Paver Principles and Techniques

CAT®

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules and precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “WARNING” as shown below.

⚠ WARNING

The meaning of this safety alert symbol is as follows:
Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operation that may cause product damage are identified by NOTICE labels on the product and in this presentation.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this presentation and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made usafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this presentation are on the basis of information available at the time it was written. The specifications, illustrations and other items can change at any time. These changes can effect the service given to the product. obtain the complete and most current informaiton available.

⚠ WARNING

Do not operate or work on a machine unless you have read and understand the instructions and warnings in the Operator and Maintenance Manuals. Failure to follow the instructions or heed the warnings could result in injury or death. Contact any Cat® dealer for replacement manauls. Proper care is your responsibility.

This presentation will cover basic asphalt paving techniques and mat troubleshooting procedures. The objective is to explain in practical terms the application; what are the things to consider before beginning to pave; how the paver works; and how to prevent or correct mat defects.

The role of the asphalt paver is to place a given mix design over an irregular grade while meeting the specifications for grade, texture and smoothness. To consistently meet demanding specifications for smoothness and profile, every phase of the job must be planned.

Good planning means that many factors have been considered and prepared for before the trucks full of hot mix asphalt show up in front of the paver. Even the most experienced supervisors and crews must have some sort of pre-project checklist. Typical factors which must be considered are:

- What is the asphalt tonnage available to be delivered to the job?
- What are the maximum and minimum paving widths on the project?
- What are the job specifications?
- What are the existing grade conditions?

Why do we need to know how much asphalt can be delivered to the paver each hour? This information will help us plan all the logistics necessary to keep the asphalt plant running at 100% capacity.

So, first, what is the plant output? 400 tons per hour, 600 tons per hour etc.?

Second, what is the length of haul, or more importantly, what is the time it takes for a hauling unit to make a round trip from the plant to the paver and back to the plant (truck cycle times)? You'll need to consider traffic conditions which vary during the day when you make this calculation.

Understanding these factors you will be able to determine how many trucks need to be assigned to a project on a given day in order to smoothly deliver the total hourly output of the plant?

These factors along with paving thickness, paving width and uncompacted material density will allow you to set an effective paving speed for your crew.

Another project planning factor is the paving width, which may be a variable from one day to the next. For example, today we may be paving 3.7 m (12’) wide. Tomorrow we may be going into a section that requires paving at 4.6 m and 5.5 m (15’ and 18’). To pave at the wider width, it will be necessary to have on hand attachments like: screed extensions, auger extensions and main frame extensions (material retaining plates). Make these available at the job on the day they are needed and be sure to check out the condition of these attachments ahead of time. Without the correct attachments, there is a temptation to cut corners in order to keep on paving and that is usually when smoothness or grade problems show up.

Paving Tip: For every foot of auger extension, add one foot of mainframe extensions plates. Auger extensions should never extend past the main frame extensions (mainframe material retaining plates).

It may seem obvious that we have to be aware of the specifications for rideability and profile, but these specifications are a very important part of the planning puzzle. The demands of paving a parking lot are a lot different than re-surfacing an airport runway. So, how we set up the paver and the paving techniques we use must be adjusted according to what we need to accomplish.

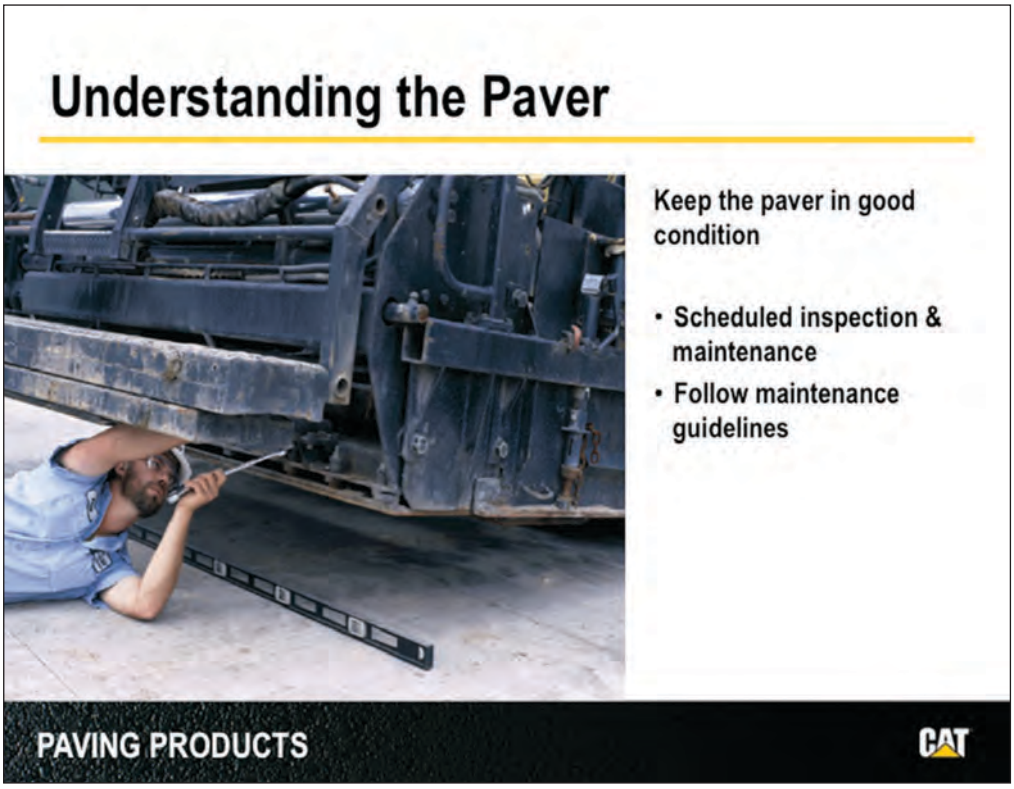
We just looked at what we need to pave at variable widths. But, what about the variables for automatic grade and slope control?

You need to be sure that:

- all sensors are in good working order
- levelers, if needed, are complete and working properly
- all mounting hardware is available
- the positioning of sensors is right for the desired result

Finally, be sure you have checked and understand all existing grade conditions. There may be conditions that require a deviation from the plan. For example, a leveling course may be needed in some sections and not in others. Check for bumps or low spots in the grade. The bumps may cause the screed to drag large stones and mark the mat. Low spots will cause uneven compaction and ultimately failed pavement. Be sure that all transitions for grade and slope are marked on the project and understood.

In summary, pre-project planning is designed to eliminate guesswork and lost time.



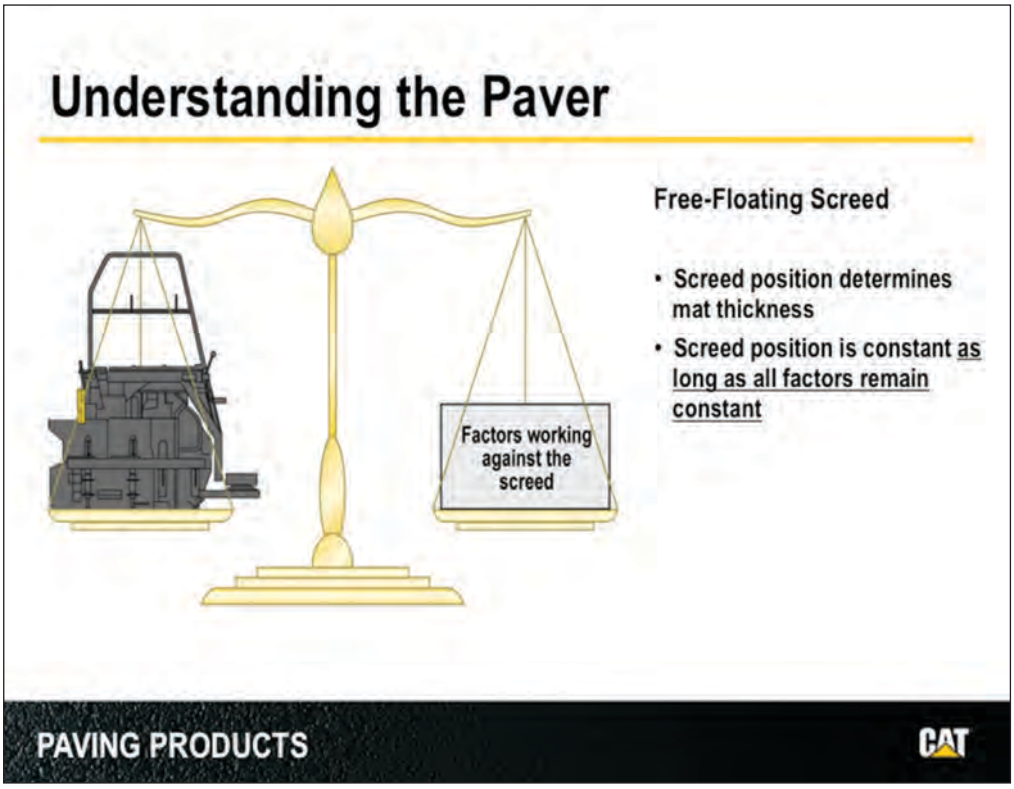
A paver is a precision tool that must be kept in good mechanical condition. A paver which is not well-maintained or one which has worn components will usually make it difficult for the crew to achieve grade and smoothness specifications. All parts of a paver which contact hot mix asphalt become wear items and these items must be part of regularly scheduled inspection and maintenance, repair or replacement. Allowing a paver to reach a deteriorated condition will affect its ability to hold tight tolerances. Be sure to follow the manufacturer's recommended maintenance guidelines and to have a documented inspection program.

WARNING: Travel Lock's should be in place before maintenance begins. Please follow the instructions and warnings in the Operator and Maintenance Manuals.

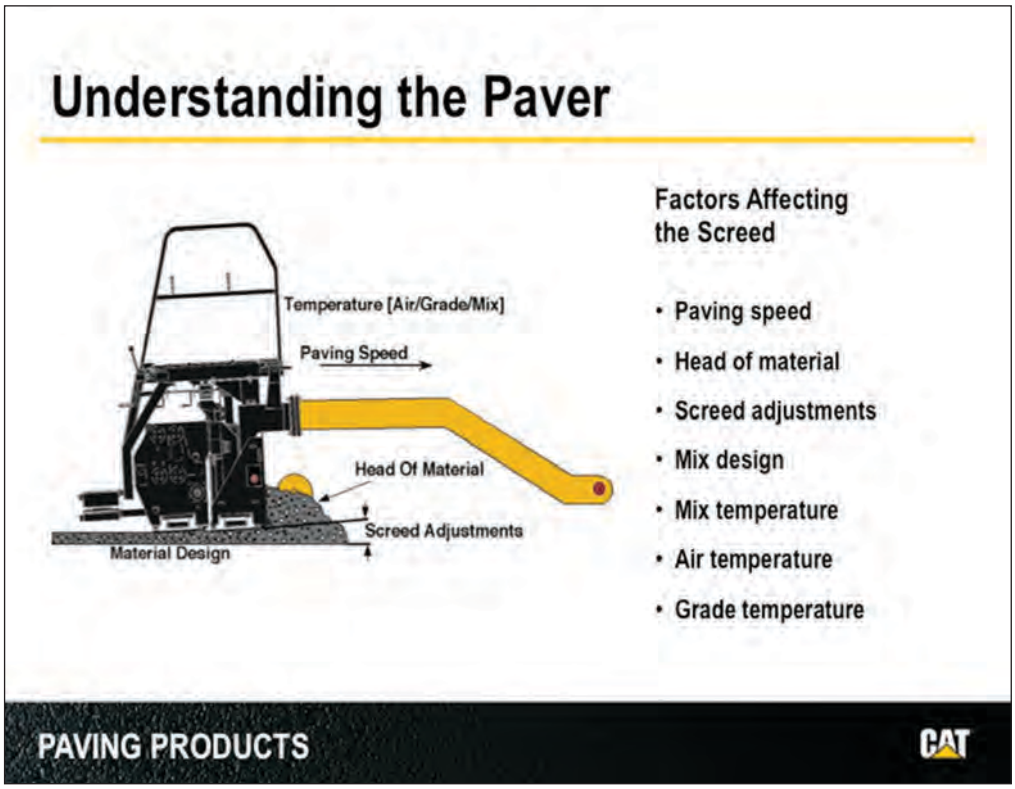
Understanding how a paver works and how a paver produces a smooth mat can be reduced to two basic concepts: the self-leveling action of a paver and the method of material delivery from the front of the paver to the area in front of the screed.

All asphalt pavers, regardless of undercarriage type, have inherent self-leveling capability. This is a fundamental of the relationship between the tractor and the screed. The screed is attached to the paver at the tow point which is near the center of the tractor. The screed is free to rise and fall according to several factors. But, in general, the screed maintains a relatively constant line of pull even while the tractor rides over an irregular surface. This is especially true when the paver is set up and operated in a manner that minimizes changes to factors which affect the screed. So, it is self-leveling that helps produce a smooth surface over an irregular grade.

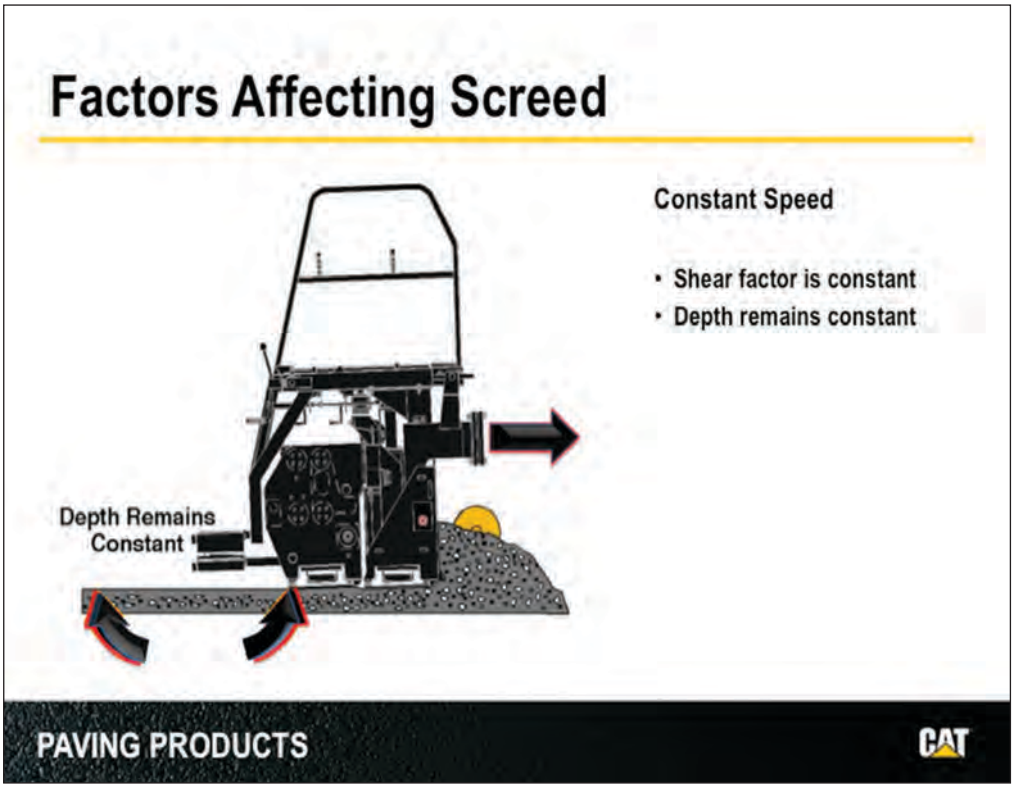
Another concept that is basically the same on all asphalt pavers is the material feeder system. The front of the tractor portion is a hopper which receives material. The hopper can store a certain amount of material which permits paving a short distance without a continuous supply. Normally, material passes continuously from the hopper via independent left and right conveyors, or slat feeders. At the back of the tractor are two independent augers which spread material across the width of the screed. Under normal operating conditions, there are material sensors which control the amount of material which is delivered in front of the screed. The material feeder system works best when the flow is a smooth and continuous delivery to the screed.



Previously mentioned was the fact that a paver screed is free-floating. The screed can be thought of as a separate piece of equipment towed by the tractor portion of the paver. The screed floats up and down, independent of the tractor, depending on a variety of factors. The screed's vertical position controls the depth of the material passing under the screed. Once a screed reaches a certain vertical position behind the paver, it will stay in that position as long as all the other factors remain constant, or in balance. Therefore, it is important to know what factors are involved in this balance and how to control them.

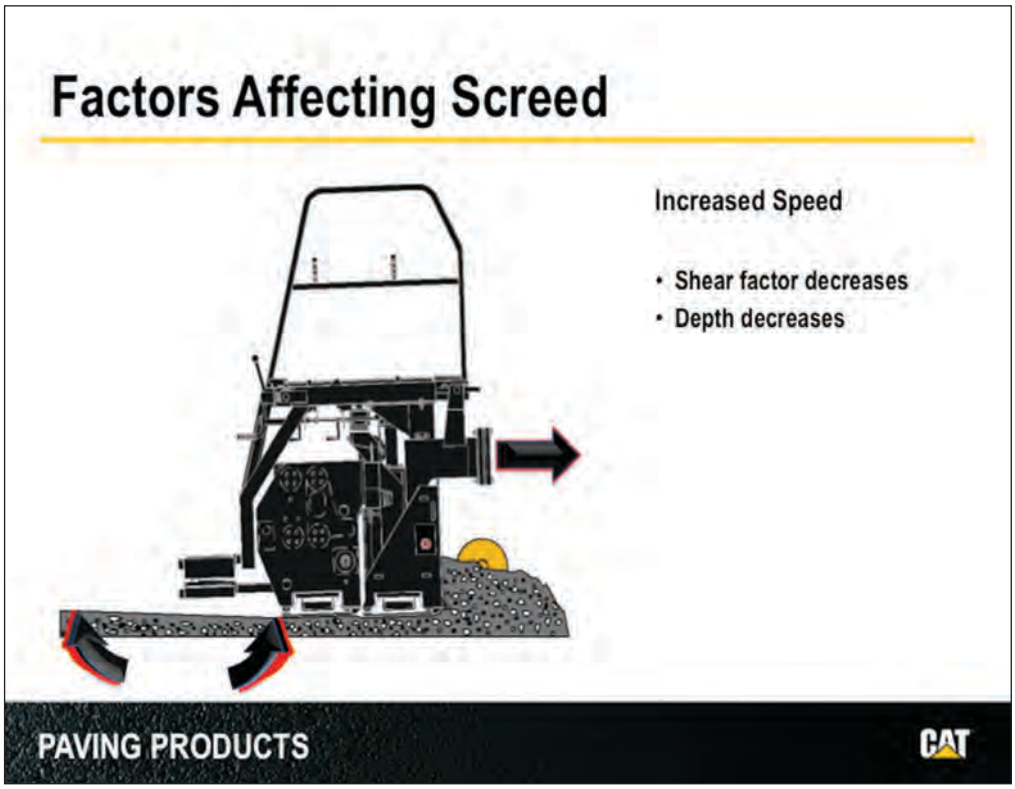


Some of the factors which affect the vertical position of a free-floating screed are controlled by the paving crew. These include the paving speed, the head of material in front of the screed and screed adjustments. Others such as material design and mix temperature are controlled by the crew at the hot mix plant and trucking logistics. Factors like air temperature and the grade are beyond the control of the paving crew but must be considered. In the following section, we'll cover those factors which are controlled on the job by the crew.

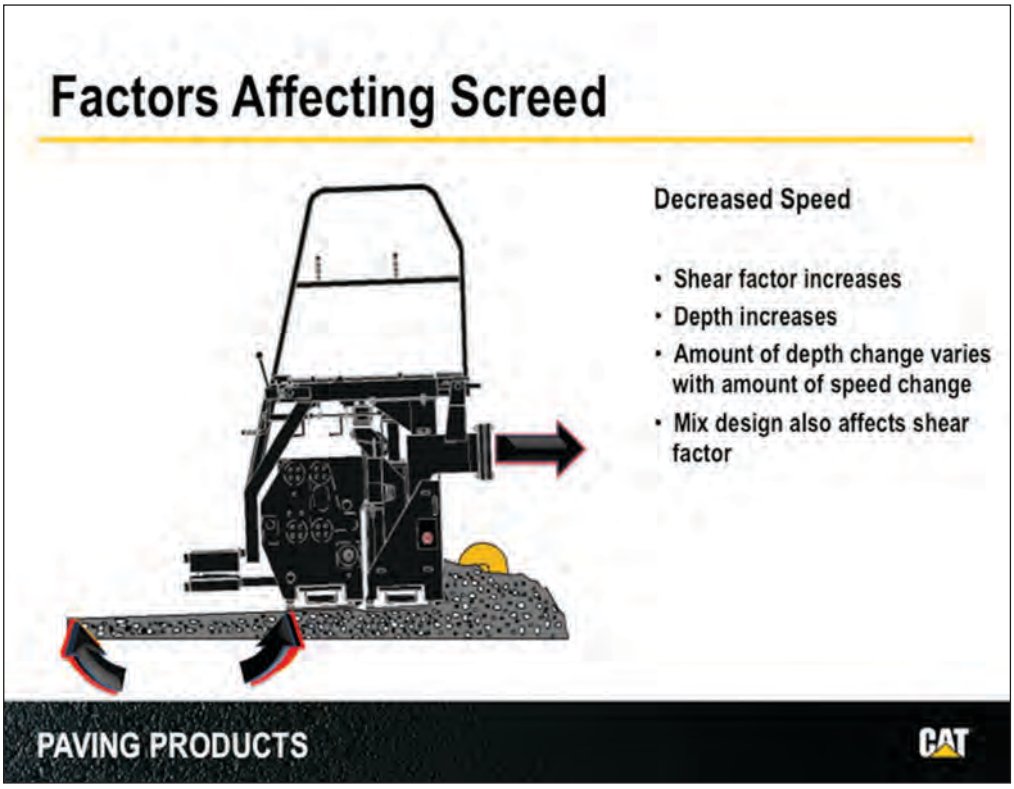


A fundamental aspect of smooth paving is maintaining a consistent speed. This is a variable factor which can be, and must be, controlled by the operator of the paver. Most modern asphalt pavers are equipped with “speed control” dials which make it simple for the operator to maintain a set paving speed.

The paving speed helps determine the ability of the screed to shear off a portion of the material in front of the screed. Depending on the mix design, at a given paving speed, a certain amount of mix will pass under the screed. When the speed is constant, the shear factor is constant and the depth of material passing under the screed will also remain constant.



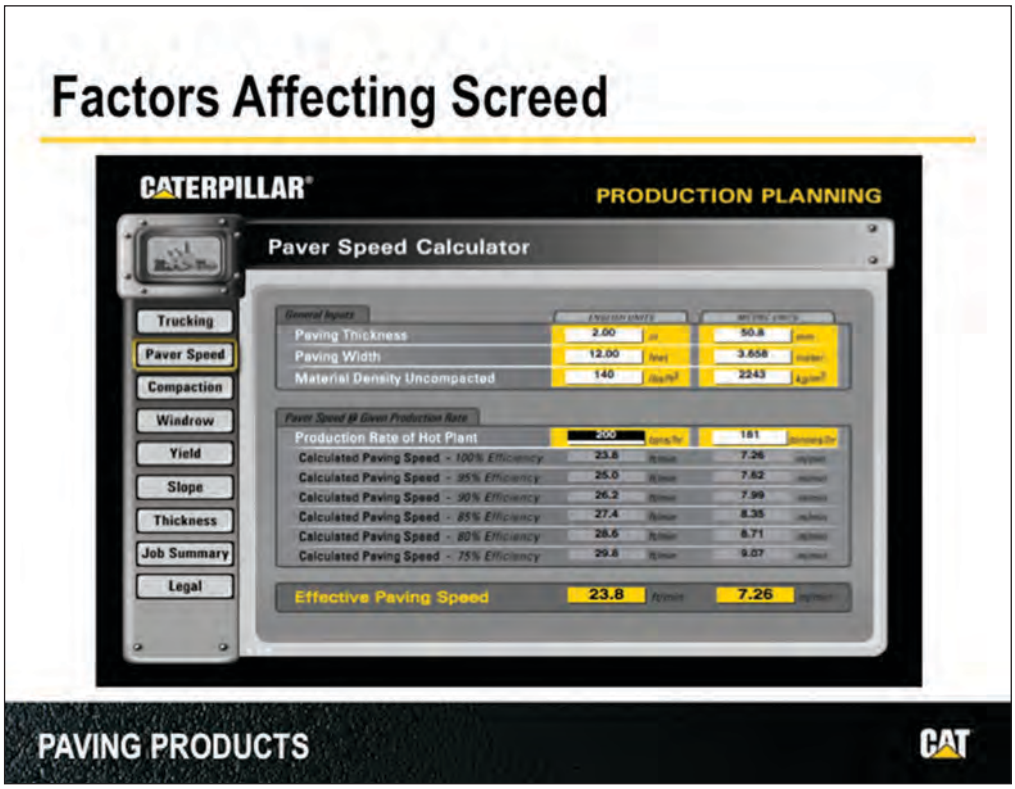
But, what happens when the paving speed is increased? The head of material will probably stay the same, but the shear factor will decrease. In other words, it is easier for the screed to pass through the material in front of it. With less resistance, the screed can "doze" more material and the screed will ride down. The material passing under the screed is less; therefore, the thickness of the mat will decrease. If the new paving speed is maintained, the new screed level will stay the same and we would have just one dip, or loss of smoothness.



Realistically, the operator will lower the paving speed again at some time and the screed balance will be affected again. With decreased paving speed, the shear factor increases and the screed will ride up. More material will pass under the screed and there will be another bump in the mat.

If the paving speed deviation is small, the change in mat thickness will also be small – perhaps not even noticeable. But, big changes in paving speed will cause a bumpy ride. Some types of material are more tolerant of speed changes, especially minor deviations. But, a nearly constant speed is critical to paving smoothness with any mix design.

Paving Tip: Stop and start the paver smoothly, but quickly. Use the propel lever to stop and start the paver; leave the speed dial set for the predetermined paving speed. The propel system is modulated to produce smooth starts and stops when the propel lever is pushed full forward or returned to the neutral position.



To help maintain a constant paving speed, correlate the paving speed to (1) the amount of material which will be delivered to the paver each hour; (2) the paving width; and (3) the uncompacted mat thickness. Here's where preproject planning and a reference chart or production calculator like this one pay off.

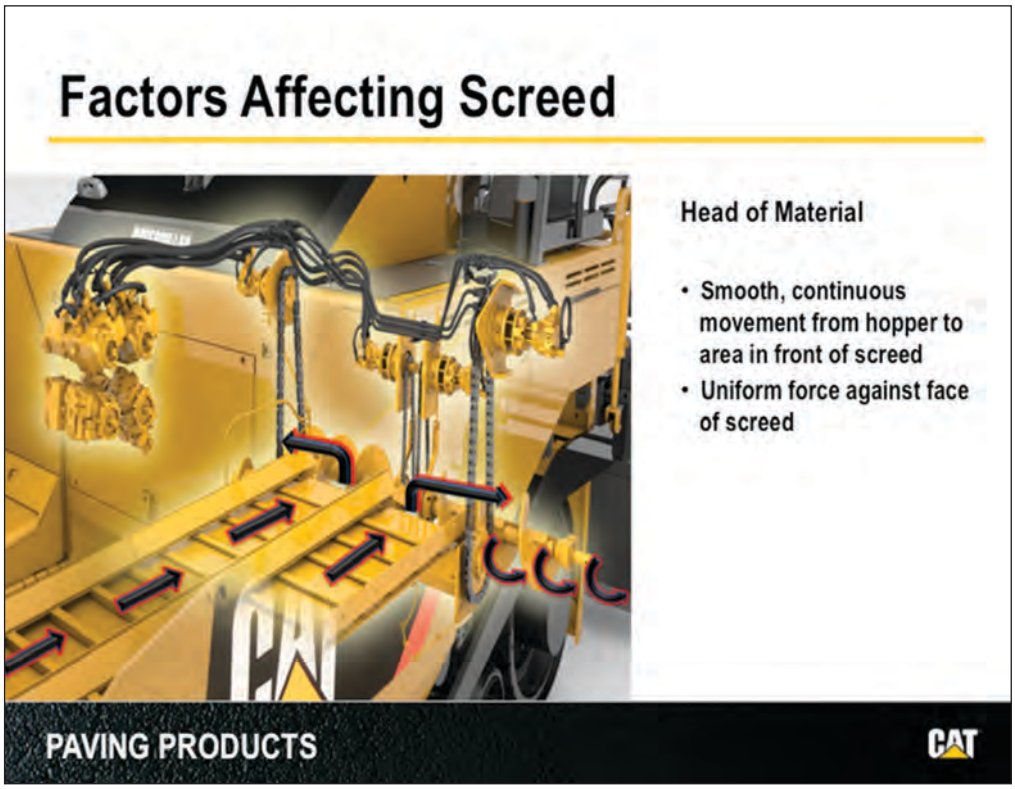
Let's look at an example where the plant output is 200 tons per hour; the paving width is 3.7 m (12'); and the uncompacted mat thickness is 50.8 mm (2").

We input our paving thickness 50.8 mm (2"), then paving width 3.7 m (12'), and finally our density uncompacted 2243 kg/m (140 lbs/ft3). Our hot plant production rate is automatically carried over from the pervious "Trucking" tab which is 181 tonnes/hr (200 tons/hr). The paving speed which would produce a 50.8 mm (2") uncompacted mat is 7.26 m (23.8') per minute. So, under these project conditions, a constant paving speed of 7.26 m (23.8') per minute at 100% efficiency would match the delivery of material if trucking logistics are correct.

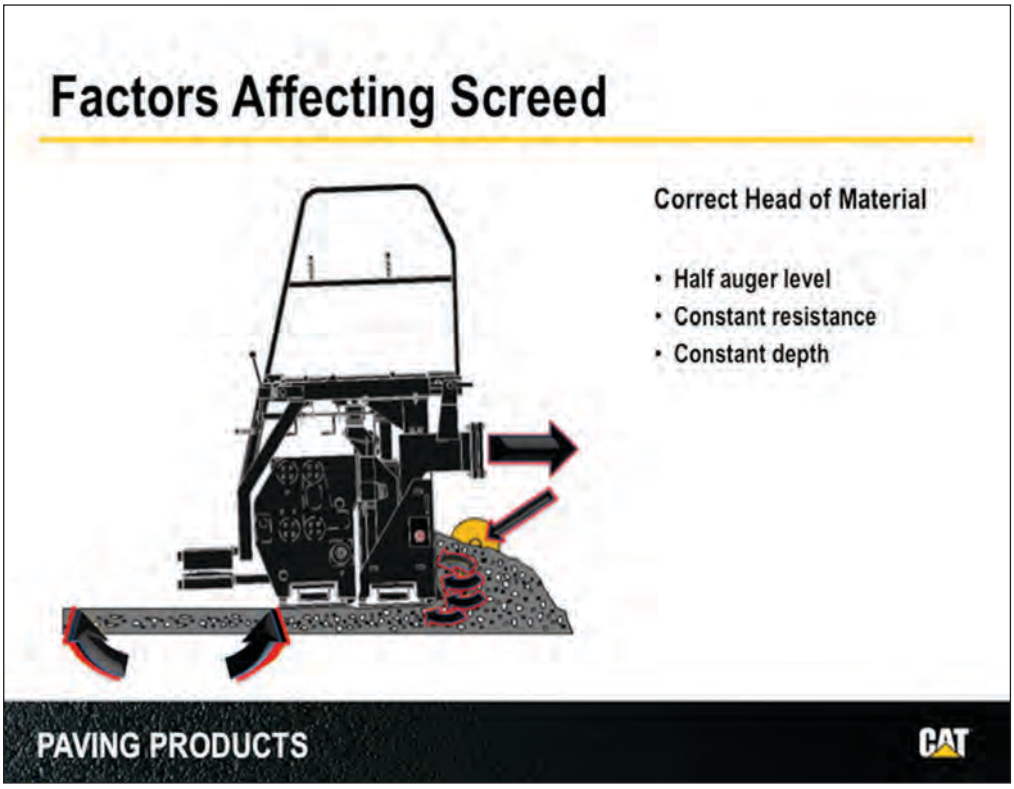
However, in the real world, truck logistics don't always work the way we want. When you are faced with a bunch of trucks lined up in front of the paver first thing in the morning, do not panic. Stay with the plan you developed in order to get the quality required. Using the example we just looked at, get rid of these trucks in an orderly fashion at 7.36 m (24') per minute – not at 30 m (100') per minute. There are several benefits to staying with the planned speed.

First, you will break up this bunch of trucks and begin to establish more equal truck cycle times which promotes continuous paving at planned speed. Second, you will not be out-producing the ability of the compaction train to keep pace.

Trucking should not dictate paving practice. If trucks continue to bunch up, find out why. Is there a plant problem? Traffic problem? If there is a legitimate reason for delivery problems, adjust the paving operation to match delivery, but always set a constant paving speed and stick with the plan.

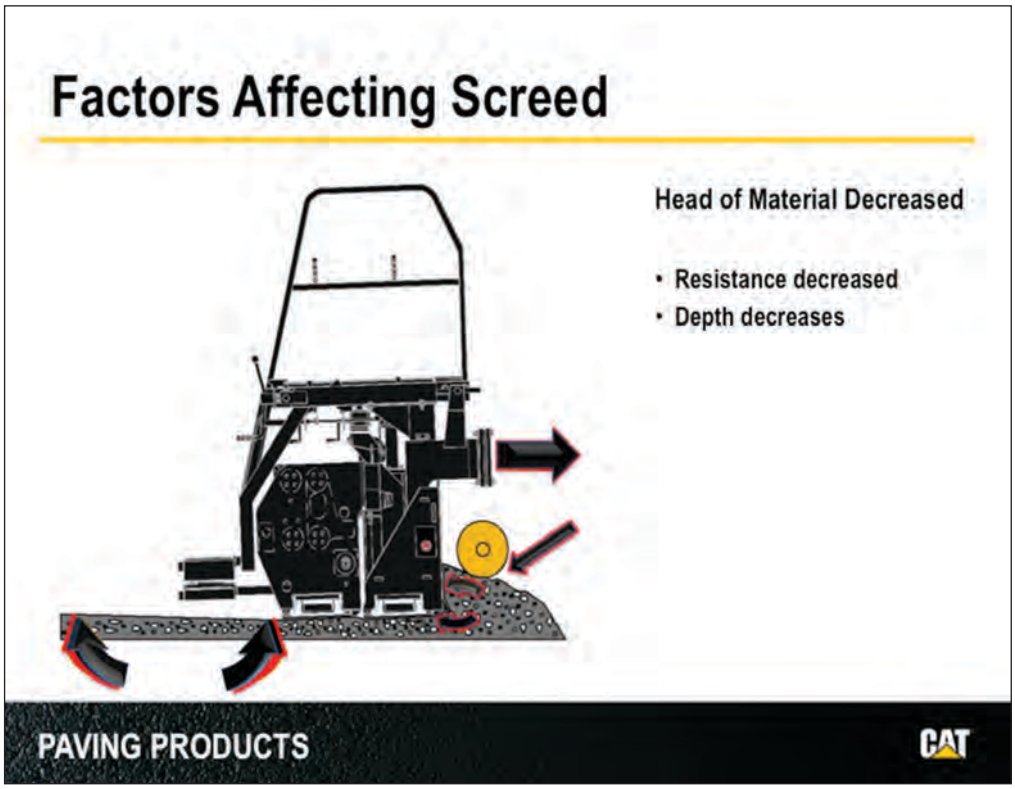


Another fundamental aspect of smooth paving is maintaining the right head of material. The way to get a constant head of material is to set up the feeder system to deliver material from the hopper to the augers in a smooth, continuous flow. Modern pavers give the operator the ability to regulate the conveyors and augers individually so the material demands of paving at any width can be met. Basically, anytime the paver is moving, the feeder system should be transferring material in an uninterrupted fashion – not starting and stopping. When the material flow is interrupted, there is a chance for material segregation, auger shadows and, most importantly, fluctuations in the head of material in front of the screed.



The correct level for the head of material in front of the screed is reached when it covers one half of the augers. There should be a small portion of the auger shaft exposed. When the mix level is maintained at this point, there is constant resistance felt by the screed and constant depth of mix passing under the screed.

Covering one half the augers is also the most efficient way for the augers to spread the mix across the paving width. If the auger chamber is overloaded, the material begins to compact in this area and added forces act against the screed. The horsepower demand goes up and there is less power available for other systems. Wear on the auger bearings also goes up. So, maintaining the half an auger level is really important.

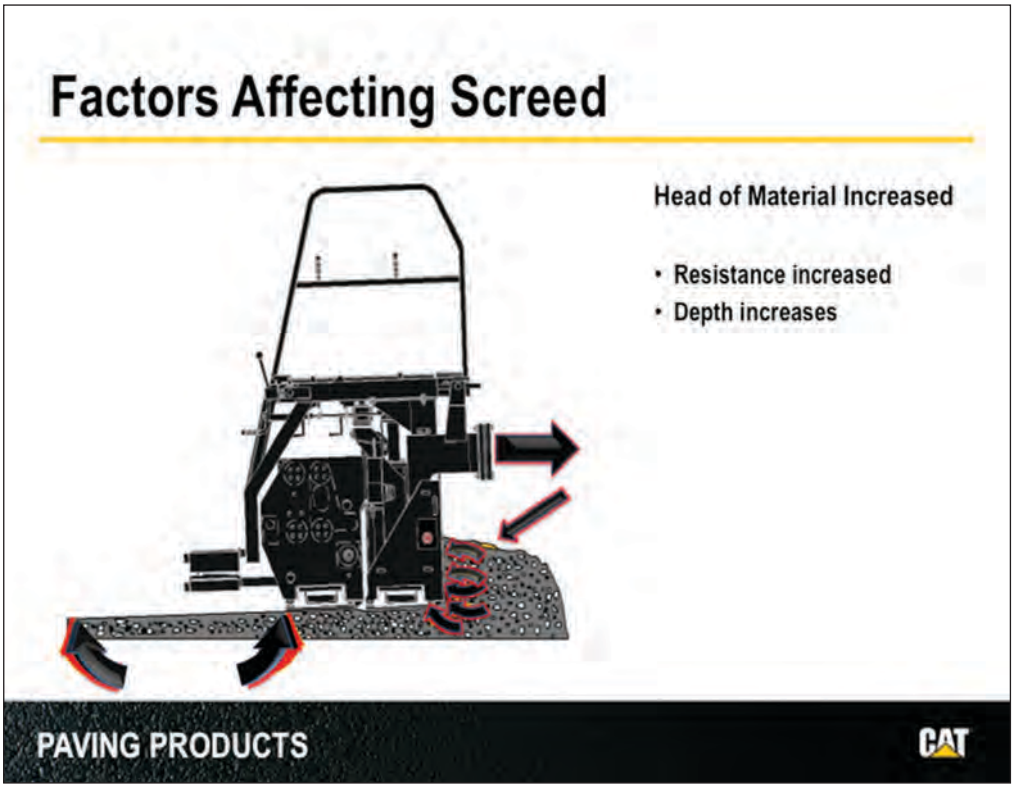


When the head of material is too low, we see most of the augers uncovered. The resistance felt by the screed is decreased and the screed will ride down. So, the mat thickness decreases.

When does this happen?

Usually, it happens many times a day when we change trucks. Normally, as the empty truck pulls away, the operator cycles the hopper wings and continues paving. This is proper practice. The problem is that the operator may not stop soon enough. Paving often continues until the feeder system is running low and the augers are turning somewhere near maximum speed. At that point, the screed will drop to a lower level, creating a depression.

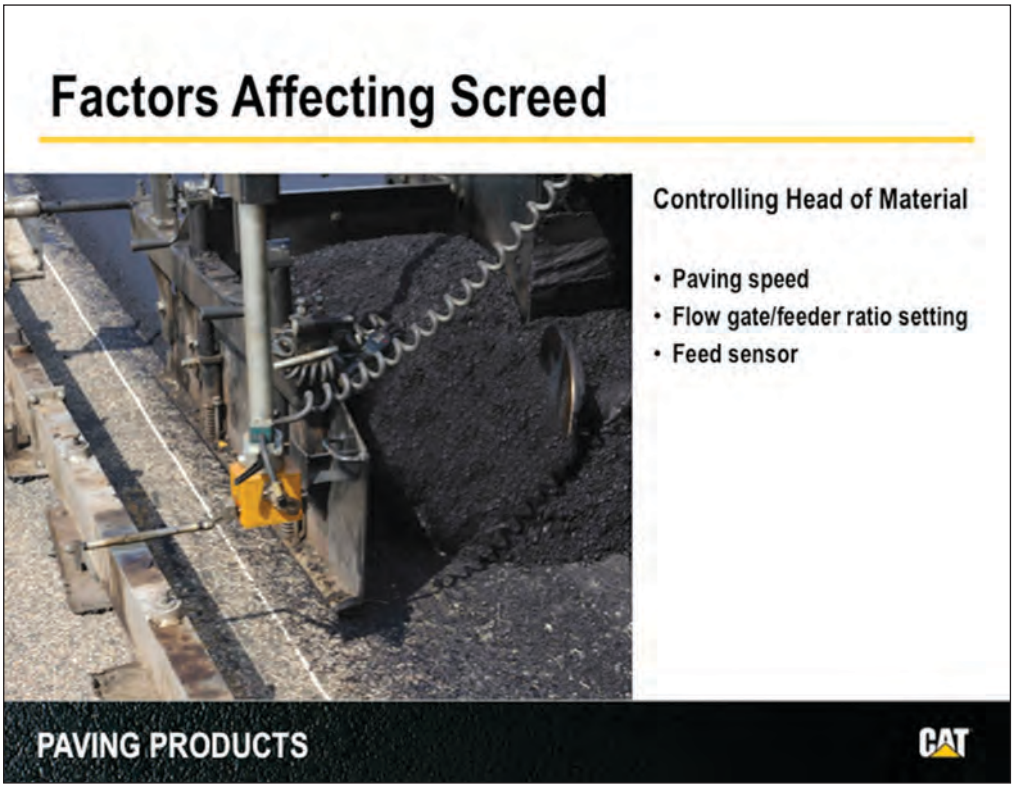
So, what happens next? When the operator picks up the next full truck, he normally puts the feeder system in manual mode and force feeds the material back to the auger chamber. In order to get the material spread across the entire paving width, it is common to overfill the auger chamber.



Now, the augers, especially at the center of the shaft, are mostly covered. This increases the resistance felt by the screed; the screed rides up; and the depth of the mat increases. In this situation, there will be a depression left by running the auger chamber too low, a rise created by overfilling the auger chamber, and finally another dip when the screed rides back to its normal level. This is not smooth paving.

Paving Tip: If you have run the auger chamber too low or are filling the auger chamber at the start of paving, don't use the manual override switches to force mix out to the end of the paving width. You'll probably overfill the center of the chamber. Instead, with the paver stopped, use the manual mode switches for the conveyor and augers. Carefully convey and auger fill in front of the screed to the level of one half auger, then shovel the mix by hand out to the end of the screed gates. **Don't forget to place the mode switches back into automatic before continuing.** This procedure takes just a few minutes and pays off in smoothness.

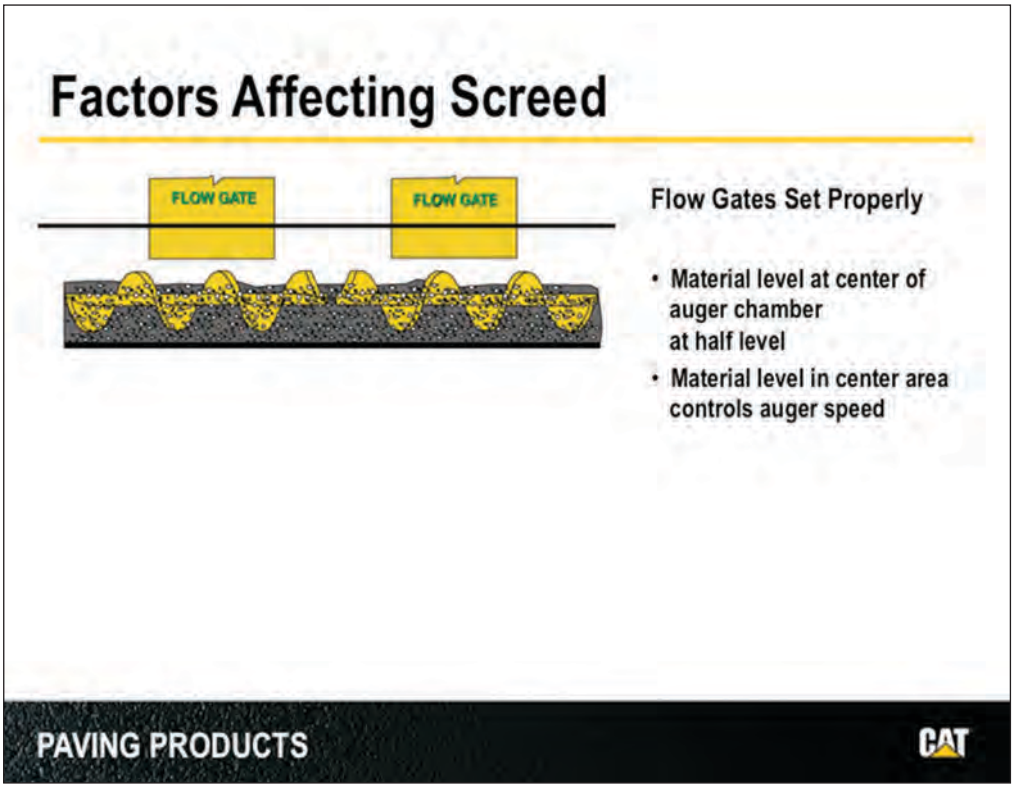
Even when paving at wide widths, it is possible to run with the augers covered to half level. For this application, use auger extensions and mainframe extensions. Be sure to position the feeder sensor out at the end of the live material. The system can be set up to control the volume of material properly, if we plan ahead and use the correct attachments.



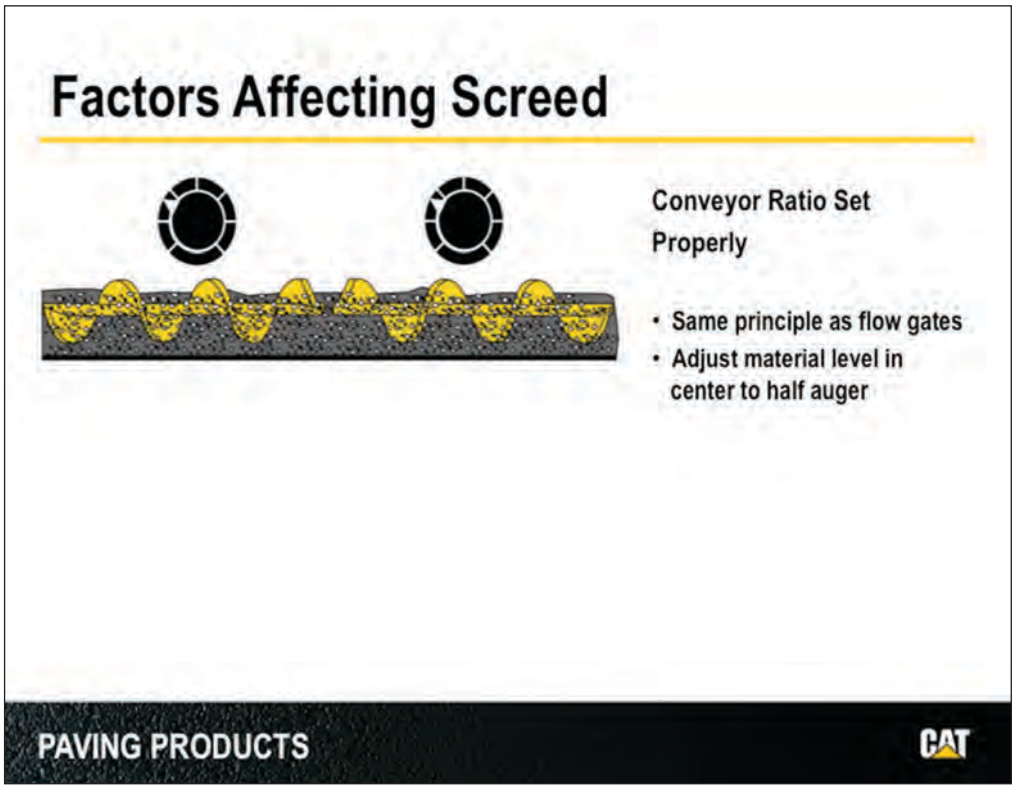
Next, let's look at how we can control the head of material. In practice, three elements need to be balanced to get and maintain the correct half an auger material height. The first factor to control is the paving speed. It should always be maintained at the calculated rate. The second is the position of the flow gates or, on newer pavers, the feeder ratio setting. The third is correct installation of the feeder sensors.

During the pre-project planning, the paving speed is calculated to match the delivery of mix to the job site. During the paving operation, the operator tries to maintain that speed at a constant rate in order to get smoothness.

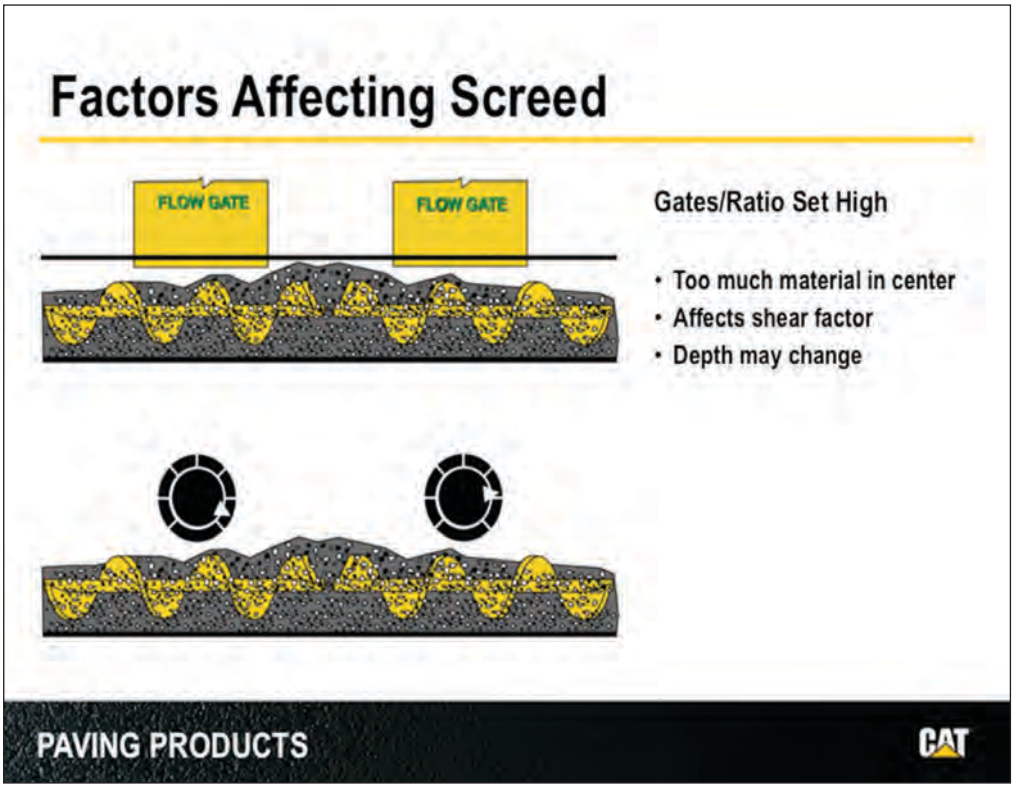
The feeder system is set to match the paving speed and provide a smooth flow of material from the hopper to the ends of the augers. When the paving speed changes, the feeder system will react automatically – either speeding up or slowing or running erratically. Occasional paving speed variations are expected, but if a major change in paving speed is needed for some reason, adjust the feeder system accordingly.



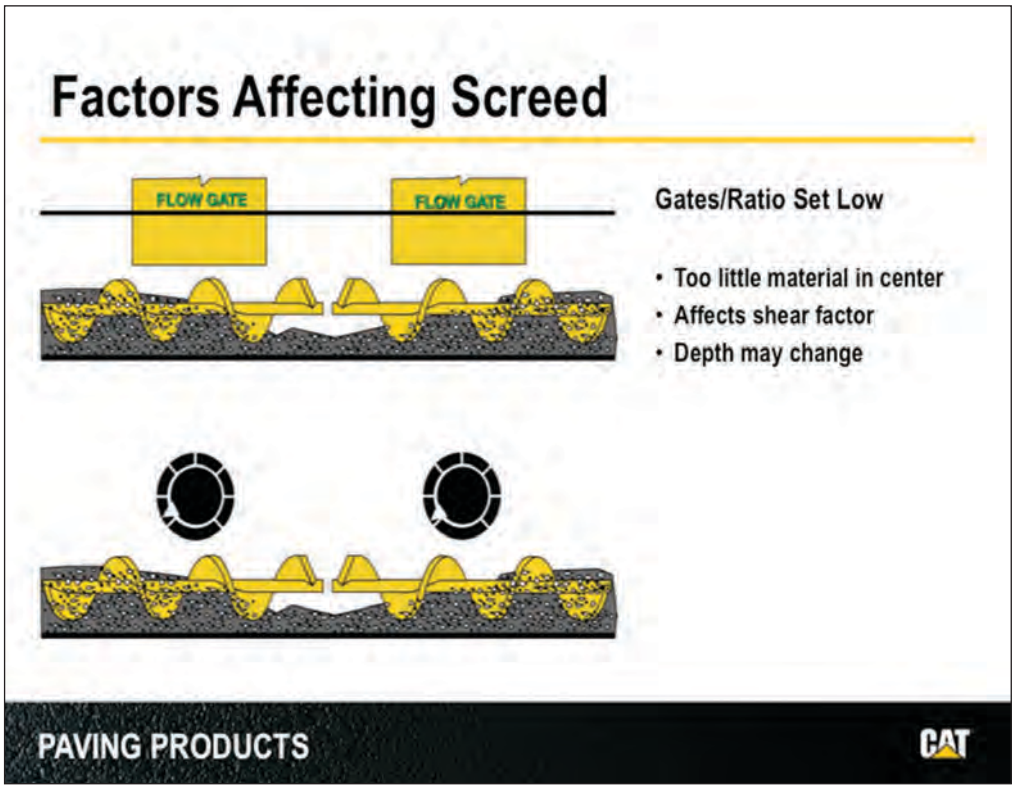
One feeder system set-up item is the position of the flow gates. These are used on some pavers and they control the volume of material carried by the conveyors back to the augers. Their primary effect is to influence the height of the material at the center of the auger chamber. When the flow gate opening is correct, the level is constant across the width of the augers and the auger chamber is half full. The position of the flow gates also influences auger speed. When less material is allowed back to the augers, they have to run faster. Typically, the flow gates are lowered as the paving width increases. This action makes the augers run faster to get material out to the end gates.



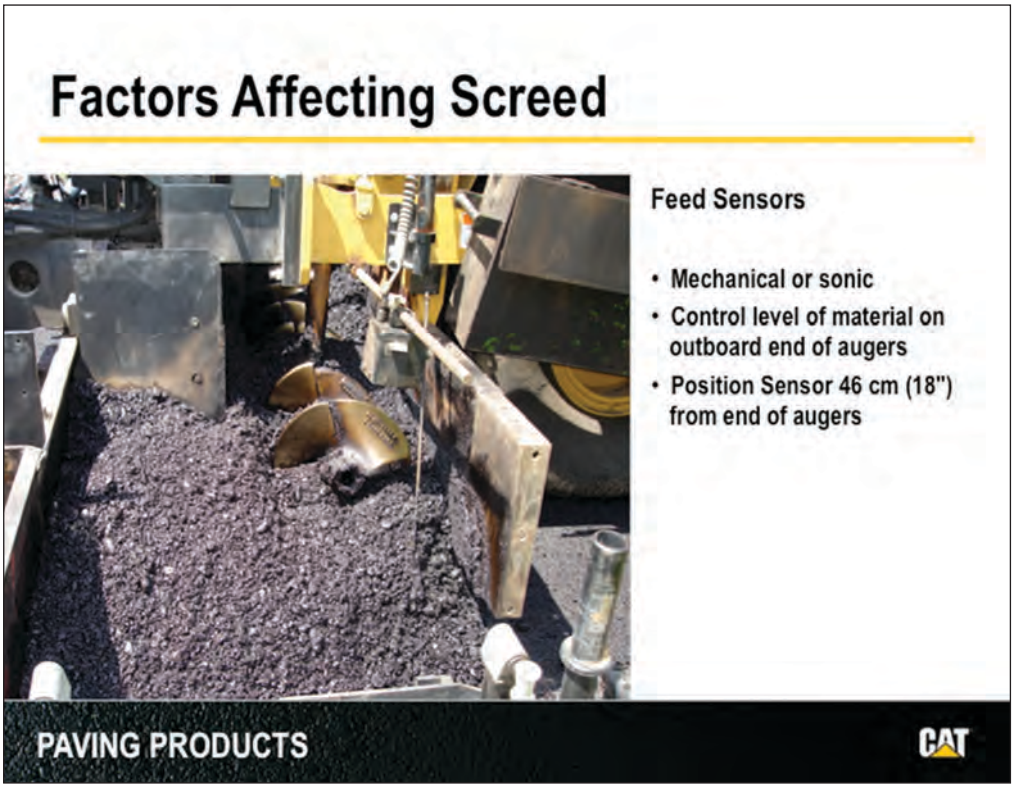
Many newer Cat and Barber-Greene™ pavers use Conveyor Ratio Dials instead of flow gates. The principle is the same as the flow gate control. But, instead of regulating the volume of material carried by the conveyors, the ratio dials regulate the speed of the conveyors as a percentage of the auger speed. The desired end result is still to have the auger chamber half full across the entire auger width.



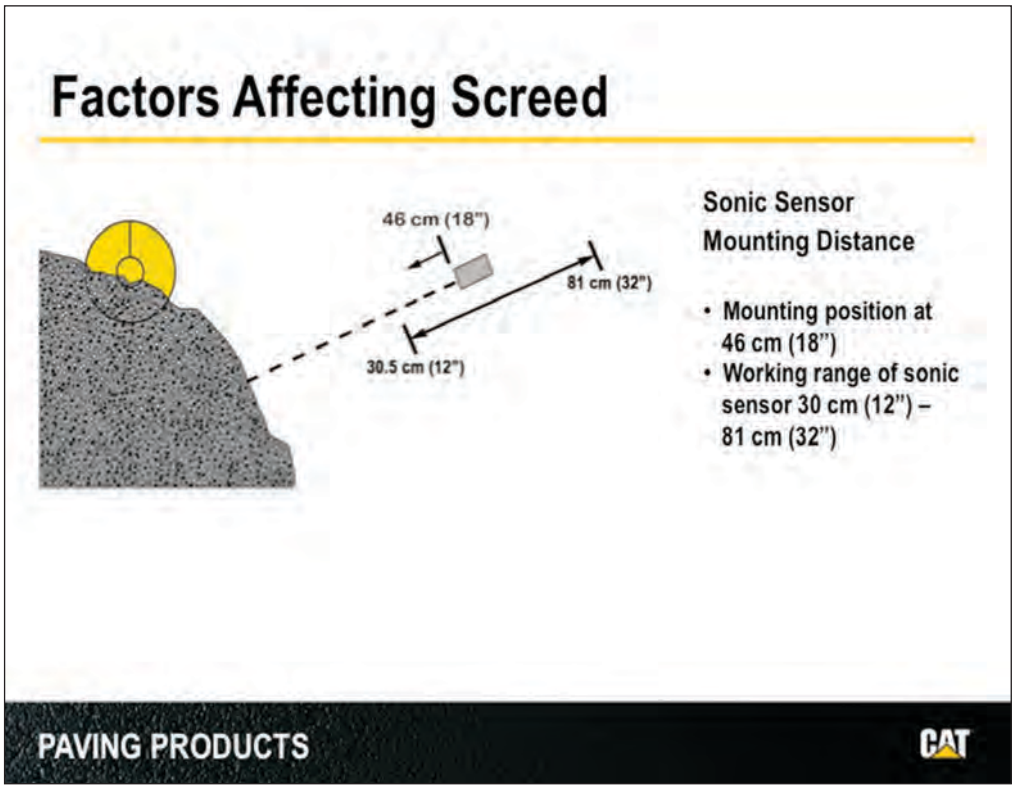
If the flow gates or ratio dials are set too high, there will be too much material in the auger chamber, especially in the center of the augers. The extra material will affect the shear factor of the screed and the mat depth may change.



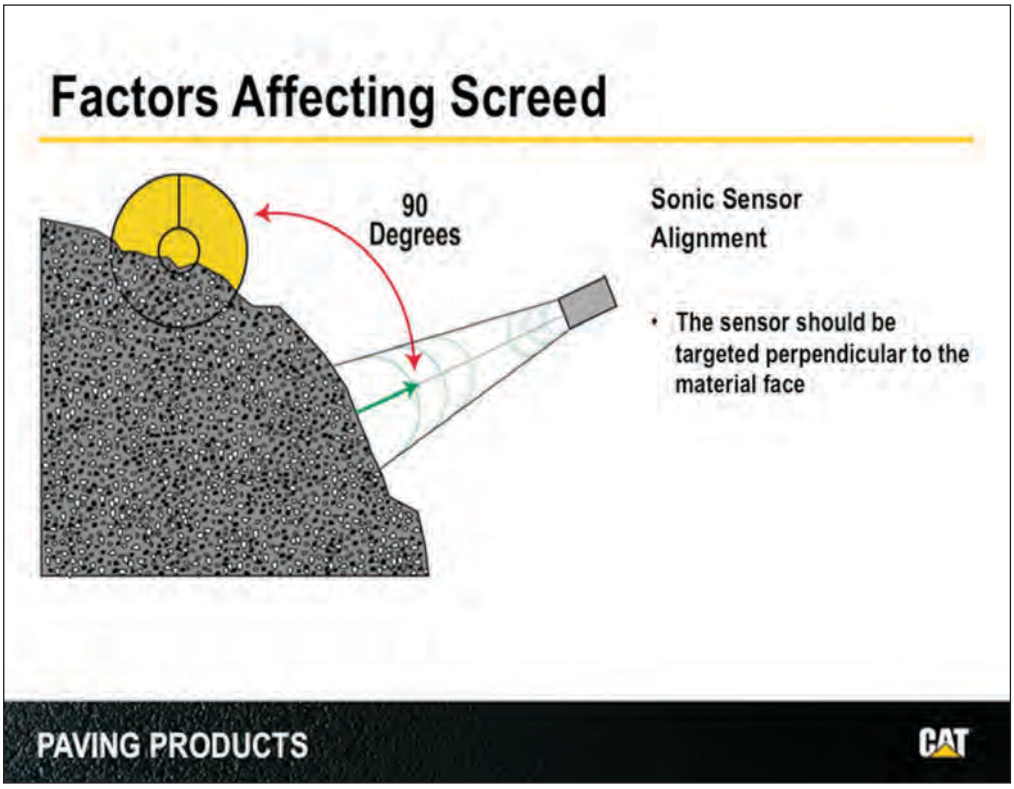
Conversely, if the flow gates or ratio dials are set too low, the feeder system will be starved for material and the augers will be uncovered. Again, the resultant change in shear factor may cause the mat thickness to vary. In this situation, the augers will automatically speed up to get material out to the ends where the sensors are located. Material segregation is another possibility when the auger chamber lacks mix.



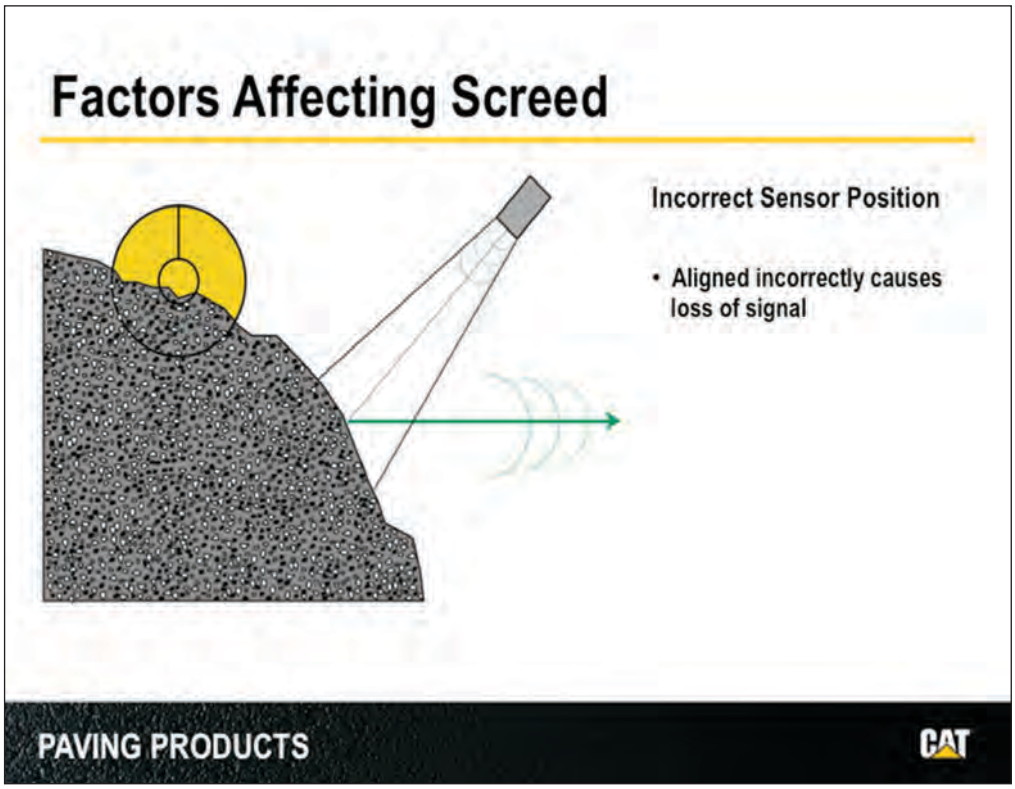
The third element in controlling the head of material is installation and set-up of the feeder sensors, either the mechanical paddle-type (shown) or sonic sensors. Feeder sensors control the level of material at the outboard end of the augers. Feeder sensors should be installed outboard of the last auger segments where they are sensing material that is moving in a steady pattern. You want to position the feeder sensors, either paddle-type or sonic, so they are sensing the active pile of material about 46 cm (18”) away from the last auger segment. If you have a paddle-type sensor, the paddle arm should be at a 45 degree angle at the 46 cm (18”) distance. If a sensor is positioned too close to the auger, it will be affected by the “wave” action of material coming off the auger and operation will be erratic. If a sensor is too far away from the auger, it may cause the feeder system to overfill the auger chamber.



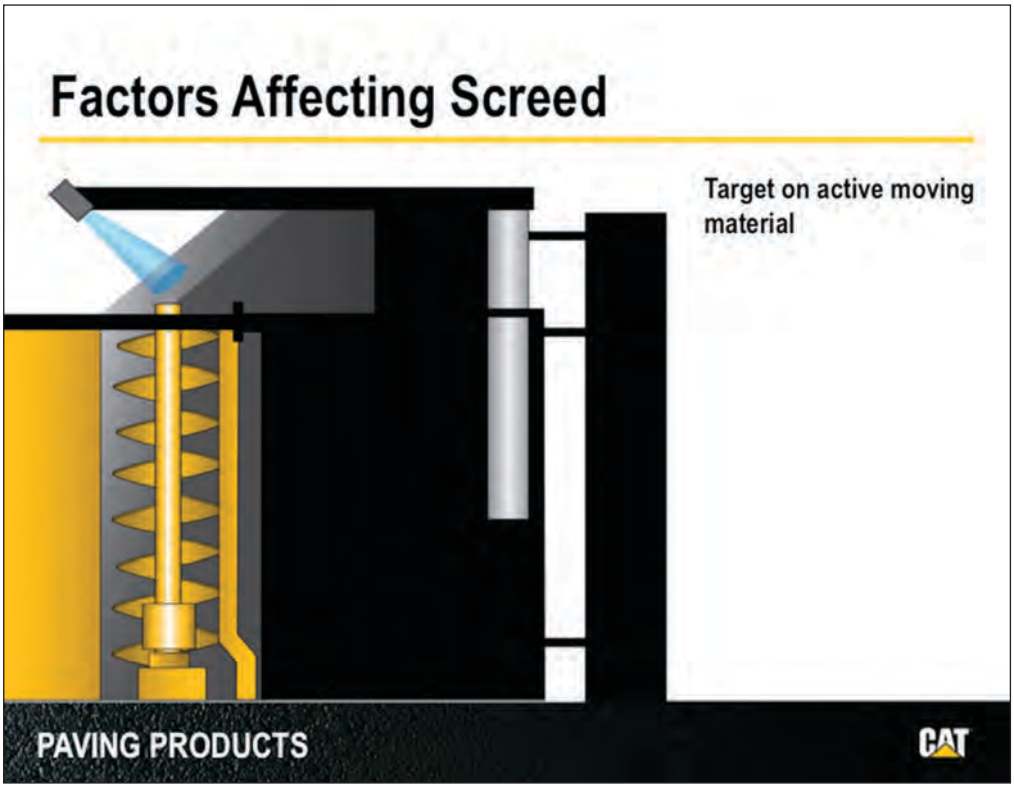
The same general rule applies for installation of sonic feeder sensors. The optimum distance away from the pile of material is around 46 cm (18”). The working range of the sonic sensor is less than 30 cm (12”) = full OFF to 81 cm (32”) = full ON. The modulation range of the sensor is anywhere in between that range. So by placing the sensor at the distance of 46 cm (18”) the operator will have a good range to control the mix height at the end of the auger.



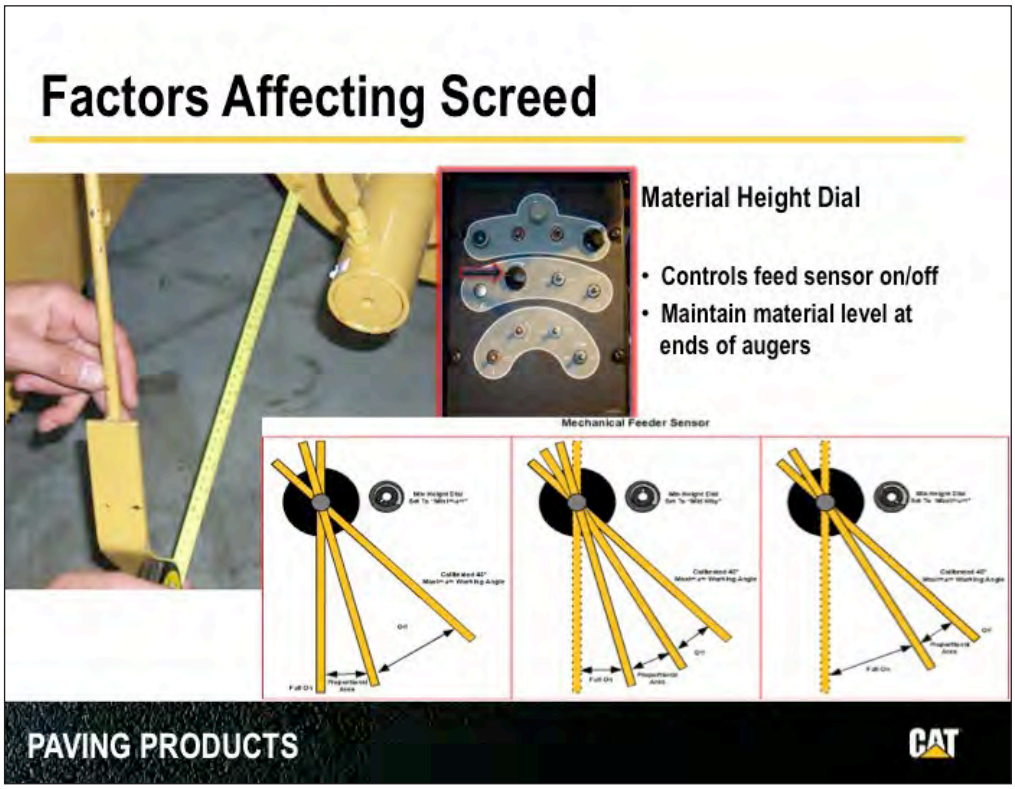
Aim a sonic sensor perpendicular to the material face. A sonic sensor generates a pulse of sound which travels to the material pile and is reflected back to the sensor. The sensor measures the time it takes for the pulse to travel out and back, and then calculates the distance.



Misaligned sensors will generate a signal which can bounce away from the sensor rather than directly back to it. Loss of signal will cause the sensor to function erratically or to not function at all.



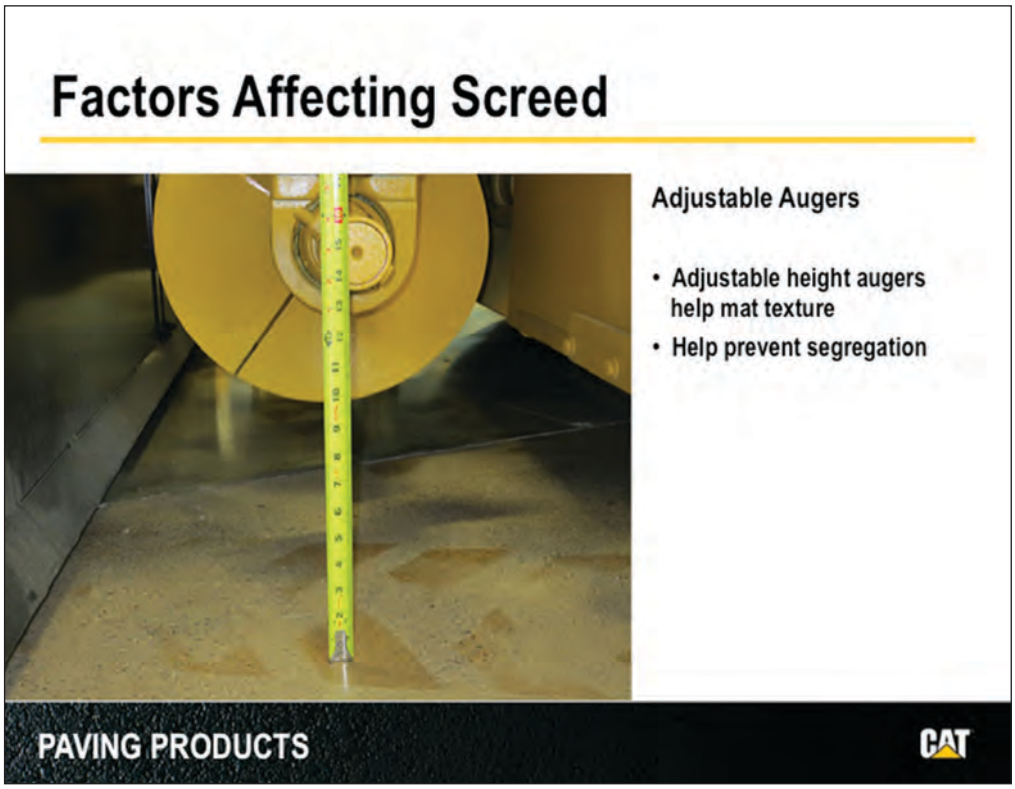
Target the sonic sensor on the active material. There will be a band of material that is steadily moving. Do not target a stationary pile. Targeting a stationary pile will result in a simple ON or OFF operation and will not control material feed properly.



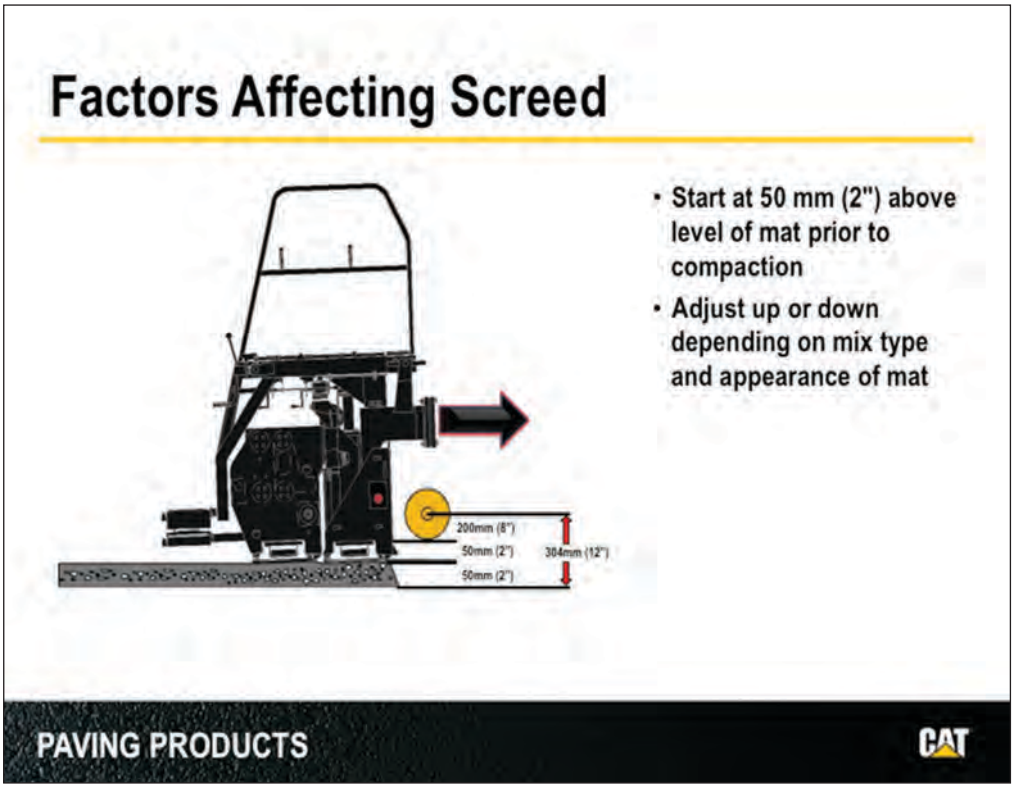
Another feature of many newer pavers is the material height dial located on the screed control box. Once the sensors, mechanical or sonic, are positioned, the material height dial is used to adjust the height of the mix at the end of the augers. These dials affect the proportional nature of the feeder sensors. Turning a dial counterclockwise makes the sensor more reactive to changes in height and the material height is reduced by quickly slowing or stopping the auger shaft. Turning a dial clockwise lets the auger run longer before slowing or stopping and the height of the material is increased.

Controlling the head of material during variable width paving requires a lot more control and judgment by the paving crew. Due to time limitations, it is usually not practical to add or remove auger and mainframe extensions when there are frequent changes in paving width. And, the crew is normally not going to re-position the feeder sensors every time the screed extenders are moved. So, it is likely that the crew will be running the feeder system in the manual mode to control the head of material.

There is a tendency to overfill the auger chamber and the area in front of the extenders when operating in the manual mode. A large head of material will cause the screed to ride up and increase mat thickness. To avoid this condition, be prepared for the change in paving width, and move material by hand (shovel) if necessary to get mix out to end of the screed extender without overfilling the auger chamber.



Another factor that the crew must consider when setting up the feeder system is the height of the augers. Many pavers now have power adjustable augers as a standard feature. Often the paver will show up at the job with the augers fully raised for transport. Setting the auger height correctly will improve mat texture and help prevent segregation.

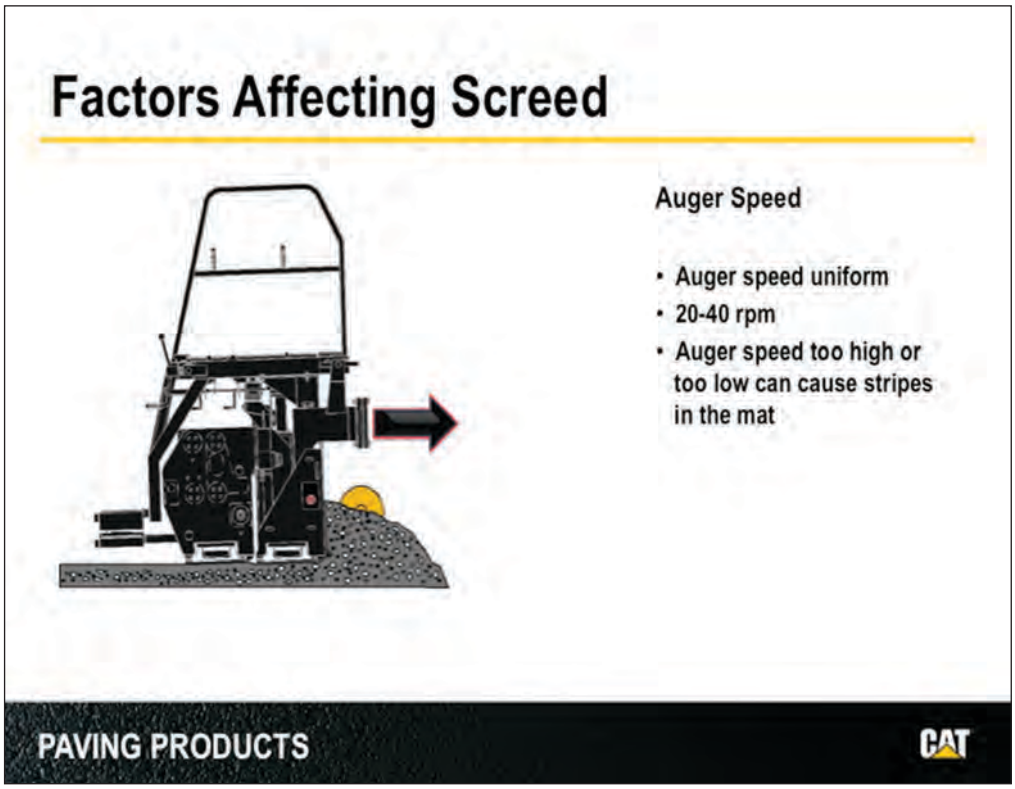


Different mixes react differently to auger height adjustment, but as a rule, set the auger height at least 50 mm (2”) above the height of the uncompacted mat.

From the bottom of the auger to the center of the auger shaft is 200 mm (8”). Now add the thickness of mat to be paved. Then add 50 mm (2”) to that. The total is the distance from the centerline of the auger shaft to the grade. Adjust the auger up or down until the dimension is reached.

Fine tune the auger height after paving starts. If the augers are set too low, you will probably see segregation immediately. This is particularly evident when paving with large stone mixes. If the augers are set too high, the head of material will also be too high and there will be a large horsepower draw to run the feeder system.

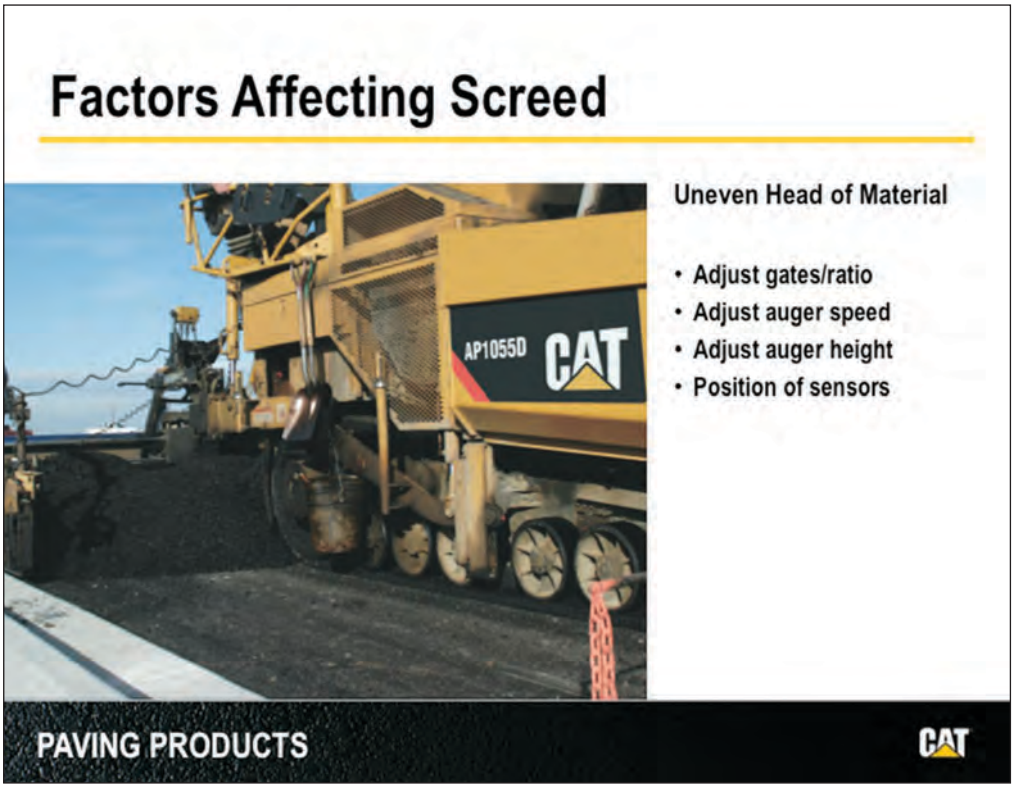
When you make an adjustment to auger height, allow the paver to travel at least the length of the machine before evaluating the result of the change.



Auger speed can also play an important role in the production of a good mat. The goal is to set up the feeder system so the augers run continuously at a uniform speed. When the paver begins to accelerate up to working speed, the augers should begin to turn and increase speed until they level off to match the working speed. The target auger speed is in the range of 20-40 rpm.

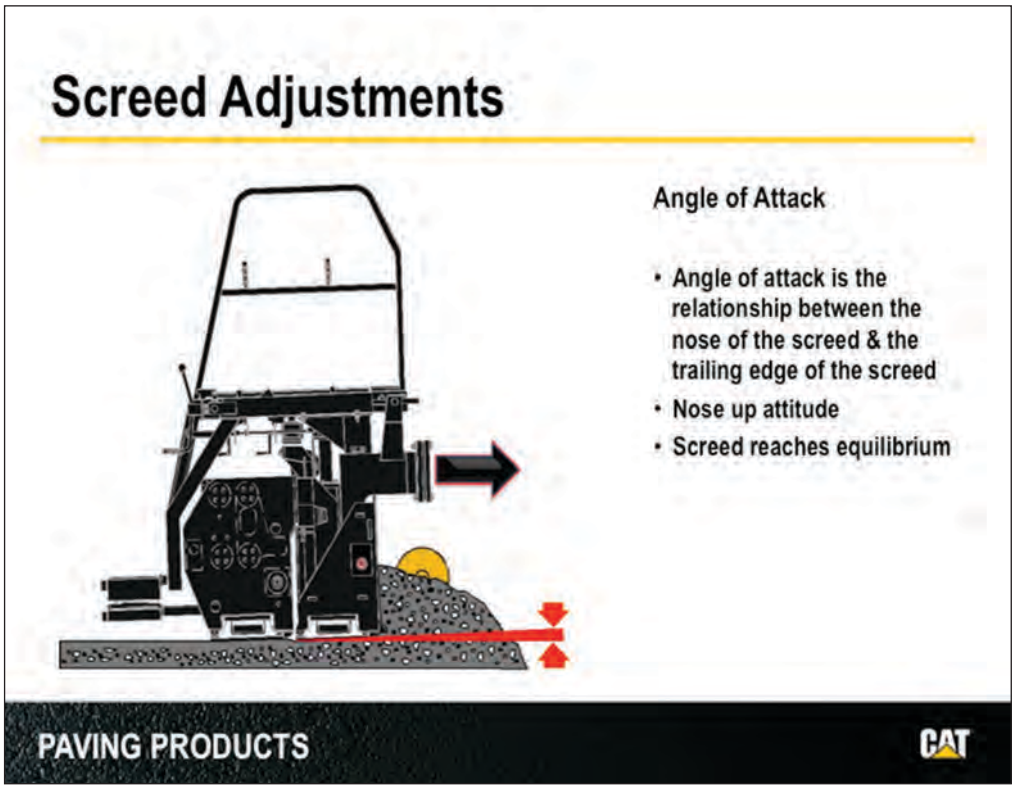
Auger speed that is too high or too low is likely to cause material segregation which will be seen as stripes in the mat. Normally, if the auger speed is too low, the stripes will appear in the center of the mat. If the auger speed is too high, the stripes will appear at the edges of the mat.

To change the auger speed, change the volume of material being delivered by the conveyors. Either adjust the flow gates or use the conveyor ratio dials. Sending more material will slow down the augers; sending less material will cause the auger speed to increase.



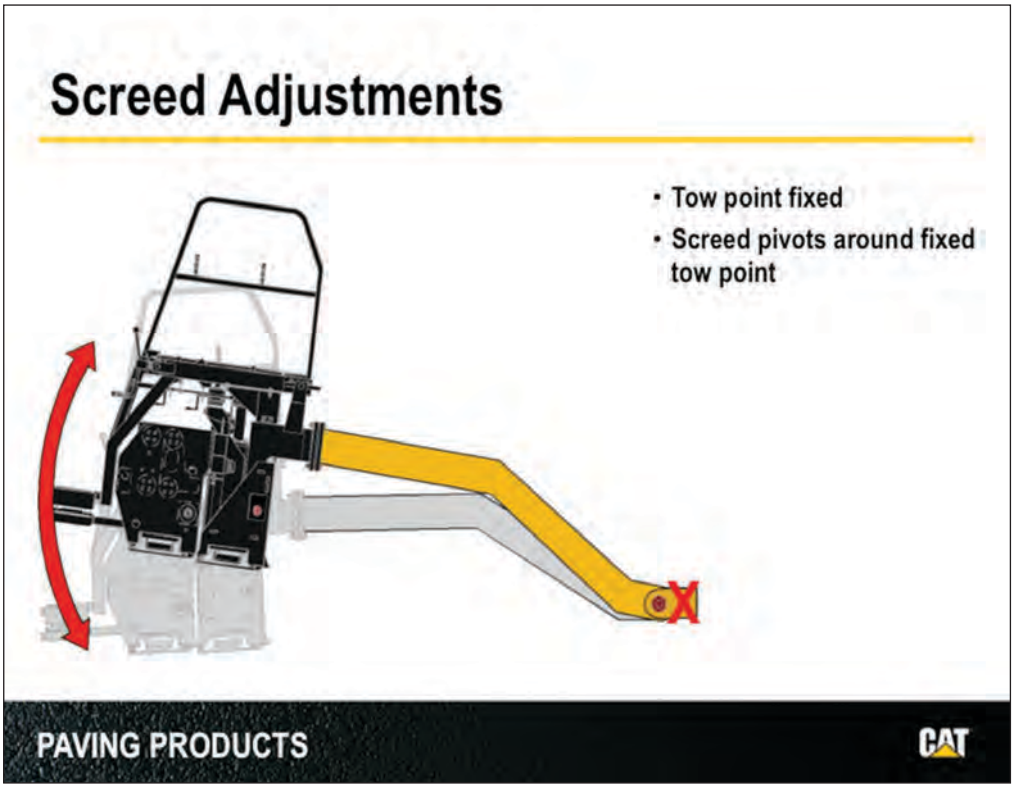
Let's summarize the feeder system factors which affect the screed and consequently mat quality. The most common problem is an uneven or inconsistent head of material. Remember the guidelines: fill the auger chamber halfway and keep the material level across the entire paving width. Next, adjust the flow gates or ratio dials to get the right amount of material back to the augers. Keep the augers running continuously in the range of 20-40 rpm. Set the auger height to 50 mm (2") above the level of the material passing under the screed – adjust the auger as needed. Position the sensors 457 mm (18") away from the last auger segment; make sure sonic sensors are properly aimed at the live area of the material.

If the paving speed is consistent and the feeder system is set up properly, many mat quality and texture problems will disappear.



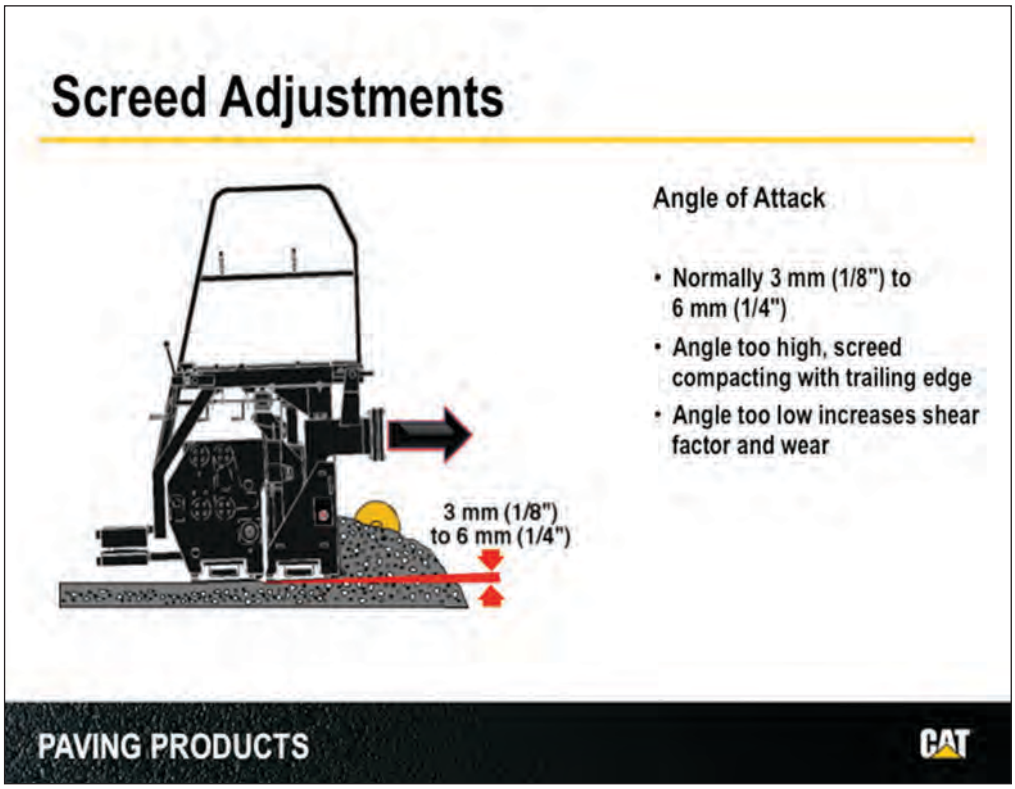
In this section, we'll cover some screed operation theory and learn more about how a screed reacts. The first concept to understand "angle of attack."

The angle of attack is the relationship between the nose of the screed and the trailing edge of the screed. A screed always runs with a slight nose up attitude. This provides the lift that allows the loose material to pass under the screed and allows the screed to ride up on the material until equilibrium is achieved. Then, the screed remains at the equilibrium height.

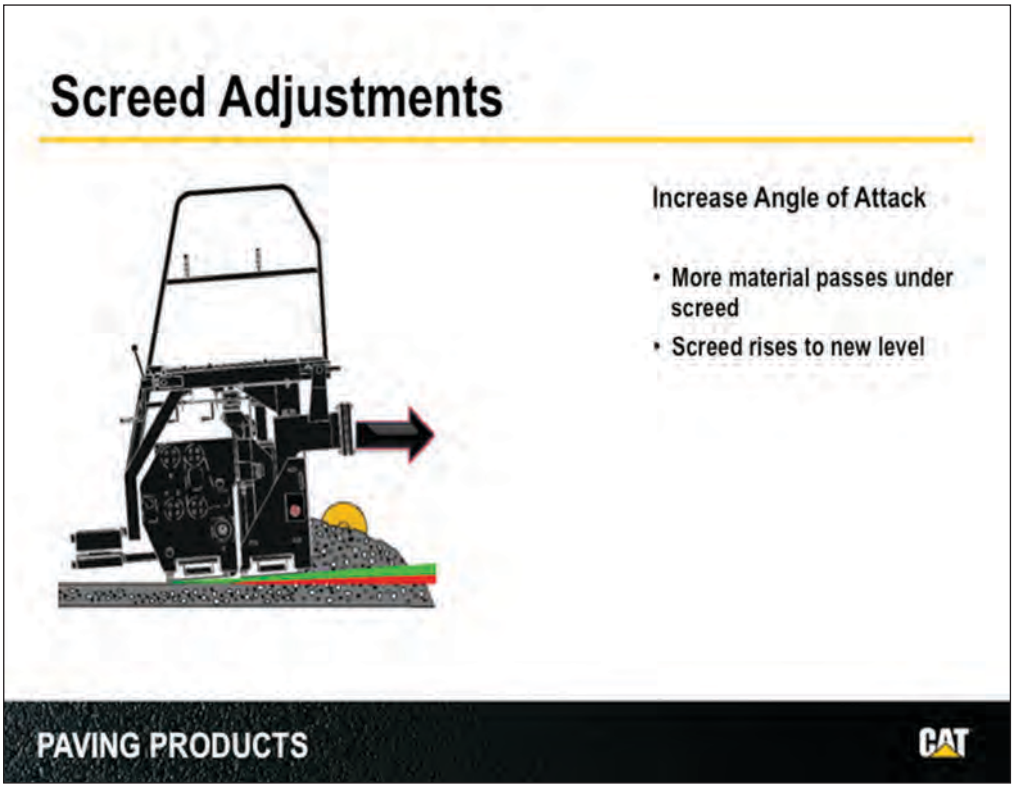


A free-floating screed is towed by the tractor. It is connected to the tractor at the tow points on each side of the tractor. The tow point is fixed. The screed actually pivots around the fixed tow point.

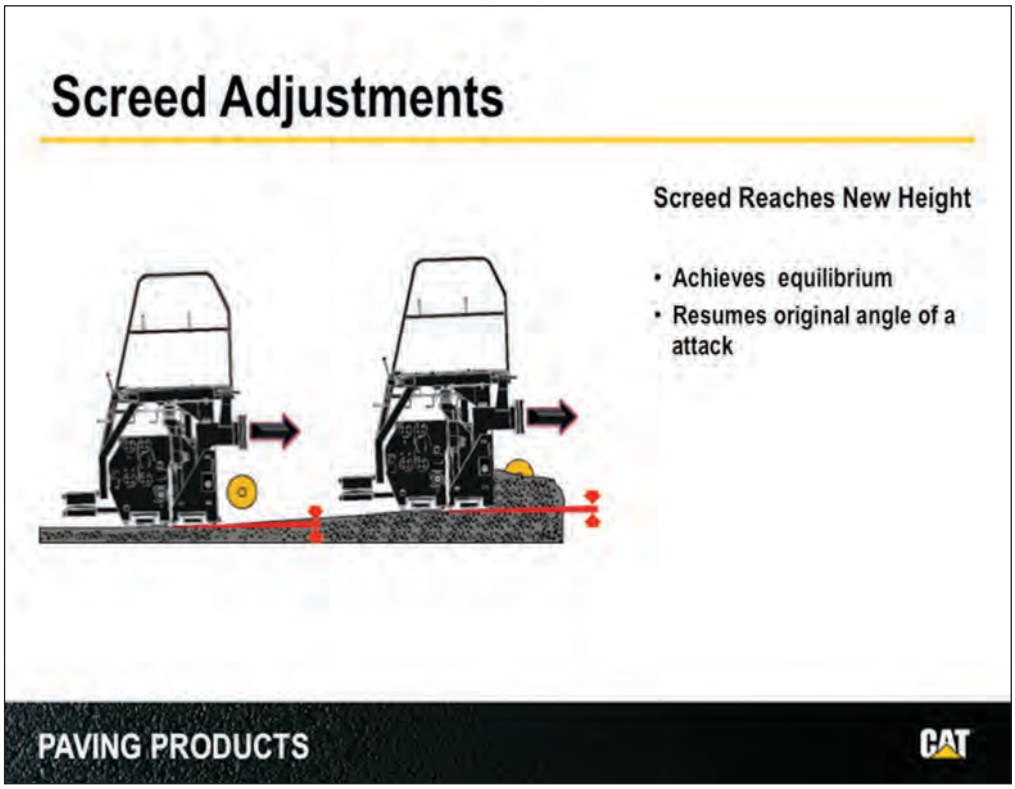
The screed, attached to the ends of the tow arms, moves up and down in an arc, not a straight line. As the back of the screed moves around the arc, the front of the screed tends to go nose down (if the screed movement is up) or go nose up (if the screed movement is downward). Therefore, as the screed moves up or down, it cancels the change in angle of attack until equilibrium is reached.



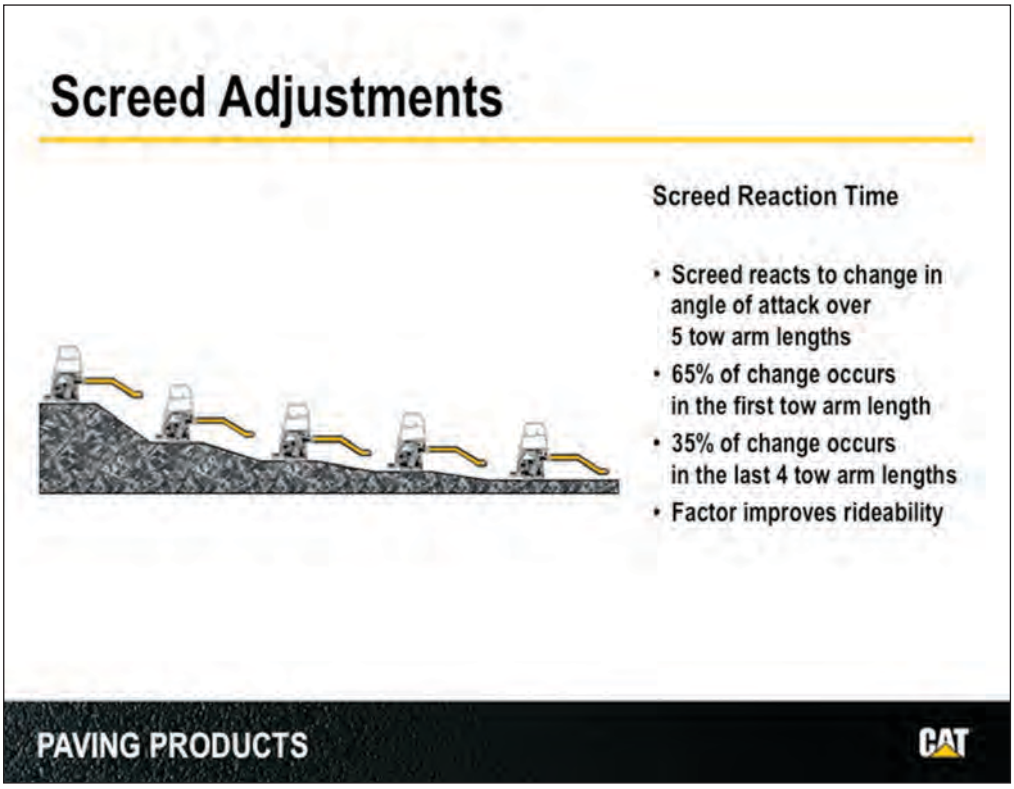
The angle of attack should be set between 3 mm (1/8”) and 6 mm (1/4”). This is the height difference between the trailing edge of the screed and the leading edge of the screed. Operationally, the angle of attack is introduced by using the depth control cranks while the screed is set on the starting point reference. With the screed set at this attitude, the full screed plate is being used to finish and pre-compact the mat. If the angle is set too high, the trailing edge will be doing most of the work; the mat will have a shiny appearance; and wear at the trailing edge will be excessive. If the angle is set too low (nose down attitude), the shear factor will increase and the nose bar will wear excessively. There will also be poor mat texture, because only a portion of the screed plate is finishing the mat surface.



During paving operation, it is common to change the angle of attack in order to change the depth of the mat. The change can be done manually through the depth cranks or automatically at the tow point. When the angle of attack is increased, as shown in this example, more material passes under the screed. The screed rides up to a new level.

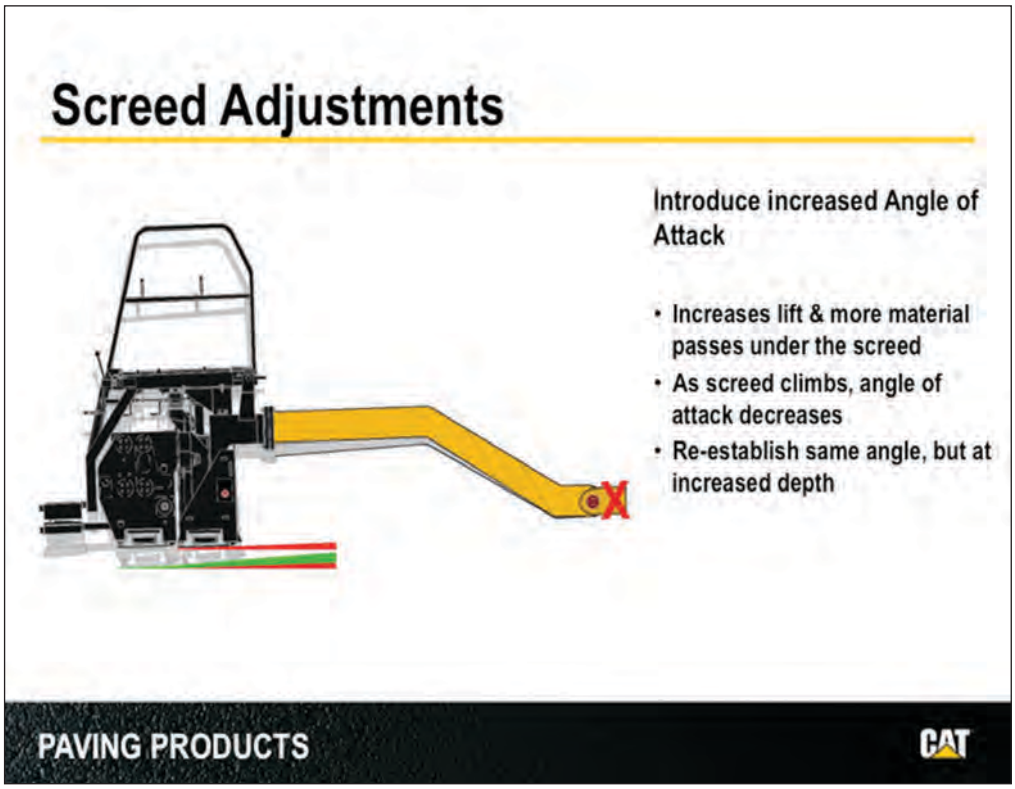


Depending on the amount of increase in the angle of attack, the screed will finally reach a new height at which equilibrium is achieved. At that time, the screed will resume the original angle of attack that was introduced at the start of paving.



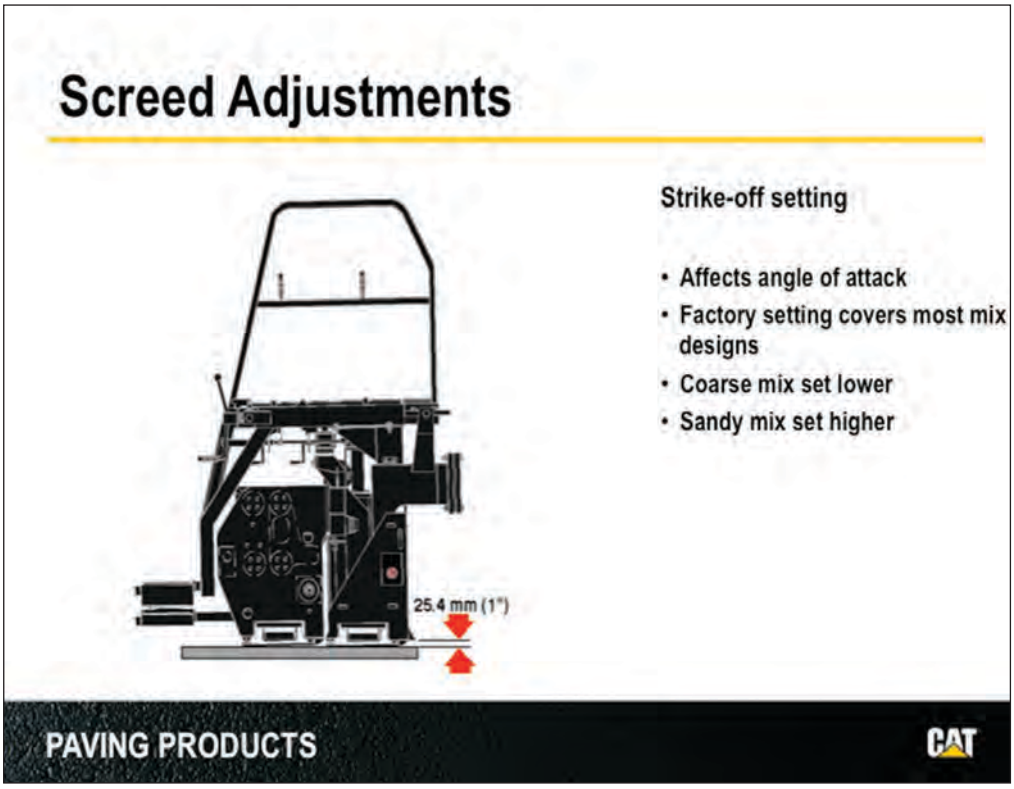
The screed reacts immediately to a change in the angle of attack, but does not complete the change (reach equilibrium and resume the original angle of attack) until it has moved forward a distance equal to about five tow arm lengths. Most of the depth change, either up or down, occurs quickly. 65% of the change happens in the first tow arm length of machine travel. The balance occurs more gradually over the last four tow arm lengths.

It is the nature of a free-floating screed to resist change. Therefore, any depth change will occur gradually and rideability (smoothness) is improved.

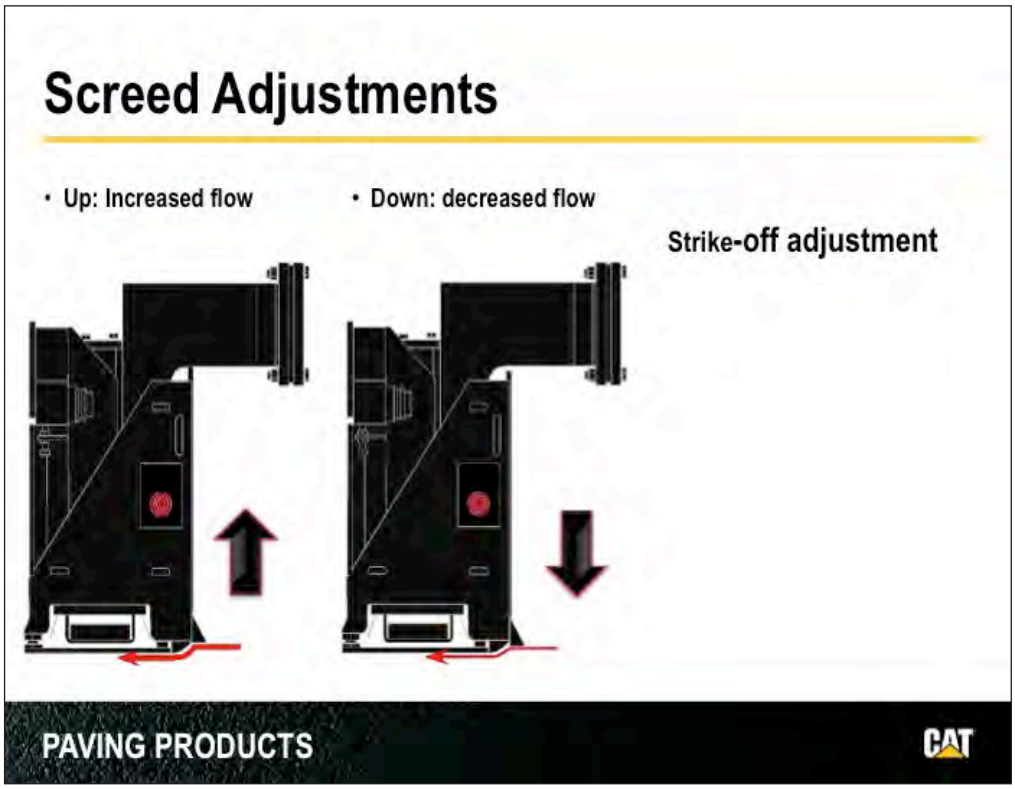


Here are the key points to remember about the screed angle of attack. First, we introduce the angle of attack at the beginning of the paving operation. Normally, we want the screed to run nose up about 3 mm – 6 mm (1/8”-1/4”). Second, increasing the angle of attack increases lift and more material passes under the screed. Then, as the screed climbs, the angle of attack begins to return to the original setting. Finally, after paver movement that equals five tow arm lengths, the screed will reach equilibrium and reestablish the original angle of attack, but producing increased mat depth.

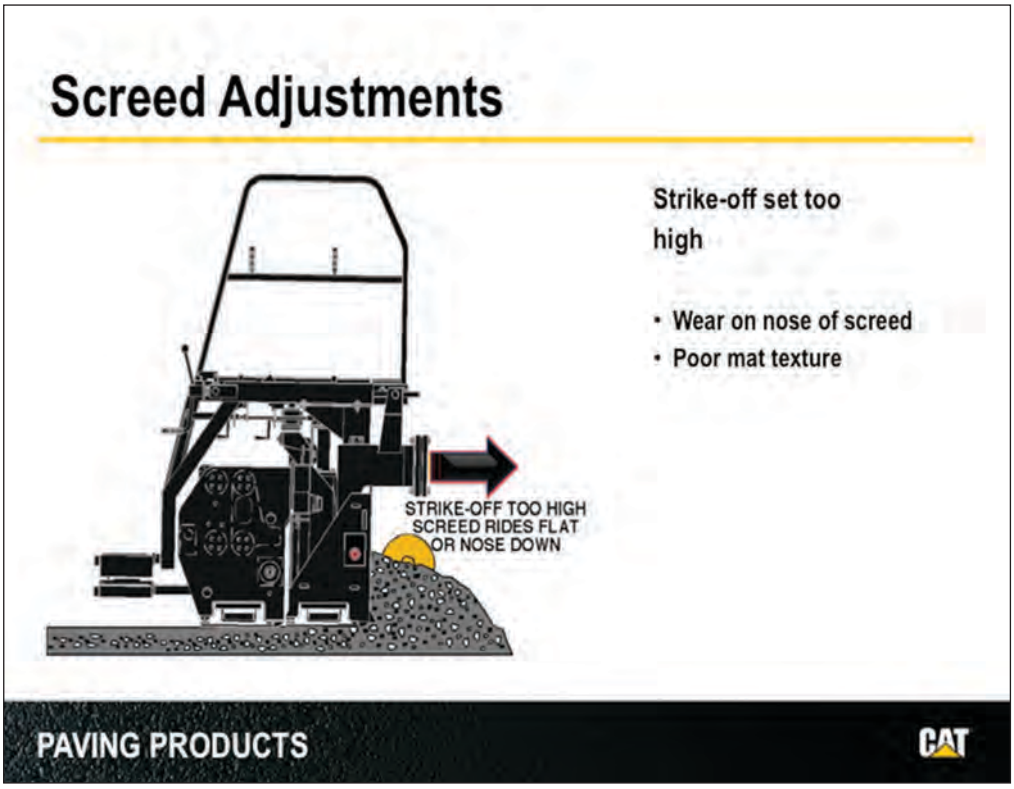
Paving Tip: You can make the screed more or less reactive to changes in the angle of attack by the position of the grade sensor(s). If a sensor is positioned close to the screed, the screed reacts quickly to changes in the angle of attack. Positioning the sensor close to the tow point slows the screed reaction. Where the sensor is positioned depends on the paving application. To match a joint, you want a reactive screed. For increased ridability, you want a screed which reacts more slowly.



The position of the strike-off which is located in front of the screed plate also affects the angle of attack. The strike-off is a material metering device which is vertically adjustable. At the factory, it is set 25.4 mm (1”) above the screed plate to expose a portion of the rounded nose bar. The more the nose bar is exposed, the more lift is applied to the screed. The factory setting of 25.4 mm (1”) is suitable for most mixes and most applications.

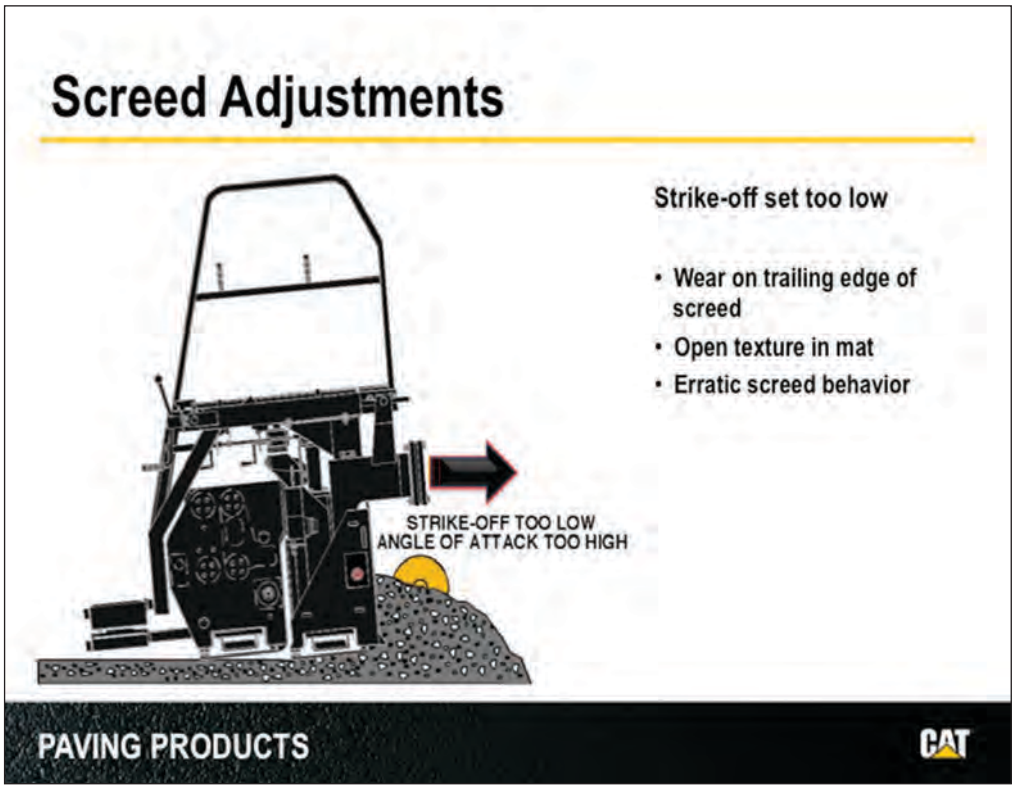


When the strike-off is raised, material flow under the screed is increased causing the screed to rise. When it's lowered, less material is allowed causing the screed to fall.



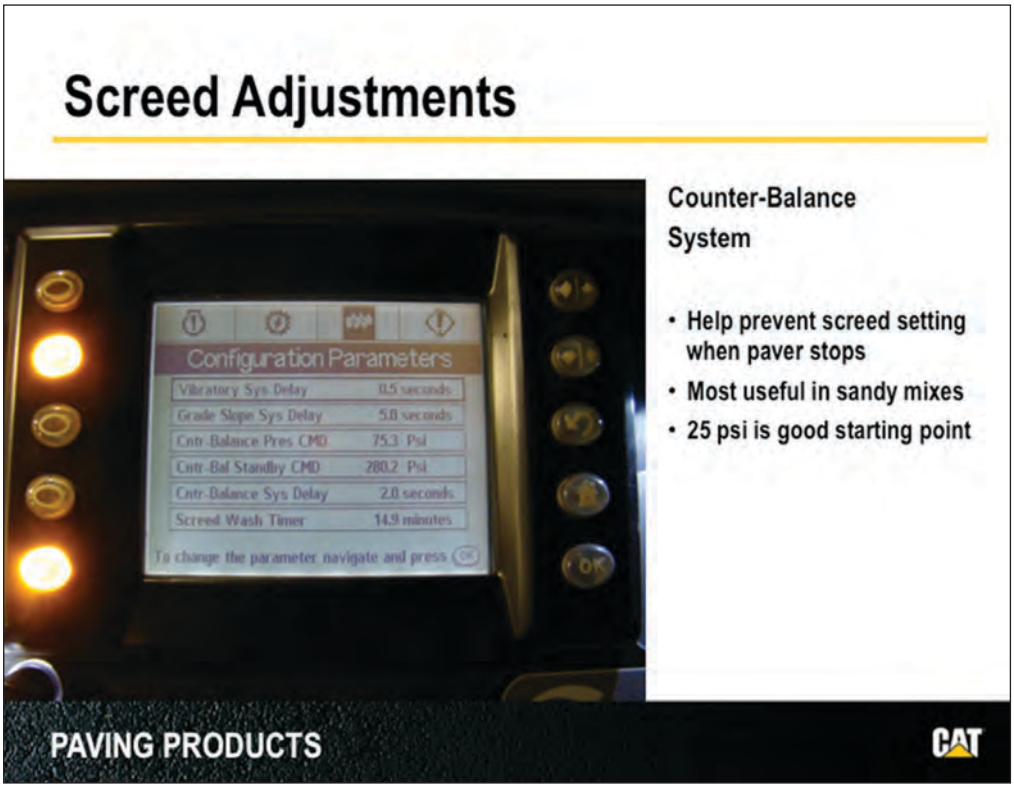
If the strike-off is set too high, more of the nose bar is exposed and lift is introduced to the screed. To compensate for the added lift, it will be necessary to decrease the angle of attack. In other words, we will force the screed to ride on its nose. Wear on the nose bar and front of the screed plate will be excessive. There will also be poor mat texture, because only a portion of the screed plate is finishing the mat surface.

Paving Tip: As previously stated, the factory strike-off setting is adequate for most mixes. However, paving with large stone mix may require you to lower the strike-off slightly.



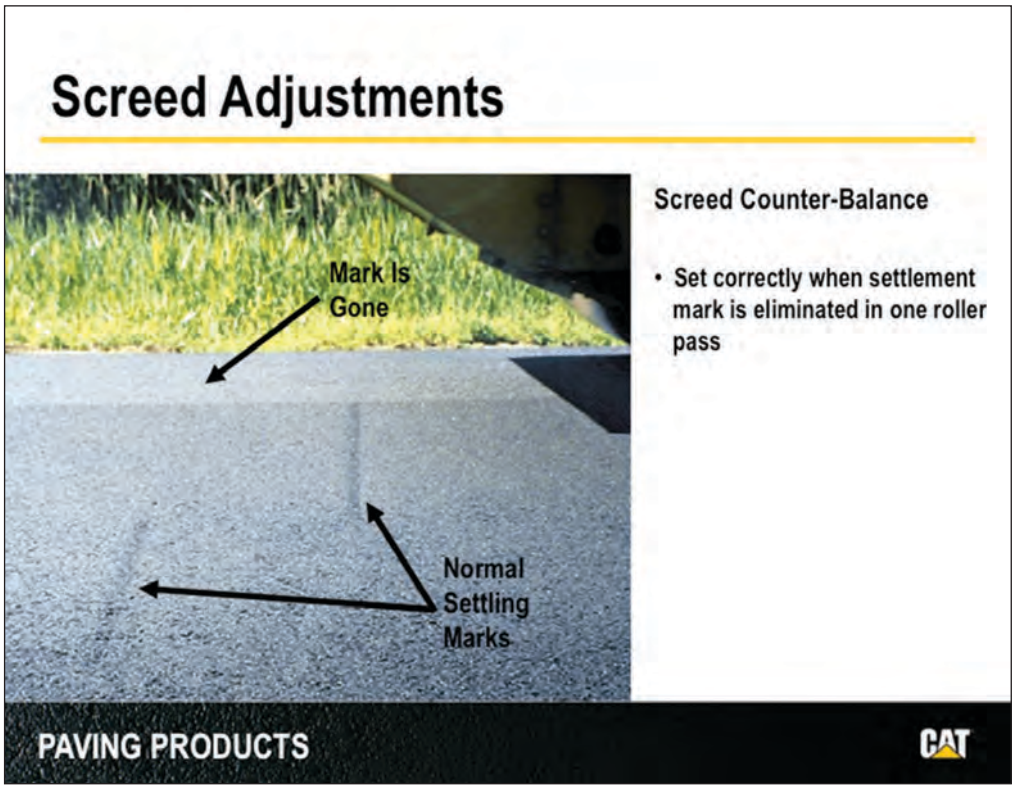
If the strike-off is set too low, the nose bar will be covered too much and there will be a reduction in lift forces felt by the screed. To compensate, it will be necessary to increase the angle of attack and the screed will run on its trailing edge. If you see a shinny appearance in the mat, this is an indication that the screed is using only a portion of the trailing edge to finish the mat. Also, because the screed is balanced on a small portion of the screed, it will be very sensitive to any changes and can react erratically.

Paving Tip: The strike-off may be raised slightly when working with sandy mixes.



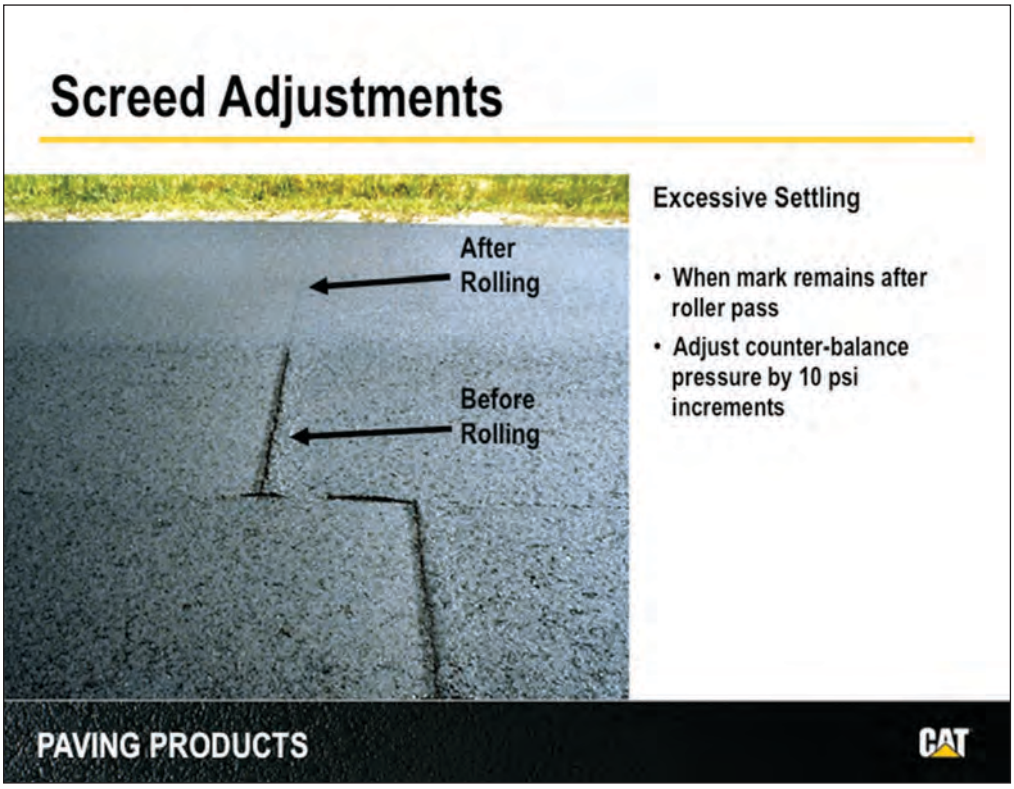
The screed counter-balance system is another feature which affects screed performance. When the counterbalance system is activated, it exerts a small amount of upward hydraulic pressure (lift) through the screed lift cylinders. Its purpose to is to help reduce screed settlement marks when the paver is stopped. It is most useful when working with sandy or tender mixes. On newer Cat Pavers it can be viewed and adjusted via the Advisor panel. Older generation machines are equipped with a pressure gauge and adjustment dial. The factory setting is 50 psi. If counter-balance is required you should reduce the pressure to the lowest possible setting to receive desired results, never to exceed 150 psi.

Paving Tip: At the start of a paving operation, place the counterbalance switch in the OFF position. Only activate the counter-balance system when there are screed settlement marks which remain after one roller pass.



A simple visual test will determine if the screed counter-balance pressure is set correctly or is needed. The first time the paver stops on the fresh mat (waiting to pick up a truck, for example), note the settlement marks left in the mat after the paver begins to operate again. Then, observe the lead compactor. If the lead compactor can eliminate the settlement marks in one pass the counter-balance is not needed and should not be used.

Remember, the screed is free-floating and we don't want to interfere with the free-floating nature by putting in too much counter-balance pressure. In most cases, the counter-balance is not required.



But, if the settlement marks remain visible after one roller pass, you'll need to turn on the counter-balance and adjust the pressure and re-test. Using a starting point of 25 psi adjust the pressure upward in 10 psi increments until the lead roller is removing the marks in one pass.

Note: If the pressure of the screed counter-balance system is increased above 1035 kPa (150 psi), the mat density may be affected. The mat density will have an open texture and the mat may require additional compaction from the compactor.

Note: If the pressure of the screed counterbalance system is increased above 1035 kPa (150 psi), the automatic grade and slope controls may be affected. The higher pressure can cause the screed to not float due to the material and the higher pressure. This will affect the ability of the grade control to maintain the proper elevation. An indication of a high-pressure setting is a grade that does not match the joint properly. A wavy mat can also result from the pressure that has been set improperly.

Note: Adjusting counterbalance pressure, either up or down, will affect the weight of the screed and may cause the screed to run at a different angle of attack.

Paving Tip: Be sure to check the depth and look for texture changes. Make final depth corrections after the counterbalance pressure is set for the type of mix.

Notes

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