Chippers: Can Safety Be Engineered?

By Peter Gerstenberger

Wood/Chuck developed the patent pending "Panic Bar," painted yellow above, to provide a dedicated, durable mechanism to stop the controlled feed system, and to lock the system out, in an emergency situation.

The short answer to the question our title poses is a qualified, "Yes." There are a few, fairly simple principles that need to be explained. A "hazard," we probably all know, is something with the potential to cause harm. Hazards are created by conditions and by actions.

Just as there are two broad causes of hazards, there are two ways to reduce hazard. An engineering control modifies a condition to reduce the hazard. An administrative control is something that changes behavior, and therefore reduces the hazard in an action.

In a perfect world, safety would be completely engineered. There would be nothing to think about, and no chance of making a mistake and causing an accident.

But of course our world, and especially our work environment, is far from perfect. As someone responsible for the safety of yourself and others, you need to be aware of every safety opportunity out there.

Brush chippers provide the perfect example of these principles. They are a vital part of the arborist's world. Their very purpose – reducing large tree limbs to small chips – points to the most significant hazard condition they create. The best way to mitigate the hazard is with awareness, attitude, training, specific procedures for operation, and appropriate supervision. All of these things are considered administrative controls. These are the areas in which you should concentrate your efforts if you want to have accident-free chipper operations.

Bandit's wooden push paddle is a simple, expendable tool to help the operator resist the temptation of reaching into the infeed chute to push small pieces.

But our title talks about engineering, and we started by saying that to some extent, safety can be engineered into chippers. There is no engineering standard for brush chippers, nor does the ANSI Z133 Standard get into considerable detail on chipper design, preferring to concentrate on chipper operator procedures.

All major manufacturers adhere to three specifications that Z133 does make: 1) Chippers not equipped with a mechanical infeed must be equipped with an infeed hopper not less than 85 inches, from the blades or knives to ground level over the centerline of the hopper; 2) chippers without mechanical infeed also need to have a flexible anti-kickback device installed in the infeed hopper to reduce the risk of injury from flying chips and debris; and, 3) chippers equipped with mechanical infeed need to have a quick stop and reversing device located across the top, along each side of, and close to, the feed end of the infeed hopper.

Another feature that is generic to most manufacturers (but not necessarily all models!) is some sort of feed sensor system. These systems enhance performance, but they also reduce the risk of injury. A feed sensor reduces the likelihood of engine stall and plugging. Because it reduces plugging,

Vermeer's upper feed control bar, combined with the bottom feed stop bar, provides a means for the operator to stop the feed rollers.

it reduces the need for the operator to unplug the machine, reducing exposure to the feed wheel and chipper knives.

The absence of any comprehensive standard left manufacturers free to analyze the risks associated with chipper operation and maintenance, and to engineer their own solutions. The remainder of this article is an overview of some of the newer, and more innovative, safety features from some of the leading U.S. chipper manufacturers.

Wood/Chuck

Some of the engineered safety features available on Wood/Chuck chippers include:

• **Panic Bar:** The Panic Bar is an innovative safety device intended to provide a dedicated, durable mechanism to stop the controlled feed system, and to lock the system out, in an emergency situation. In an effort to reduce accidents that may be caused by inattention to the surroundings, improper feeding techniques, improper material preparation, or ingestion of non-wood material, Wood/Chuck developed the patent pending "Panic Bar." The name derives from the fact that even in a "panic" situation all the operator must do is grab the bar. It does not employ any electrical components, and when activated daily as directed by Wood/Chuck, requires very little maintenance. Also, the panic bar is activated outside of the feed chute, preventing the suggestion that it is acceptable to place any part of the body into the feed chute.

The Panic Bar feature is unique in the following respects: It can be activated from almost any location around the feed area, even from the front of the chipper; it operates independently from the ANSI Z133-mandated feed system control bar; it is powder-coated a distinctive color to differentiate it from the control bar; and unlike some devices, it must be reset before the chipper will commence feeding.

Morbark lock pins lock the chipper drum or disc when changing knives, and when raising the top feed wheel for maintenance.

• **Discharge deflector/chute adjustment bar:** This device allows the operator to adjust the chip deflector and the discharge chute position without climbing on the chipper. This will reduce the opportunity for an operator to fall during adjustment or be hit by discharged chips, while facilitating proper chute and deflector placement.

• **Chipper hood safety latch:** Wood/Chuck's system reduces the chances of opening the hood while the disc is still rotating, and prevents starting the unit with the disc hood open.

Bandit

Some of the engineered safety features available from Bandit include:

• **Last chance pull cable:** Located in the infeed hopper, these cables actuate the system that reverses the infeed rollers, giving the operator a "last chance" to extricate themselves from the chipper. Bandit makes this device available to other manufacturers to retrofit their machines.

• **Disc hood pin with keypad lock:** The keypad lock prevents unauthorized persons from accessing the disc.

• **Hood pin electronic limit switch:** This device positively prevents the engine from being started without the hood pin in place, so someone turning the ignition key cannot inadvertently set the disc in motion.

• **Fold down feed tray cushion spring:** The spring reduces the effort needed to raise and lower the fold-up infeed chute, a nice back-saving feature that is standard on some of Bandit's heavier models.

• **Wooden push paddle:** This is a simple, expendable tool to help the operator resist the temptation of reaching into the infeed chute to push small pieces.

• **Mechanical spring lock pin:** With this device, the disc's hood cannot open until the disc has come to a complete stop.

Vermeer

Vermeer has been a leader in brush chipper safety innovation since the mid 1980's, starting with long feed tables with upward sloping sides that help keep operators from reaching and touching the feed rollers from anywhere around the in-feed table. To reduce the risk of injury for maintenance and service personnel, Vermeer designed the access time to the cutting mechanism to be longer than the coast down time of the disc/drum when using the prescribed shutdown procedure. This ensures that the sharp knives and the rotating disc/drum have stopped before the system is exposed.

Vermeer's latest technological advancement to improve brush chipper operator safety, include:

• **Bottom Feed Stop Bar:** Mounted on the leading edge of the feed table, this patent-applied-for system makes it possible for the operator's leg to strike the bar and shut off the feed either intentionally or automatically in an emergency situation. Vermeer feels this will provide a distinct advantage over comparative systems that require the operator to react, pull, or push something in order to stop the infeed mechanism. The new Vermeer system offers two settings for sensitivity to assist in difficult chipping conditions. The "Default" mode is most sensitive and requires the "Bottom Bar" to be depressed a shorter distance before activating the stop switch that controls the rotation of the feed rollers. The less sensitive setting requires the bar to be depressed further before triggering the switch to stop the feed rollers.

Bandit's "last chance pull cables," located in the infeed hopper, actuate the system that reverses the infeed rollers, giving the operator a "last chance" to extricate themselves from the chipper. Bandit makes this device available to other manufacturers to retrofit their machines.

• **Upper Feed Control Bar:** Combined with the "Bottom Feed Stop Bar" is a four-position upper feed control bar with dual stop positions as well as forward/reverse feed positions. Mounted over the feed table, this control bar provides a means for the operator to stop the feed rollers as well as selecting forward or reverse feed operations.

• **Reset/Hold-to-Run Button:** Dual reset/hold-to-run buttons allow the operator to readily reset a trip to the "Bottom Feed Stop Bar" or the upper feed control bar and to temporarily override either bar. By holding the reset button, a limb with wide branches will continue feeding even if it moves either bar to a stop posi-

tion. When the limb is finished feeding, the upper bar can be easily returned to the forward feed position to continue normal chipping.

Morbark

Morbark's safety features include:

• **Safety switches:** Standard on all models are safety switches on the chipper hoods that will shut down the chipper if the pin that secures the chipper hood is removed during operation. Also, this switch will not allow the engine to start until the hood pin has been installed.

• **Clearance:** Adapting the Z133 requirement for drum-style chippers, all models' infeed chutes provide at least 85 inches of clearance between the pinch point of the feed wheels and the operator's feet.

• **Lock pins:** All chippers have a lock pins to be installed to lock the chipper drum or disc when changing knives, and when raising the top feed wheel for maintenance.

• **Safety cords:** All hydraulic fed chippers have two safety cords that hang down in the infeed that an operator can pull on to reverse the feed wheels if he or she is being pulled into the chipper.

• **Non-slick pads:** Chippers have non-slick pads on all fenders to prevent the operator from slipping when climbing onto the chipper during maintenance.

Morbark's chippers have non-slick pads on all fenders to prevent the operator from slipping when climbing onto the chipper during maintenance.

The hydraulic feed wheel on Woodsman chippers can be raised from either side of the machine.

Woodsman chippers are equipped with a removable access panel in the chipper housing that allows access for changing, turning and adjusting the four-sided anvil.

Woodsman

Adjusting the anvil (or bed knife) in many chippers is a two-person job, with the requirement for one person to climb inside the feed area to gauge the setting. This is a potentially unsafe situation, placing a person inside the feed chamber. Woodsman chippers are equipped with a removable access panel in the chipper housing that allows access for changing, turning and adjusting the four-sided anvil. One person can easily accomplish the task without entering the feed chamber.

A hydraulic feed wheel lift is a feature on many chippers, but with Woodsman, the feed wheel can be raised from either side of the machine. Also, with its single feed-wheel design, firewood length material is much easier to feed. With less effort required to feed short pieces, there is less risk of the operator reaching into the feed system.

Conclusion

The "take-away" from this article is that, to some extent anyway, safety is engineered into brush chippers. Safety features should be an important consideration in your next chipper purchase. And because these features vary considerably from manufacturer to manufacturer, it is left to you to evaluate which feature or collection of features will provide your crews with an optimal safe work environment.

Keep in mind that the most important "device" we can use to stay safe in the face of workplace hazards is the one housed between our ears. Therefore, make your hiring decisions as carefully as you make your purchasing decisions. Invest in employee training and education, and provide appropriate supervision. These actions will reward you over time.

Peter Gerstenberger is senior advisor for safety, compliance & standards at TCIA.