Baling Strategy Cuts Losses

Reducing hay losses begins at baling.

How you make your round bales can have a serious effect on hay losses at the time of baling and storage losses prior to feeding.

Story & photo by
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If you think it doesn't matter how you build your round bales, think again. Your baling technique can have a serious effect on your hay losses at the time of baling and your storage losses prior to feeding.

Darryl Slingerland, project manager, Agricultural Technology Centre, Lethbridge, Alta., Can., estimates improper baling can result in a crop loss of 5%-25% during baling and up to a 100% loss in storage.

"If a round bale is improperly made and exposed to moisture, it can lose all its nutritive value within 12 months," he says. "The only thing it might be good for is bedding."

Making the right bale isn't as easy as it might seem, Slingerland says. Some variables that will affect the final product are the kinds of forage going into the bales, the size of windrows, the type of baler used, ground speed, and even temperature and humidity at time of baling.

"You have to pay close attention throughout the baling process," he says. "You miss a step, [and] it could mean serious problems down the road."

Proper maintenance

For Slingerland, one of the major causes of hay waste at time of baling is operating poorly maintained equipment. He cites, as an example, balers that have broken or missing teeth on their pickup. He notes that as pickup efficiency is reduced, more hay will be left on the field.

"It is very important that all maintenance has been performed according to the manufacturer's specifications," Slingerland says. "That way you know that baler is operating at peak efficiency."

This also applies to making sure there is an adequate supply of twine, remembering that the knots connecting one roll of twine to the next must be small enough to pass through the guides and twine arm.

Slingerland notes that one baler component that requires periodic adjustment is the pickup. Research confirms that a pickup mechanism that is out of adjustment on a large round baler may cause losses as high as 12%. He recommends the pickup be set as high as possible to minimize wear and damage, but low enough to ensure complete windrow cleanup.

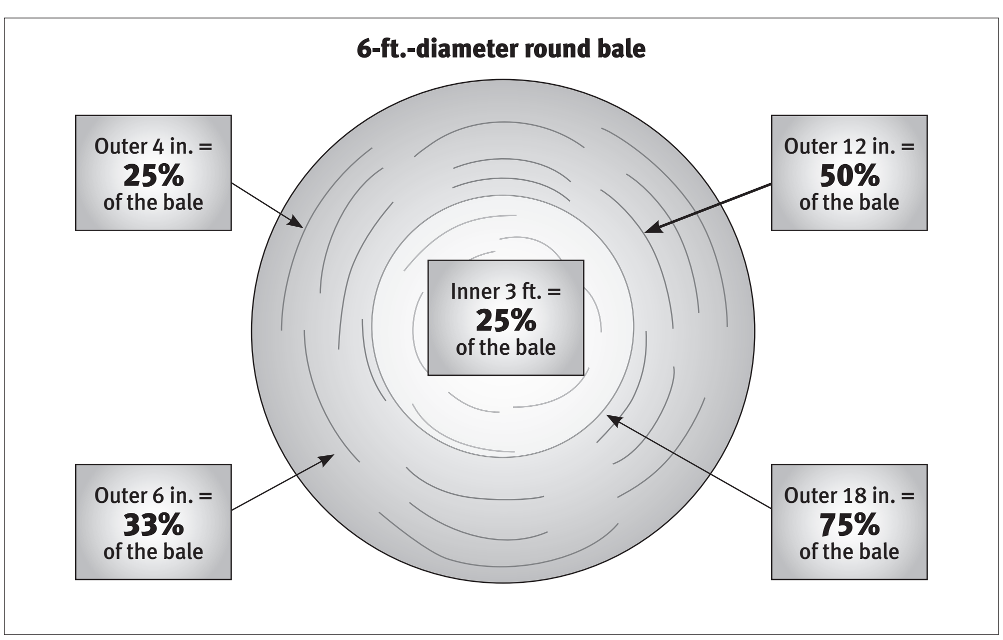
Adjust bale density, size

Another baler component that is likely to require adjustment is the bale chamber. During the past 15 years, round baler technology has made significant advances. While the density on older balers could not be adjusted, newer ones can be adjusted for both bale density and size. Many of today's machines produce a product that is twice as dense as their predecessors. This prevents moisture from penetrating deep into the bale and limits spoilage.

"With the older, low-density bales it is not unusual to get 3 or more inches of loss; with the new ones it can be under an inch," says Justin Sexten, state beef nutrition specialist at the University of Missouri. "It just makes sense for a rancher to make his bales as dense as he can handle with his equipment."

Researchers in Canada have determined that one of the real benefits of the new adjustable (expanding)-chamber balers is they experience less leaf loss when baling alfalfa. The expanding-chamber balers lose 2%-4%, while the fixed-chamber balers lose 3%-8%.

Fig. 1: Effect of depth of spoilage on hay waste (%)



Source: Illustration courtesy of University of Missouri.

A dense bale will also hold more hay per bale, have less surface area in contact with the ground and is less likely to fall apart when being moved.

Bale densities will range from 8 to 14 pounds (lb.) per cubic feet (cu. ft.) — or 128 to 224 kilograms (kg) per cubic meter — for hay, depending on the baler. Bale weight is related to both density and size. A recent University of Missouri study showed dry-matter (DM) loss in exposed, high-density bales is a very acceptable 3%-5%.

Sexten adds that it also makes sense to make one's bale size as large as the baler and loader permit. "The larger the bale, the greater percentage of hay you have moved toward the middle and away from that potential loss zone," he says. "If you get 5 inches (in.) of spoilage on a small bale, you have lost a greater percentage of the bale than you would with a larger bale."

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— Darryl Slingerland

Watch windrows, moisture content

For Slingerland, one of the most important prebaling activities is laying down appropriately sized windrows. Evenly distributed hay in windrows aids in the drying process and allows the machine to build a bale that is even across its width. Barrel-shaped bales are difficult to handle and have a tendency to shed their twine.

Ideally, the windrow should be as wide as or slightly wider than the baler pickup. Crowder wheels can be installed on the pickup to help direct material into the pickup when faced with wider windrows.

When wide windrows are not possible, Slingerland recommends reducing the windrow width to no more than half the pickup width. "This allows you to weave your baler back and forth, distributing the hay across the full length of the pickup," he says. "The more evenly you can feed the material into the baler, the more even density you are going to get in the bale itself."

He warns that when the windrow width is between one-half and one baler pickup width, weaving becomes ineffective and will result in barrel-shaped bales that are thicker in the middle than in the ends.

Researchers have measured chamber losses as high as 18% for large round balers when putting up alfalfa. This is two or three times higher than losses occurring in rectangular balers. One way to reduce bale chamber losses is to minimize the number of turns within the bale chamber.

This can be accomplished by keeping the feed rate as high as possible. Feed rate is dictated by two factors:

1. the volume of hay entering the baler — the larger the windrow, the higher the feed rate; and
2. the field speed — the faster the field speed, the higher the feed rate.

When the windrows are sparse or a slower field speed is necessary, bale revolutions can be reduced by lowering the power take-off (PTO) speed.

Remember, at the end of the bale-making process, do not rotate the bale more times than necessary to secure the twine. It is not only a waste of twine, but it contributes to bale chamber loss.

If there is a single environmental factor that will affect bale chamber losses, it is hay moisture at time of baling. When hay is too dry at baling, the process will result in excessive leaf loss and poorly packed bales. On the other hand, if baling is initiated while the hay is still wet, spoilage in storage could occur.

Slingerland concludes that hay with the

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right moisture content — approximately 18% — is more likely to produce, with minimum bale chamber losses, firm, well-shaped bales that are less likely to spoil in storage. Fig. 1 (see page 164) shows the relationship between moisture spoilage and hay waste.

Bale for uniformity

In order to maximize hay pickup and leave as little as possible in the field, Slingerland recommends traveling in the same direction as the windrower so that the material goes into the baler headfirst.

As mentioned earlier, if the windrow is half the pickup width or less, weaving will be required to maintain density consistency throughout the bale. This is particularly true for expanding-chambered balers, which initially require continuous weaving to build a uniform bale core on a narrow windrow.

Once the bale is approximately 2 ft. in diameter, the weaving pattern should be modified from continuous to one in which the baler crosses over to the other side of the pickup then proceeds straight for a count of 10 before crossing over again.

Fixed-chamber balers do not require continuous weaving at the initial stages of bale-making, because the hay tumbles in the bale chamber, distributing itself more evenly than in expanding-chamber balers.

Slingerland notes that newer expanding-chamber balers are often equipped with density sensors. "These sensors inform the operator if one side is filling up more than the other," he says. That way he knows when to move to the other side of the windrow to even out the bale.

He adds that newer balers also have an automatic control device that signals when the bale is nearing completion. "This gives the operator a chance to finish off the bale properly," Slingerland says. "This might involve some weaving to complete the process."

Sisal is biodegradable and is ideal for short-term bale grazing where the cattle are turned out on the actual bales. Plastic twine is better for long-term use, where the beef producer will be removing the twine at the time of feeding.

Speed and wrapping are important

Slingerland estimates that with uniform, full-width, substantial windrows, a baler operator can expect to travel at 4-6 miles per hour. The ground speed should be matched to the PTO speed so the chamber is filled as quickly as the pickup allows. This minimizes the number of times the bale rolls in the baler and reduces leaf loss.

Round bales may be wrapped either with twine or a surface wrap. "The cost for surface wrap is considerably more, so most feeder hay is put up with twine," says Slingerland, adding that on many of the newer balers twine-wrapping is fully automatic.

He adds that short-stemmed, dry materials need closer twine spacing than longer-stemmed hay. The range can be 4 in. to 10 in., depending on the type of hay.

Twine is available in plastic or sisal. Sisal is biodegradable and is ideal for short-term bale grazing where the cattle are turned out on the actual bales. Plastic twine is better for long-term use, where the beef producer will be removing the twine at the time of feeding.