

# Mechanically Conditioning Alfalfa Hay

Randal K. Taylor  
Extension Agricultural Engineer

Department of Agricultural Engineering

**A**lfalfa is called the “queen” of forages because it provides high levels of energy, protein and nutrients for livestock. Unfortunately, not all alfalfa is equal in feed value. There are many factors which enter into producing high quality alfalfa. One factor, the harvest process, has a certain amount of risk associated with it. After alfalfa is cut, it dries in the field to a moisture content that is acceptable for packaging.

During this time, it is vulnerable to rain damage.

If alfalfa is baled too wet, forage quality is reduced due to heat and mold. On the other hand, if alfalfa is too dry, substantial leaf loss occurs during the harvesting process, which is also detrimental to quality. Since stems and leaves dry at different rates, baling alfalfa within this moisture content range is one of the many challenges of quality alfalfa production. However, mechanically conditioning alfalfa provides a means for meeting this challenge.

The main objective of mechanically conditioning alfalfa is to allow moisture to escape from the stem faster. Properly conditioned alfalfa stems dry at nearly the same rate as leaves, which allows baling to begin sooner. There are three common methods for mechanically conditioning alfalfa: 1) crimping or bending the stem until it breaks; 2) crushing or smashing the stem to break its waxy surface layer, and 3) abrading or rubbing the stem to remove much of the stem's waxy layer. Once the surface layer is opened, moisture will escape.

removes the waxy layer from the stem. Fingers on at least one tine type conditioner pass through a comb section to increase conditioning.

There is minimal difference in field curing time between alfalfa conditioned with different types of roll or tine conditioning units. While losses from different types of rolls are similar, tine type conditioners can have higher crop losses than roll type conditioners because of improper conditioner adjust-

ment. Proper machine adjustment has a much greater impact on curing time and harvest losses than conditioner type.

## Types of Conditioners

There are many different conditioners available from hay equipment manufacturers. Most can be grouped into two basic categories: roll type conditioners and impeller or tine type conditioners.

Roll type conditioners consist of two rolls that crimp or crush the stem as it passes between them. Rolls come in a variety of shapes, textures and sizes and are made of polyurethane, steel, rubber or a combination of these.

Some conditioners have a pair of intermeshing rolls, which crimp the stem; others have one smooth roll and one fluted roll, which crush the stem. Intermeshing rubber rolls are the most common type of conditioning rolls (Figure 1).

Tine type conditioners usually consist of steel or rubber fingers swinging from a rotating hub. The free-swinging fingers carry the crop over the hub, against an adjustable conditioning hood (Figure 2). The abrasive action of stems rubbing against the hood and other stems

## Adjusting Conditioners

The conditioner is the heart of a mower-conditioner and should be treated as such. If properly adjusted and operated, it can speed the drying of alfalfa, which minimizes the chance of rain damage. A recent survey by Oklahoma State University estimated that 72 percent of the state's alfalfa growers use a mower-conditioner; however, only 39 percent of these growers adjusted conditioner rolls annually. Furthermore, 26 percent never adjusted rolls. Similar conditioners are found in Kansas, which raises the question of how well these conditioners are actually performing.

Crop characteristics such as stem diameter and leaf/stem ratio depend on plant maturity and growing conditions and will vary significantly throughout the growing season and from field to field. Conditioning roll adjustment



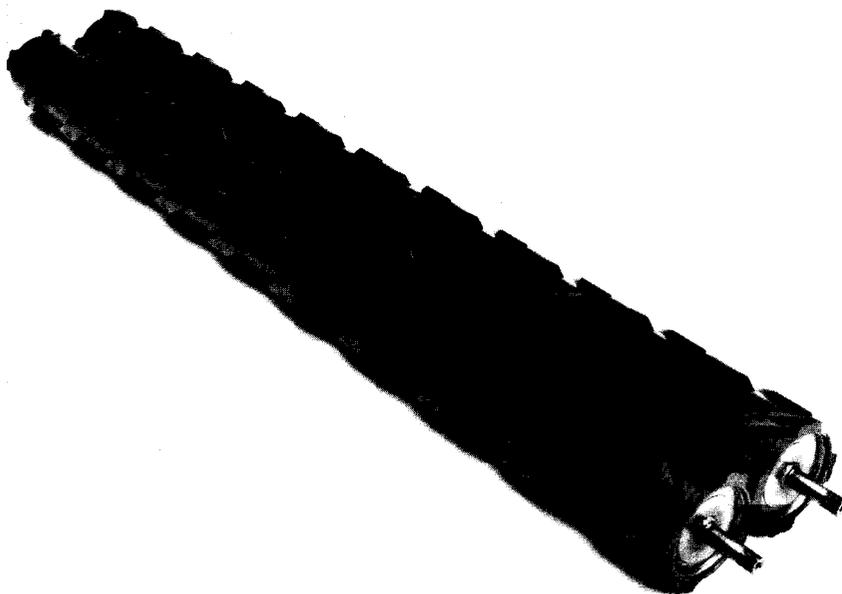


Figure 1. Intermeshing polyurethane rolls.

(Photo courtesy John Deere Ottumwa Works)

should reflect these changes. As a minimum, conditioning rolls should be adjusted at every cutting. Some industry experts suggest adjusting conditioner rolls in every field. Yield also plays a role in conditioner adjustment. High yielding alfalfa needs a wider roll spacing to allow proper flow of material with adequate conditioning.

The greatest increase in drying rate from conditioning comes from starting with a high quality product. Conditioning poor quality, weedy or overripe alfalfa improves drying rate little. Grasses and weeds require more conditioning than alfalfa to dry quickly and will increase the drying time of the windrow.

Under most conditions, the effect of conditioning is not immediately apparent. It is difficult to determine how well stems are broken or how quickly moisture will escape. However, in about an hour, moisture will begin to escape from stems and the results of conditioning will show. Temperature, relative humidity, wind speed, windrow shape and size have significant effects on how

quickly alfalfa dries. On hot, dry or windy days, alfalfa dries faster. Wider, thin windrows dry 30 to 40 percent faster than narrow, thick windrows.

One of the most overlooked conditioner adjustments is tractor engine speed. Tractors should operate at rated PTO speed when mowing to maintain adequate speed of cutting and conditioning mechanisms. Slow engine speed can cause plugging of the conditioner in heavy crops, and high engine speed may cause excess conditioning.

Keep all this in mind when considering conditioner adjustments and avoid adjusting conditioners unless you are sure it will improve drying rate. Generally, conditioners can be adequately adjusted for each cutting, provided that crop characteristics do not change drastically during the cutting. The following discussion offers some general guidelines for conditioner adjustment. Read your operator's manual for specific procedures.

#### **Roll Type Conditioners**

There are two basic adjustments on

most roll type conditioners: roll spacing and pressure. Some conditioners also have adjustments for roll speed and timing. Roll spacing is simply the clearance between the rolls and is the base point for conditioner adjustment. Roll spacing should be uniform across the full width of the rolls. Check the operator's manual for the minimum roll spacing and NEVER allow rolls to run against each other when cutting. Roll spacing should be adjusted for large changes in material feedrate through the machine. Feedrate will depend on a number of things, but most importantly it depends on crop yield. Typically higher yields will require a wider roll spacing. After adjusting the roll spacing, rotate the rolls one complete turn by hand to make sure they don't touch.

Roll pressure must be adjusted to suit crop conditions and is the most crucial adjustment on conditioners. Increasing roll pressure does not set the rolls closer together; it only determines the force required to separate rolls. Use just enough pressure to properly condition the crop or just crack about 90 percent of stems. An easy way to quickly check conditioning is to examine a handful of conditioned hay. If nine out of 10 stems show some cracking of the waxy layer while leaves and blossoms are still attached to the plant, conditioning is sufficient. If more than 5 percent of the leaves are bruised, have dark spots or are separated from the plant, overconditioning is occurring. By no means should the entire mat of material be crushed. Crushing too much material (over-conditioning) requires more fuel and power and causes unnecessary machine wear. Overconditioning also causes leaves to dry faster and results in higher leaf loss with little, if any, gain in drying rate. Since overconditioning causes leaves to dry faster, higher losses also appear during raking and baling operations. Uniform drying helps minimize harvest losses that occur if the

leaves are too dry and brittle when the stems are ready for baling. However, if roll pressure is inadequate, material may wrap around the rolls. Rolls should operate damp but should not squeeze moisture from the plants.

Roll speed is proportional to PTO speed and is usually not adjustable. This keeps material flowing through the rolls evenly. If roll speed is adjustable it should be increased in relation to travel speed for heavy alfalfa to help keep the mat of material passing between the rolls near an optimum thickness. If roll speed is not adjustable, reducing ground speed will help keep the mat thickness near optimum in high yielding alfalfa.

As roll drive chains and sprockets wear it may be necessary to retime intermeshing rolls. Timing on these rolls is crucial. If the roll lugs touch, excessive wear and vibration can occur. Check chain tension and horizontal position of the rolls if they are retimed.

#### *Tine Type Conditioners*

There are two primary adjustments on tine type conditioners: rotor speed and hood clearance. A slower rotor speed is desirable for alfalfa and other leafy crops to eliminate over-conditioning. Reducing rotor speed is usually achieved by switching sheaves on the drive belt. Conditioning alfalfa at high rotor speeds may cause excessive leaf loss.

Hood clearance is the most important adjustment on tine type conditioners. The hood should be close enough to supply adequate conditioning but not so close that leaves are shredded. Reducing the hood clearance too much could plug the machine. Examine stems closely before making adjustments. If the waxy layer is showing scratches, conditioning is probably good. Again, only time will tell how quickly the crop will dry. Increasing the clearance between the rotating fingers and the hood will decrease conditioning intensity.

### **Adjusting conditioners for other hay crops**

Though the same principles of mechanical conditioning apply to other hay crops, some adjustments are necessary to maintain adequate conditioning. If mower-conditioners are used in hay crops other than alfalfa, they should be adjusted for each crop to maximize effectiveness.

Roll type conditioners generally require an increase in roll pressure for tougher grass hay. Avoid too much pressure, which will cause overconditioning. Decrease roll pressure in hay that requires little or no conditioning so the crop will easily flow through the conditioner. Keep enough pressure to avoid wrapping the crop around conditioning rolls. Minimal roll pressure in these crops will increase machine productivity and lower fuel and power requirements.

Cane hay requires a wider roll spacing because of the larger stalk diameter and higher yields, but roll pressure should be similar to that of alfalfa. Use only enough pressure to crack stalks without causing excess damage.

Increase rotor speed on tine conditioners in grass hay to improve conditioning. Once rotor speed is set, the hood can be adjusted to "fine tune" conditioning action. Stems should show some rubbing marks but should not be slashed. In heavy hay, the conditioning hood should be moved farther from the tine tips for effective conditioning and reduced chance of plugging at the hood opening.

### **Troubleshooting**

The majority of operating problems with mower-conditioners can be traced to improper adjustment or poor maintenance. The "Troubleshooting" chart on the next page is designed to help solve problems. The suggested remedies should be applied with caution. Be sure you know what the problem is before attempting to fix it. A thorough understanding of your mower-conditioner is a must if problems are to be solved satisfactorily. Consult your operator's manual for more details.

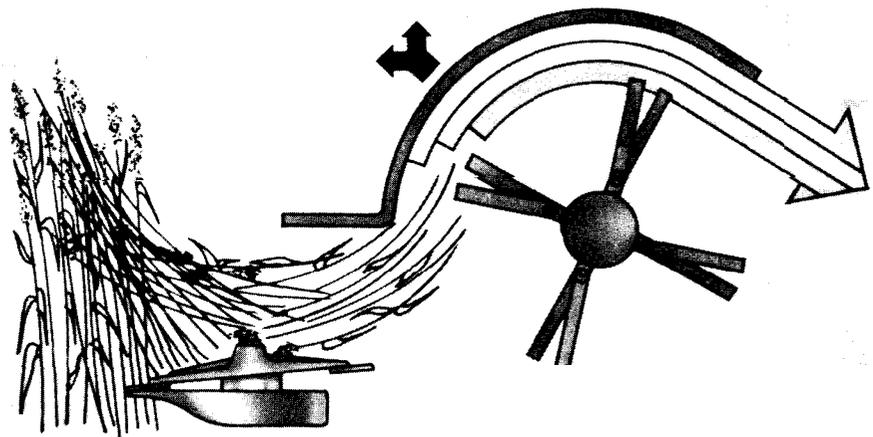


Figure 2. Impeller conditioner on a disc mower. The hood is adjusted to match crop conditions and desired conditioning effect. (Photo courtesy: John Deere Ottumwa Works)

## Troubleshooting

Symptom	Problem	Solution
Leaf damage or leaf loss	Reel speed too fast	Reduce reel speed
	Overconditioning	Increase roll spacing or decrease roll pressure
Stems shredding	Incorrect roll spacing or pressure	Increase roll spacing or decrease roll pressure
Rolls plugging	Foreign objects between rolls or material wrapping on rolls	Stop engine and disengage PTO; when completely stopped, remove foreign objects
Excessive noise	Incorrect hitching	Re-hitch
	Rolls too close	Space rolls
	Rolls out of time	Time rolls
	Knife or guards bent	Straighten knife and reset guards
	Knife section too long (protrudes)	Straighten knife and/or grind tip of section
Poorly formed or bunchy windrows	Reel speed too slow	Speed up reel
	Incorrect windrower shield adjustment	Adjust windrower shields so material flows along sides of shields
	Swath flap down	Adjust flap up
	Incorrect PTO speed	Correct PTO speed
	Incorrect reel adjustment	Adjust reel so crop is carried over guards and into conditioner
Improper conditioning when rolls are adjusted correctly	Crop wraps on rolls	Increase roll pressure



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