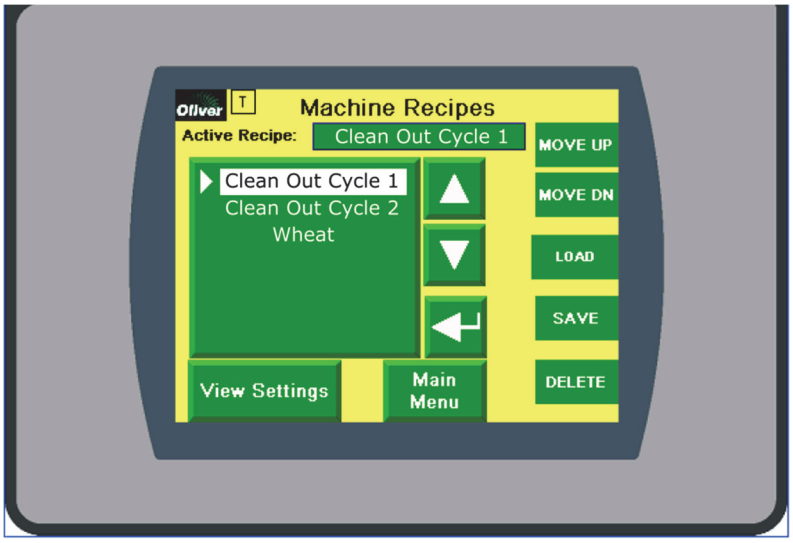


Figure 38: Machine Recipes Screen

Notice in Figure 38 that there are 3 recipes listed. Depending on which recipes were loaded at the factory, you may have more or less recipes. There will always be a Clean Out Cycle 1 and 2 Recipe listed. These two recipes are used for cleaning the left over seed or other particles off of a machine. From this point on, the steps are different depending on what task is being accomplished.

I. *Loading a Stored Recipe*

To Load a saved recipe, use the up and down arrow keys on the Machine Recipes page to select the recipe you want. In this example the arrow moved from the Clean Out Cycle 1 recipe to the Wheat recipe, as shown in Figure 39.

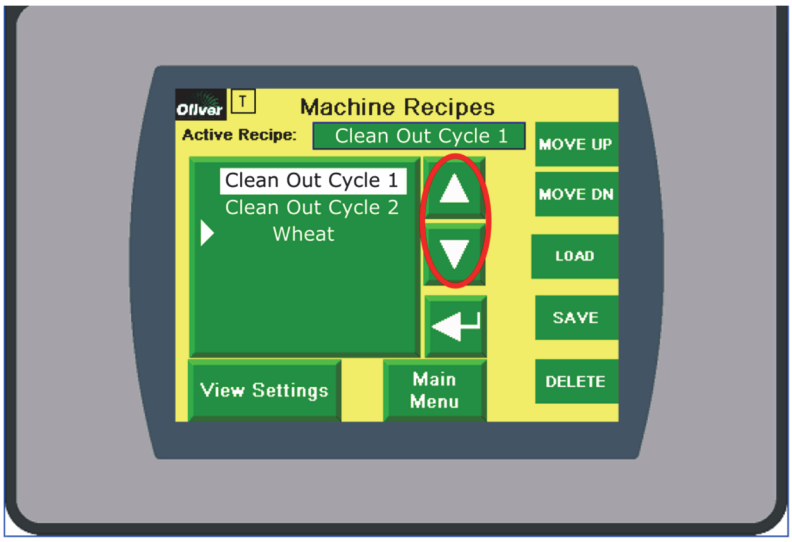


Figure 39: Changing Recipes

Notice in Figure 39 that the Clean Out Cycle Recipe is still highlighted. In order to finish selecting the Wheat recipe, press the enter button as highlighted in Figure 40.

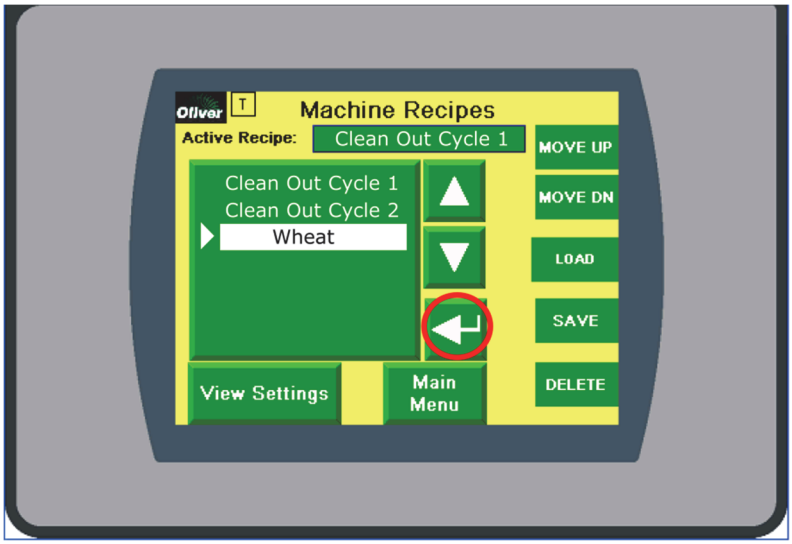


Figure 40: Hitting enter to highlight recipe

Notice that the Wheat recipe is now highlighted. Now press the Load button to load the recipe. Finally press the View Setting button to return to the Machine Settings screen, which will now show the current recipe as the recipe you just loaded, and the parameters will match what was last saved in that recipe.

II. Saving a New Recipe

Saving a new recipe starts by pressing the save button on the Machine Recipes screen, as shown in Figure 41. This will take you to a screen that looks exactly like the Machine Settings screen, except it will have the name Save Recipes at the top as shown in Figure 42.

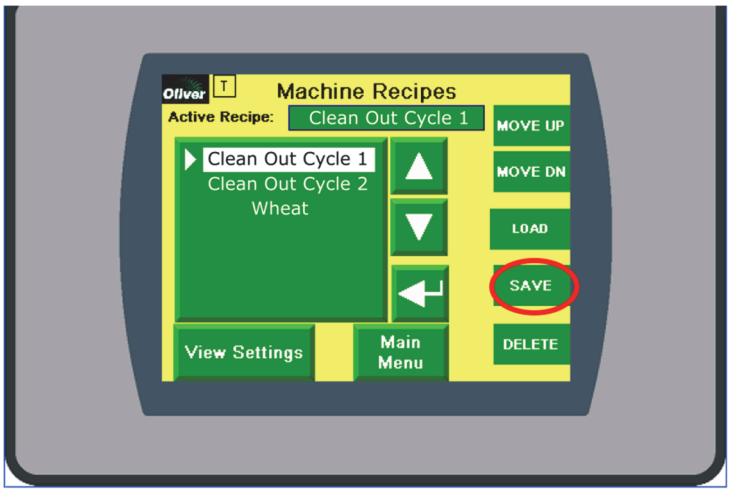


Figure 41: Saving a new recipe

Figure 42: Save Recipes Screen

The values here will be the same current values you were using on the Machine Settings screen. Check to make sure they are the way you want them to be, and then click on the Insert NEW button. This will take you to the Save Recipe Screen, shown in Figure 43. Press the button marked Press to Change Recipe Name. This will bring a keyboard up for replacing the recipe name as shown in

Figure 43: Save New Recipe Screen

Figure 44: Keyboard for naming recipe

Once you have named the recipe what you want it to be, then press the Insert New button. This will finish saving the recipe, and will take you back to the Machine Settings Screen.

III. Altering a Stored Recipe

If you find that you have been to change the parameters of a recipe slightly for better results, such as might happen in a different season with more or less humidity, then you will have to alter an already created recipe. The first step is the same as that of saving a new recipe. On the Machine settings screen, press the Save Button as shown in Figure 45. This will take you to the Save Recipes Screen in Figure 46.

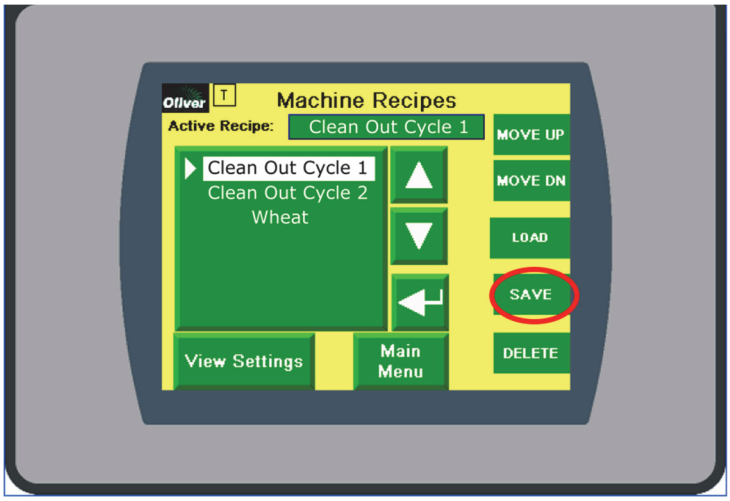


Figure 45: Altering a stored recipe step 1

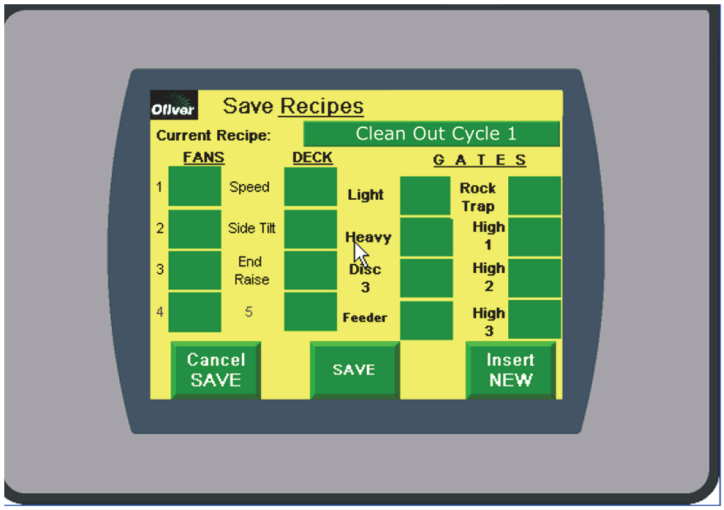


Figure 46: Altering a stored recipe step 2

Note: if you didn't load the recipe you wanted to change before you played with the parameter settings, then go through the section titled Loading a stored Recipe, and then come back to this point. If you have to do this, make sure you write down the settings you wanted to save before loading the correct recipe.

Assuming the current recipe name matches the recipe you want to change, check the parameters to make sure they are the values you want them to be and press the save button to save them to that recipe. If the name doesn't match, read the bold faced note just above to get the correct recipe loaded that you want to change.

IV. Deleting a Stored Recipe

In order to delete a Recipe, select the recipe you wish to delete. In this case, let's delete the wheat recipe. Use the up and down arrow keys to select wheat, and then use the enter key to highlight the wheat, as shown in

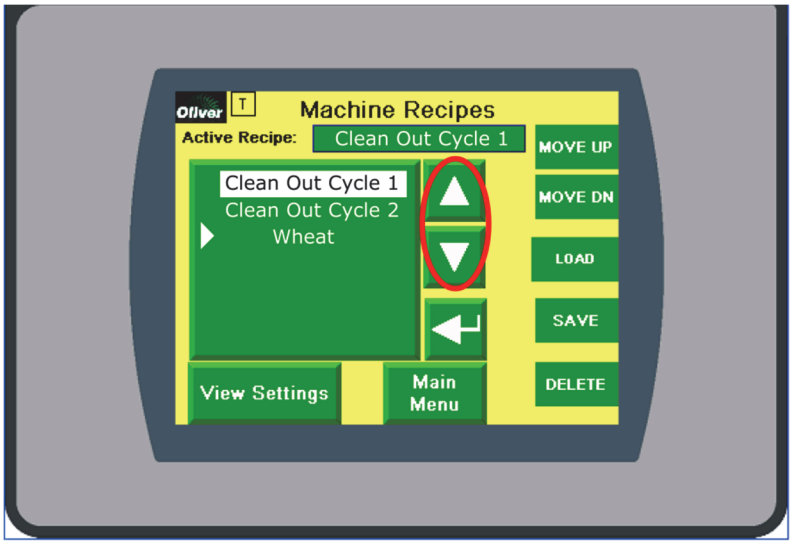


Figure 47: Selecting Recipe to Delete

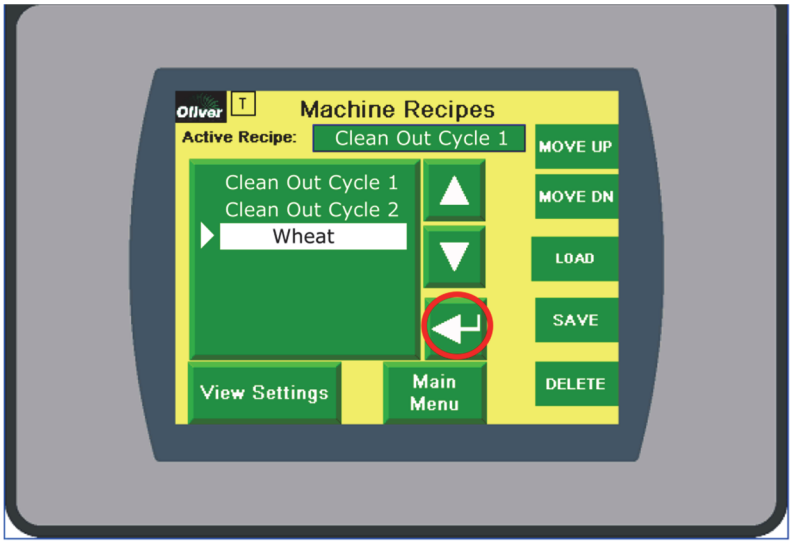


Figure 48: Highlighting the recipe to delete

Then press load to load the recipe, and then press delete to delete the recipe. Both buttons are on the left. When you press the delete button, it will bring you to the screen in Figure 49.

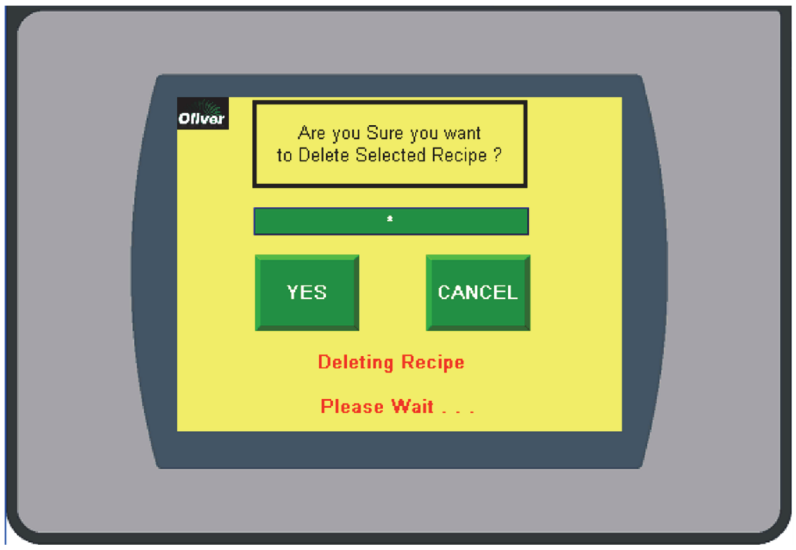


Figure 49: Are you sure you want to Delete?

If the recipe name is correct, then press yes. If not, press the cancel button and go through the process again, correcting any errors made.

II. Manual Mode

The Manual Mode of the machine is mostly used for diagnostic purposes and for testing of the gravity table before it leaves the factory. The Manual Mode allows the user to start one part of the machine at a time. This can be very useful if a part of the machine faulted while running in Automatic Mode, or if there is a strange sound or other issue that only affects one part of the machine. The Maintenance screen also shows how many hours are on the machine and bearing greasing intervals. In order to work in Manual Mode, the user will need to stop the machine if in Automatic Mode, go to the Main Screen and set the Machine to Manual Mode. The Main Screen should look like Figure 50 for operating in Manual Mode.

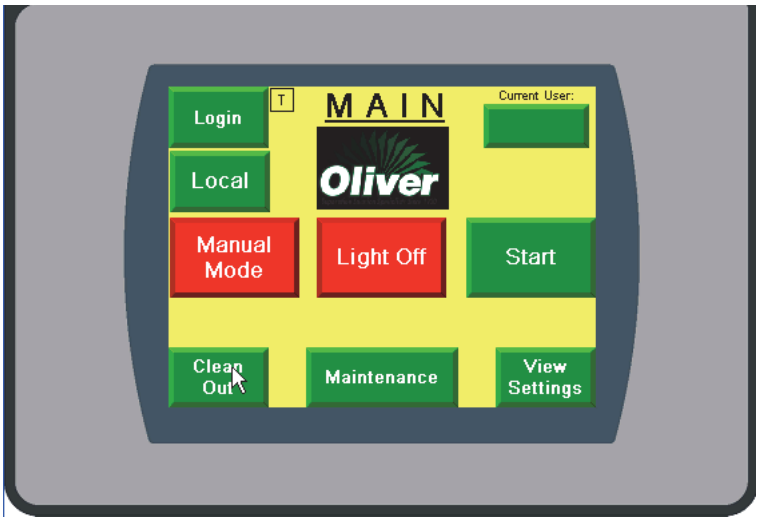


Figure 50: Main Screen in Manual Mode

From the Main Screen, press the Maintenance button. This will take you to the Maintenance Screen as shown in Figure 24 if the Machine is not faulted.

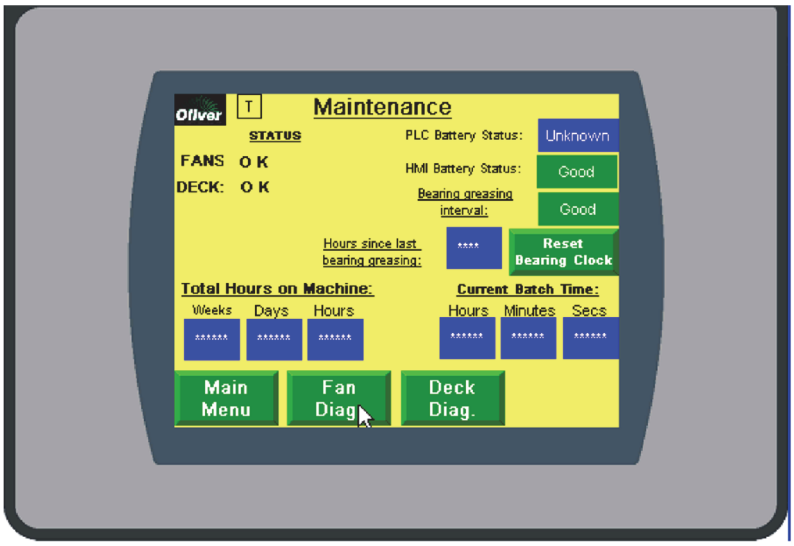


Figure 51: Maintenance screen when not faulted.

I. Maintenance Screen

The first thing to notice is that the Maintenance Screen is a diagnosis Screen. In the upper left of the screen, below the Oliver Logo, there is a current Status for the Fans and the Deck. When the machine is not in a faulted state, the screen will show a status of ok as shown in Figure 51. If the

FBD were faulted, then the Maintenance Screen would look like Figure 52. Note that if only the Fans were faulted, only they would show a fault, and vice versa.

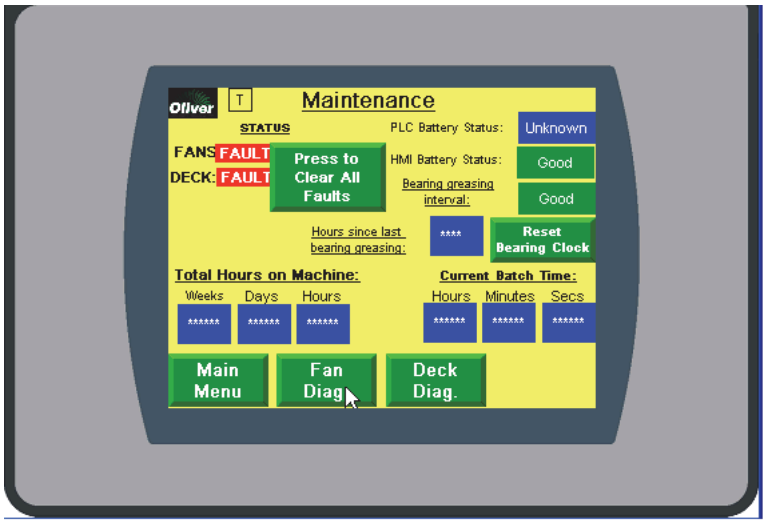


Figure 52: Maintenance Screen When Machine is Faulted

I. Faults on the Maintenance Screen

If the Machine is faulted, it will look like Figure 52. In this case, not only will the faults be indicated under the status in the upper left, but the green button marked Press to Clear All Faults will be displayed. Depending on what options the machine has, or if it is a Retrofit machine, there will more or less options in the status list. For instance, a Retrofit machine with a feeder would have a dampers status and a gates status.

Note: If the Gravity Separator has been power cycled or there was a power outage, the machine will show that it has a faulted status on both deck and fans. Just press the Clear all Faults button to clear the faults. There should be no reason to have to diagnose the faults.

If the machine has faulted during normal operation, it may be possible to simply clear all the faults and to return to Automatic Mode. Sometimes a slight power fluctuation will cause the machine to fault. It can be a good place to start when diagnosing the faults. Fault diagnosing itself will be covered in **Appendix D: Basic Troubleshooting** if clearing the faults fails to restore the machine to a non-faulted condition or if the machine returns again to a faulted condition.

II. PLC and HMI Battery Status

The PLC and the HMI both have batteries. The Maintenance screen will show one of three conditions for the PLC and HMI battery status. If the batteries are operating within the normal voltage and current parameters, then they will have a status of Good. If they are dying they will have a status of Bad. The third possibility is that the PLC is not returning a value for the status of its battery, and in that case the HMI will indicate an unknown status. In this third case it is probably best to replace the PLC battery as long as the two are communicating normally otherwise. See Figure 53.

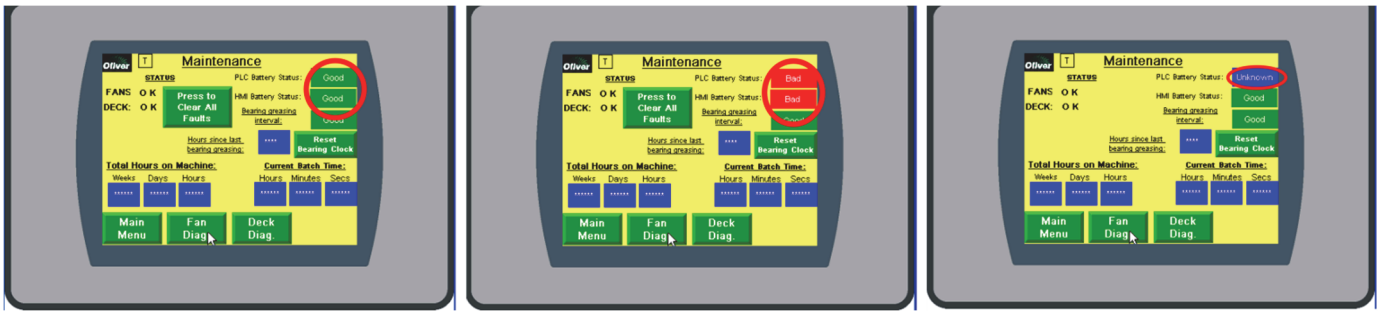


Figure 53: Various possible battery status screens

The PLC battery is used for memory back up and retention. If the battery is removed while the PLC is not powered, the PLC will lose its internal memory and the PLC program. The same thing will occur if the PLC battery goes dead. The battery also controls the various clocking functions of the PLC program, and the program may start to work unreliably if the battery is low due to clock skew. Consult Appendix B on replacing the PLC battery in order to find the correct replacement part and to dispose of the old battery.

The HMI battery is used for the internal clock on the HMI, and it is not used for backup or retention of the HMI program. Removing the battery will not result in a loss of program. If the battery dies, the internal clock on the HMI will be affected and there may be some strange results. Please consult Appendix A and Appendix B on how to replace the HMI and PLC battery respectively.

III. Bearing Greasing Interval

The bearings on the Gravity Separator need to be greased at regular intervals. The suggested number of hours is 2000. Once the machine has been run for 2000 hours, it will issue a warning, changing the Bearing Greasing Interval status from a green button with "good" indicated on it to a red button with "regrease" indicated on it. The number of hours since the last bearing greasing is in the blue box. The number of hours can be reset at any point to 0, when hopefully the bearings have been greased. See Figure 54.

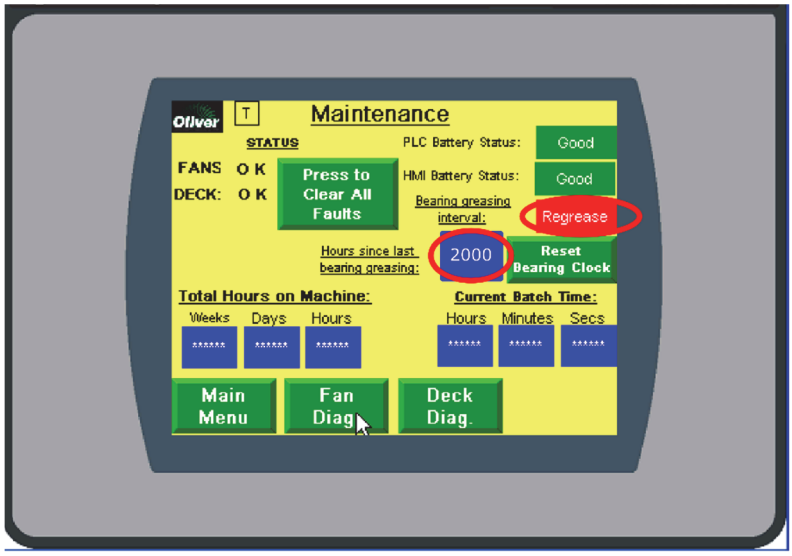


Figure 54: Alarm to grease the bearings at 2000 hours

IV. Total Hours on Machine and Current Batch Time

The PLC keeps track of how many total hours the machine has been run and how long the current batch has been running and displays it on the HMI screen. The Total Hours on Machines is a running total and is never reset. The Current Batch Time resets every time the machine goes from a stopped to a started state in Automatic Mode.

II. Fan Diagnostics

The next screen used in the Manual Mode is the Motor Diagnostics screen. It is entered by pressing the Fan Diag button on the Maintenance Screen. See Figure 55.

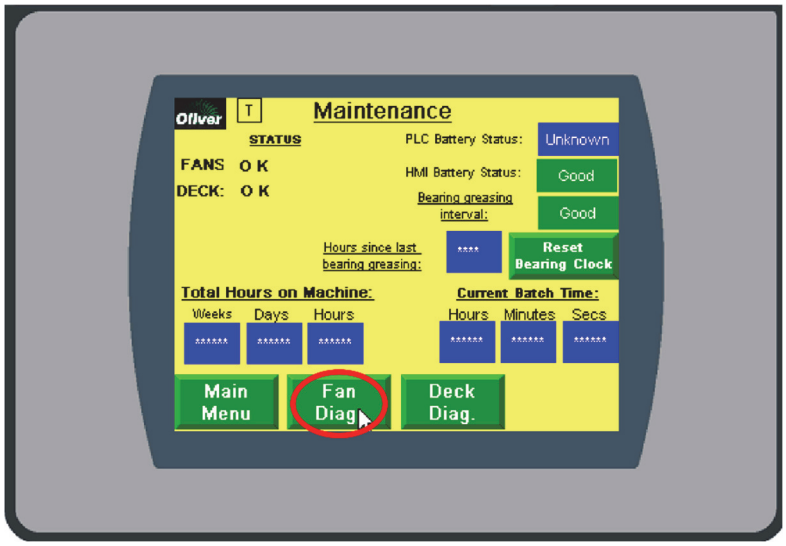


Figure 55: From Maintenance to Fan diagnostics

That will bring you to a screen that, depending on whether your machine is left or right handed, looks like Figure 56. The screen will adapt itself so that the order of the fans on the screen matches the order of the fans in the machine depending on handedness of the machine.

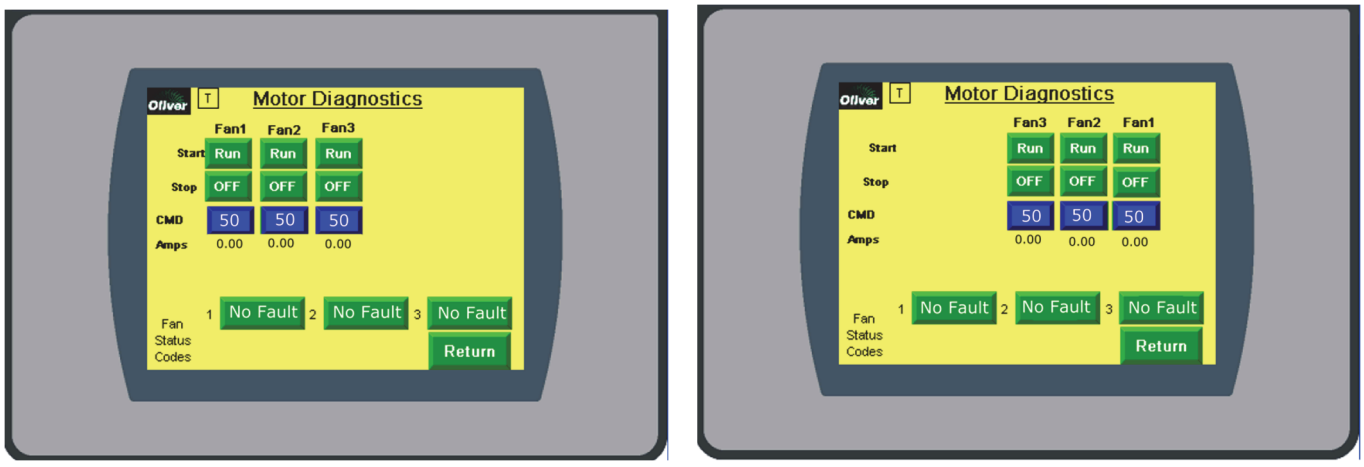


Figure 56: Motor Diagnostics Screen Left and Right Hand

Note: If you have a Retrofit machine, there will only be one fan, and it will not have the amp draw or fault options because it is not controlled by a VFD. The rest of the sections on the fans do not apply to a Retrofit machine.

I. *Starting the Fans*

Notice for each fan there are two green buttons for starting and stopping the fan, a blue numeric entry for a commanded fan speed, and a read out for the amp draw of each fan. To start a fan, start by choosing how fast you want it to go. This is done by touching the HMI screen with your finger on the blue CMD box below the fan. This will open up a keypad for you to enter a numeric value into the box. For example if you want to change Fan1s speed to operate at 75% of maximum, it would look like Figure 57.

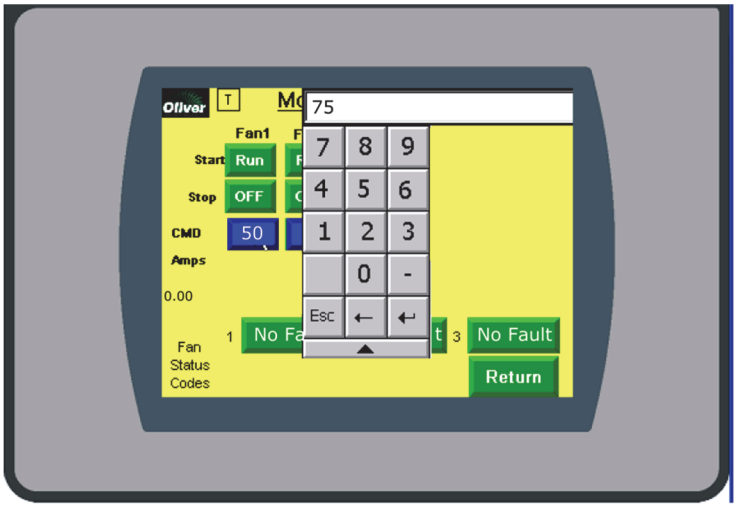


Figure 57: Changing the Fan speed Manual Mode

Once the speed is set, you can turn the fan on. You could also turn Fan1 on then change the speed. There is no certain order this has to be done. To turn on the fan, you use the buttons in the Start and Stop position under Fan1. When the fan is not moving, the buttons will be green, and the start button will say Run, and the Stop button will say OFF. This indicates that the fan is not running, and that you press the start button if you want it to turn on. Once the start button has been touched, it will then change the buttons to a blue color. See Figure 58.

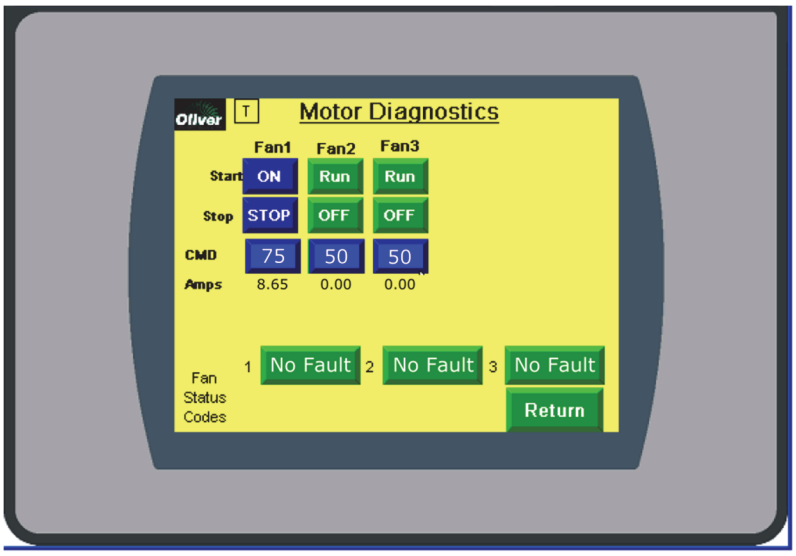


Figure 58: Fan1 Turned on Manual Mode

The start button now indicates that the FBD fan1 is on, and the stop button now indicates that it must be pressed to stop. Notice that the amps read out now indicates that the fan motor is now

pulling amps. (The figure is only for reference. Your motor may pull a different current.) If the stop button is pressed the fan will stop running, and the buttons will go back to green and will return to their previous wording. All of the fans work in the same way.

II. Fan VFD error codes and faults

The next diagnostic tool on the Fan Screen is the VFD error code indicators and the invisible buttons indicating a fault. Suppose Fan1 has faulted because the PLC has lost communication with the VFD while in Automatic Mode and you have come here to diagnose why. The screen would look like the following in

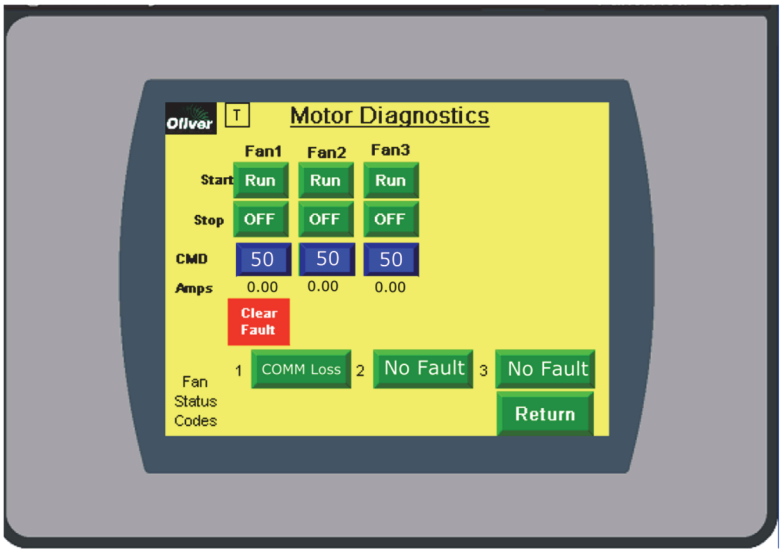


Figure 59: Fan 1 Faulted Manual Mode

Notice the formerly invisible red box below Fan1. The appearance of this red box that says Clear Fault indicates that Fan1 is faulted. If there is a fault on the Maintenance screen in the fans, you can come to the Motor Diagnostics screen to see which fans are faulted. Also notice the box for the Fan Status Code for Fan 1. It now indicates that there is a COMM loss, when previously it had said there was no Fault. To try to clear the fault and turn the Fan1 on, either by itself in manual mode, or as part of the machine in automatic mode, press the red Clear Fault button.

Note: A fan cannot be turned on in Manual Mode or Automatic mode if it is faulted

To diagnose fault codes and errors, please reference Appendix D: Basic Troubleshooting under VFD Fault codes.

III. Deck Diagnostics

The next screen available from the Maintenance Screen is the Deck Diagnostics screen. To get there, press the deck diagnostics button on the Maintenance Screen.

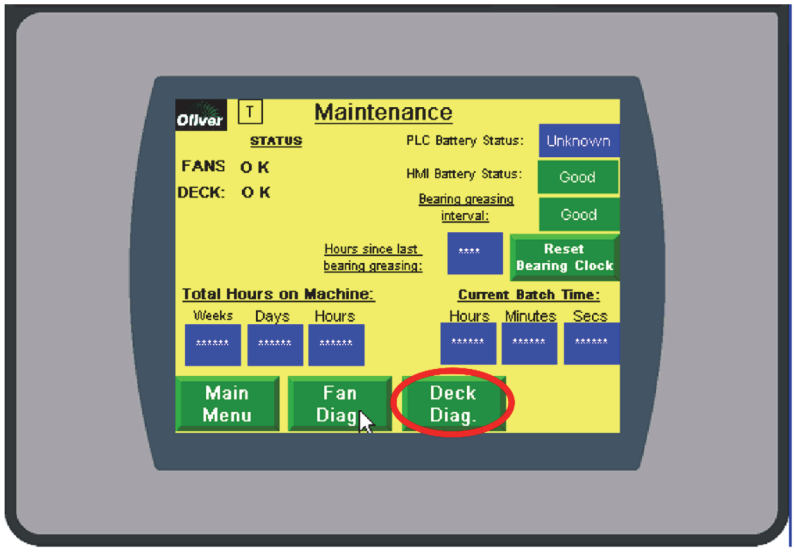


Figure 60: Going from Maintenance to Deck Diagnostics

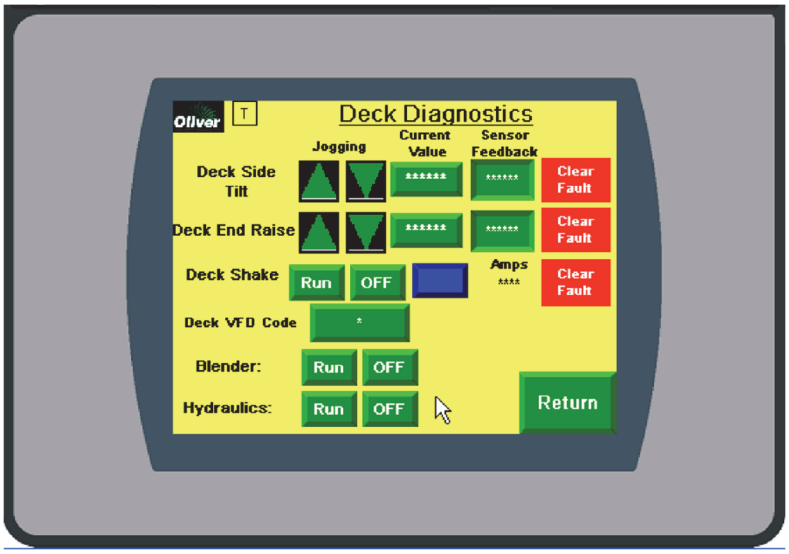


Figure 61: The Deck Diagnostics Screen

I. *Deck End Raise*

The diagnostics for the deck end raise allow the deck to be moved and the current percentage of the maximum value to be displayed alongside the sensor value. This allows the user to determine if the PLC thinks the deck is moving in the right direction. For instance, suppose in Automatic Mode the Deck End Raise had been commanded to go to 75%. It never reaches the position prescribed in 60 seconds and it faults. When the operator comes to the Deck Diagnostics screen, he sees that the current value says the deck is at 0% End Raise, which would indicate it was being retracted instead of being extended. There are several ways the combination of the current value and Sensor Feedback can be used together to troubleshoot issues with the Deck End Raise. If the Deck is not moving properly, consult the troubleshooting manual for further information.

Notice that, as shown in Figure 61, that the Deck Diagnostics Screen can have the same red box marked with the Clear Fault. The Clear Fault box will only come up if the Deck End Raise is faulted. If it is not present the Deck End Raise is not faulted. The Deck End Raise must not be faulted in order for the deck to be moved. If the Deck End Raise is faulted, press the Clear Fault button to clear it.

Note: The hydraulics must be on before the deck can be moved.

II. Deck Shake or Speed

The Deck Shake or Speed is analyzed in exactly the same way that the fans are. Notice that for the Deck Shake there are two green buttons for starting and stopping the Deck, a blue numeric entry for a commanded Deck speed from 300 – 600 RPMs, and a read out for the amp draw of the deck. To start the Deck, start by choosing how fast you want it to go. This is done by touching the HMI screen with your finger on the blue CMD box below the fan. This will open up a keypad for you to enter a numeric value into the box. For example if you want to change the Deck Shake it would look like Figure 62.

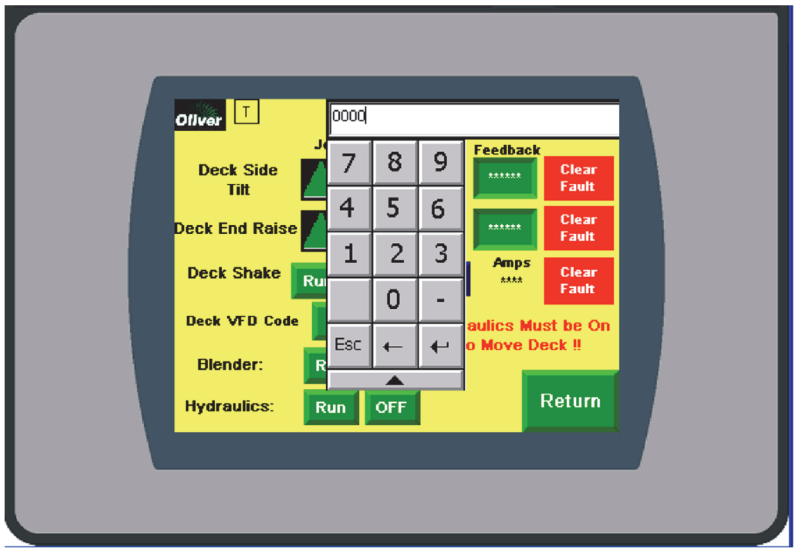


Figure 62: Changing Deck Speed Manual Mode

Once the speed is set, you can turn the Deck Speed on, as long as it isn't faulted. If the Deck is faulted, press the red Clear Fault box first, which will only appear if the Deck is faulted. To turn on the deck, you use the two green buttons to the right of the Deck Shake designation. When the deck is not moving, the buttons will be green, and the start button will say Run, and the Stop button will say OFF. This indicates that the deck is not running, and that you press the start button if you want it to turn on. Once the start button has been touched, it will then change the buttons to a blue color.

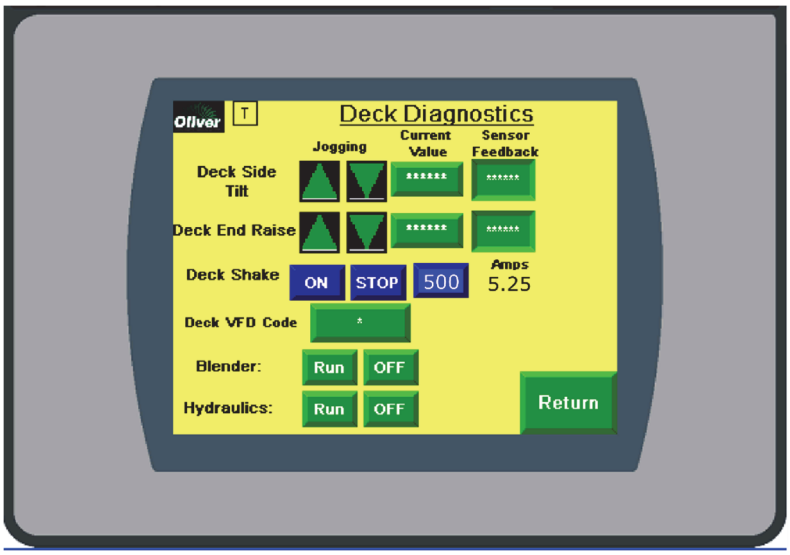


Figure 63: Deck Shake on Manual Mode

The start button now indicates that the Gravity Separator Deck Shake is on, and the stop button now indicates that it must be pressed to stop. Notice that the amps read out indicates that the deck motor is now pulling amps. (The figure is only for reference. Your motor may pull a different current.) If the stop button is pressed the deck will stop running, and the buttons will go back to green and will return to their previous wording.

III. Hydraulics

The last part of the Deck Diagnostics Screen is the Hydraulics. Just as the Deck Shake was controlled via the two green buttons, so is the Hydraulics, which operates in exactly the same way. The hydraulics must be turned on to move the deck, as the deck is moved via hydraulic cylinders. The hydraulics could also be turned on in order to determine if the hydraulic pump is moving in the correct direction.

For all troubleshooting issues, please consult the troubleshooting part of the guide.

III. Remote Mode

The final mode of the Gravity Separator is a remote one. The remote mode allows control of the machine to be passed to a Supervisory Control and Data Acquisition (SCADA) system. This control is not comprehensive. It is limited in functionality, both for safety reasons as well as quality of control reasons. The details of the Remote Mode and how to connect the FBD to a remote SCADA are given in the Appendix E: Remote Control of the Machine.

IV. The Joystick

One layover from the non-automated world is the Joystick. The Joystick on the FBD is independent from the automatic mode, manual mode, or Remote mode. It will control the End Raise on the FBD in any mode as long as the hydraulics is on. Pushing the joystick to the left will increase the End Raise, and to the right will decrease the End Raise. For the side tilt, pushing up with decrease the side tilt, and pushing down will increase it.

IV. Initial Setup and Startup

Now that you are familiar with the theory and the modes of operation of the Gravity Separator, it is time to do the initial startup of the machine.

1. Close the rock trap and the cut out gates on the machine. They will be set up after proper separation has been achieved. It is suggested to print out the functional operation part of the manual in order to have a visual reference of the effects of each of the controls.
2. Set the Gravity to the proper initial preset adjustments in Table 2.
3. Start to feed some product on the deck by slowly opening the feeder.
4. Adjust the deck speed to in order to get the product to move up the deck towards the high side.
5. Turn the two fans nearest the feed in to 100% to help get the product moving down the deck.
6. Once the product is moving towards the discharge end and the deck starts to fill up, bring the first two fans values back to the preset values in Table 2.
7. When the deck is full, start with the fan at the discharge end of the deck and turn it up until the product boils, and then turn it down until it just stops boiling. Do this for each fan one at a time until you reach the feed end of the deck. Repeat the whole process one more time. Once the fans have been balance twice there should be a good pattern going.
8. The product should be nice and smooth across the deck. The depth of the product at the high side should be 1-3 time as deep as the light side. If this is not so, increase the side tilt until the product depth at the high side is 1-3 times that at the low side. If the high side is too deep in product, decrease the side tilt until the product is the correct depth. Note that the adjustments need to be made in small increments, and there needs to be sufficient time between changes that the product depth stops changing, otherwise it will be impossible to zero in on a good solution for the side tilt.
9. Adjust the deck speed until there is proper disturbance of the product so that the air can fluidize the product. If this cause separation to go badly, decrease the side tilt to compensate. Don’t use too much deck speed or the product will remix, causing a bad separation.
10. Adjust the End Raise to that there is not too much product at the feed end to be able to lift the product into its fluid state. When the end raise is properly adjusted, there should be just enough product on the deck for the fans to fluidize the product, and there should be either the same depth of product all the way down the deck, or there might be all the way down to 1/3 of the product on the deck at the discharge end. This will all depend on the product used.
11. Increase the feed rate, compensating with the End Raise to keep the product flowing, until the gravity has reached the maximum amount of capacity it can separate well. Don’t put too much product on the deck so that the separation suffers.
12. Finally open the rock trap and cut out gates. The cut out gates will allow more capacity on the deck. Just be sure not to open them too much. Just make small changes until the product capacity and separation are both balanced. Start with the cut out gate at the discharge end.

Gravity Separator Pre-Set Adjustments for initial setup									
Voyager Pre-Set Adjustments									
Model	**Deck Mesh**	**Deck End Raise**	**Deck Side Tilt**	**Deck Speed**	**Fans**				
					1	**2**	**3**	**4**	**5**
1040	10Ms	50%	75%	500	100%	75%	50%		
1040	16Ms	50%	75%	480	75%	50%	25%		
1040	30Ms	25%	50%	460	50%	25%	10%		
1050	10Ms	50%	75%	500	100%	75%	50%	25%	
1050	16Ms	50%	75%	480	75%	50%	50%	25%	
1050	30Ms	25%	50%	460	50%	25%	25%	10%	
1060	10Ms	50%	75%	500	100%	75%	75%	50%	25%
1060	16Ms	50%	75%	480	75%	50%	50%	50%	25%
1060	30Ms	25%	50%	460	50%	25%	25%	25%	10%
Maxi-Cap Platinum Pre-Set Adjustments									
Model	**Deck Mesh**	**Deck End Raise**	**Deck Side Tilt**	**Deck Speed**	**Fans**				
					1	**2**	**3**	**4**	**5**
					100%	50%	25%		
2400P	16Ms	50%	75%	480	75%	50%	0%		
2400P	30Ms	25%	50%	460	50%	25%	0%		
3000P	10Ms	50%	75%	500	100%	50%	25%		
3000P	16Ms	50%	75%	480	75%	50%	0%		
3000P	30Ms	25%	50%	460	50%	25%	0%		
3600P	10Ms	50%	75%	500	100%	75%	50%	25%	
3600P	16Ms	50%	75%	480	75%	50%	25%	0%	
3600P	30Ms	25%	50%	460	50%	25%	25%	0%	
4800P	10Ms	50%	75%	500	100%	100%	75%	50%	25%
4800P	16Ms	50%	75%	480	75%	75%	50%	25%	0%
4800P	30Ms	25%	50%	460	50%	50%	25%	25%	0%

Table 2: Pre-Set Values for Gravity at Startup

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