



The Super Conditioner

Field Recommendations and Users Guide



JOHN DEERE



NEW HOLLAND



Congratulations on your purchase of the Super Conditioner from Circle C Equipment. With Pride of Ownership and normal care, this forage conditioning system will enable you to harvest better quality hay.

This document is intended to introduce you to the basics of the Super Conditioner. With Land prices and input costs continually rising, improving forage quality is vital to the industry. These rolls are designed to collapse the hollow structure of forage crops, cracking the full length of the stem. With this concept, it is possible to greatly shorten the drying time of baled hay, allowing harvesting of the crop within a tighter weather window and minimizing respiration losses, bleaching, and leaf loss.

More importantly, correct use of the Super Conditioner will increase forage crop quality and yield, increasing the profit to the grower. Management of windrowers equipped with the Super Conditioner requires discipline and an open mind. The added income from increased forage quality, marketability, and yield will make you money. Please read this document carefully and contact customer service at 1-800-367-1847 with any questions about operating your Super Conditioner correctly.

Principles of Operation

Standard crimpers operate on the principle of two lugged rolls intermeshing to crimp the stems of the crop every 3-4 inches. This creates openings for moisture to escape, thus allowing a faster dry down than if no crimper were used. There are limitations to this system. A gap must be maintained between the rolls. The amount of pressure that can be applied downward through the top roll is limited. Too little clearance between the rolls, or too much pressure on them, will "macerate" or chew the crop, resulting in increased leaf loss.

The Super Conditioner consists of two smooth rubber rolls with heavy duty steel cores, state of the art bearings that are capable of carrying the high load, and a system to apply extreme downward pressure to the top roll. There is no clearance between rolls and they turn with each other. Since the crop stem has a larger cross section than the stemlets and leaves, the stem is cracked along its entire length. Moisture now evaporates out the side of the stem rather than traveling several inches to the nearest crimp. This ensures a faster rate of drydown. It is important to adjust the Super Conditioner with the right amount of pressure for maximum evaporation without mashing the leaves into a pulp.

A specific pattern is cut into the rubber, assuring consistent crop flow through the rolls as well as full length conditioning of the entire stem. The design of the Super Conditioner allows this to happen

without separating the leaves from the stems.

To maximize results from the Super Conditioner, we offer the following recommendations. These suggestions come after a lot of research and testing. Some of them may require a departure from your past tried and tested methods of harvest management.

Field Preparation

Stones cause damage to sickle sections, guards, rotary knives, augers, and other windrower components. One of the best tools available for rocky fields is a water-filled heavy roller. Dealing with the stones is better than risking damage to your machinery. Also, most windrowers are adjustable to allow stones and dirt to drop out between the cutter bar and the conditioner rolls. Check your windrower owner's manual.

Afternoon Harvesting

University research has shown that cutting forage crops in the afternoon can optimize forage quality, especially palatability.

DRYING FORAGE

Super Conditioner is a quality tool that greatly improves hay quality. The Super Conditioner gives the farmer a greater advantage against *Mother Nature*. One advantage is decreasing dry down time. This gets the farmer off his field and allows the next growing cycle to begin quicker. He now has a more marketable premium product in the stack two to four days sooner.



Hay Curing, Baling & Storage

Steve B. Orloff

Significant yield & quality losses occur when alfalfa is not harvested correctly. The goals of harvesting are to cut alfalfa at the growth stage that provides the optimum combination of yield and quality and to maintain quality and minimize losses through rapid curing and timely raking and baling. There is increasing interest in maximizing hay quality through variety selection and management. These efforts are nullified if the high-quality alfalfa is not harvested and stored properly.

Nearly all alfalfa in the Intermountain Region is harvested for hay, so this chapter emphasizes hay making practices rather than those used when making green chop or silage. The hay-making procedure most commonly used in the Intermountain Region is a four-step process. It begins with cutting the alfalfa, which is usually done with a 12 or 14 foot self-propelled swather. After a few days the partially dried, or cured windrows are combined or laid side by side. This hastens the curing process and improves the efficiency of the baling operation. After the hay has dried sufficiently, it is baled. Finally, it is roadsided by a self-propelled bale wagon.

Hay Curing

One of the most critical aspects of harvesting is drying cut alfalfa to a point where it can be safely baled. This is especially true in the Intermountain Region, where thunderstorms pose a significant and continual threat. Rapid, uniform curing of alfalfa is highly desired. It minimizes quality losses due to bleaching, respiration, leaf loss, and rain damage and improves subsequent yields by reducing the effect of windrow shading, lessening traffic damage to re-growth buds, and allowing timely irrigation after cutting.

The moisture content of alfalfa growing in the field is generally between 75 and 80 percent. The drying rate of cut alfalfa depends upon several environmental variables. These include solar radiation, temperature, relative humidity, soil moisture, and wind velocity. Research in Michigan and California indicates that solar radiation is by far the most significant environmental factor influencing drying rate.

The objective of the hay producer is to utilize management practices that accelerate the drying rate within the confines of uncontrollable environmental conditions. To determine which management practices would be most effective it is helpful to understand the alfalfa drying process.

The drying process of alfalfa occurs in two phases. The drying rate during each phase is governed by the resistance to water loss from the plant (fig 1 explains the various resistances to moisture loss). The first phase, or rapid drying phase accounts for approximately 75 percent of the moisture loss that occurs during the curing process and requires only 20 percent of the total drying time. The Stomata (leaf pores) are wide open, and moisture loss occurs from leaves through these openings and from water transfer from the stems through the leaves. Some water also departs through the cut ends of stems and through bruised tissue. The main limiting factor to drying during the first phase is boundary layer resistance, the resistance, the resistance offered by the layer of still moist air around the plant.

(cont. pg 2)

(cont. from pg 1)

Wind moving over and through the windrow can accelerate drying by replacing the moist air in the boundary layer with drier air. The first phase is usually complete before the end of the first day after cutting. The second phase, the slow drying phase, commences at about 40 percent moisture content, when the pores of the leaf and stem close. Stomatal resistance increases immensely and drying rate depends on cuticular resistance. Compared to moisture loss in the initial phase, moisture loss is extremely slow in this phase. In fact, the drying rate in this phase is 1/100 the initial drying time.

- **Boundary layer resistance:** resistance related to the layer of still moist air close to the plant surface.
- **Cuticular resistance:** The resistance of the plant surface to water movement.
- **Stomatal Resistance:** resistance that is controlled by the pores on the surfaces of the leaves and stems.

Figure 1—Resistances to water loss in alfalfa



Example of a Chevron Roll pattern.

Standard Conditioners

Standard conditioners have an intermeshing design, which will not allow them to run tight together. This creates the crimping action described earlier. The stem is pinched every two to four inches (depending on make and type of conditioners). This leaves the rest of the stem intact. The moisture inside the stem must now travel the distance to the crimp in order to evaporate. For the first several hours the plant is now still fighting to survive and grow. This delays the dying and wilting process.



Hay Conditioned with a Standard Conditioner such as the Chevron rolls above, is easily recognized by bends or crimps in the hay every few inches along the stem.

How The Super Conditioner Works

The Super Conditioner rolls run tight together cracking the entire length of the stem without juicing the plant. The infinite adjustment of the airbag system allows the operator to do this with very little practice. This accomplishes two things the standard



The Super Conditioner's special spiral Shapad pattern provides a consistent pressure on the hay stem down the entire length

Mechanical Conditioning

To accelerate curing, many growers mechanically condition or crimp the alfalfa as they cut it. In fact, mechanical conditioning has become a widely accepted practice. Most conditioners lightly crush the forage between intermeshing rollers located behind the header of the swather. The primary rationale for crimping is to crush and break the stems, which dry more slowly than leaves, thus facilitating water loss and bringing the drying rate of stems more in line with that of leaves. Mechanical conditioning affects both phases of the drying process. It accelerates the slower phase by breaking the cuticle. Sometimes growers question the effectiveness of mechanical conditioning and wonder if the cutting operation could be simplified if the conditioning rollers were removed. Research has shown that mechanical conditioning hastens the drying process by as much as 30 percent. Drying time saved by mechanical conditioning can vary considerably, however, depending on weather conditions and alfalfa yield. Conditioners should be set so that stems are cracked and crushed but not cut or severely macerated. Consult the owner's manual for proper conditioner adjustment.



Super Conditioned hay has an evident crack all of the way down the stem.

conditioner does not. It allows the moisture to escape out the side of the stem instead of traveling down the stem to the nearest crimp. It also instantly kills the plant so that instead of fighting to repair itself, it starts the wilting process immediately. Your hay has less exposure to the elements that can damage it. (Sun bleach, dew, rain, wind, etc...)

With his new tool and proper management, the farmer can become an expert in his own environment in no time at all, increasing his hay quality and yields while saving money. However like any new tool he must first learn how to use it.

After learning how to use it, saving UP TO 50% in dry down time is very possible with close management. The more adverse the conditions the more drying time will be saved. In perfect drying conditions it is harder to save more than one or two days drying time, but is very possible with close management. Other advantages are palatability and leaf retention. The gentleness of the super conditioner rolls allows the stem to be completely cracked without shattering the leaves. It also leaves the stem softer which is great for the cow intake and in more consistent feeding. The cow cleans the trough instead of leaving wasted stem matter and improves milk production at the same time.

Rake Management

Because rake timing is a very important part of good management the traditional timing will change. This is another part of the process that will have to be learned in order to maximize dry down. The reason for this is that all of the structure of the stem has been removed and the windrow will collapse faster and mat down as the wilting process proceeds. Therefore it is usually necessary to rake one or two days sooner than the farmer is used to. Once the hay is fluffed up the air can flow through it making the dry down much faster if conditioned properly. This process must be learned, as every environment is different.



Many times Super Conditioned hay will look too green from the side of the road. It is recommended that you get out of your truck and check the hay closely for moisture levels. Raking too late will cause unneeded leaf loss.



Most common hay rakes combine windrows together while fluffing up the hay. This allows the hay to get more air around it for the final drying sequence, while making the hay ready to be baled.

Raking

The purpose of raking is to expedite the drying process by transferring the alfalfa to drier soil and inverting the windrow. Inversion exposes alfalfa on the bottom of the windrow, which at this point has a higher moisture content than that at the top. Also, raking usually combines two windrows, thus facilitating baling and roadsiding. Raking is very effective, but it must be done at the proper moisture content; otherwise, excessive yield and quality losses will occur. Many growers rake alfalfa when it is too dry.

The optimum moisture content for raking is 35 to 40 percent. At this moisture content, a significant increase in drying rate is achieved while severe leaf loss is avoided. Raking at too high a moisture content may twist (commonly referred to as a rope) rather than invert the hay and can actually slow drying rate. Leaf loss associated with raking hay too dry is significant. When raking hay at 20 percent moisture content, 21 percent of leaves are lost; when raking at 50 percent moisture, only 5 percent are lost. Therefore, hay raked just prior to baling will be too dry. The greatest loss is in the leaf fraction. Such loss significantly reduces the quality of the hay, since leaves are its most nutritious component. Research has shown that raking alfalfa hay that is too dry is more detrimental to hay quality than baling when too dry. In one study, late raking resulted in a 25 percent loss in yield and a 2 to 4 percentage unit reduction in total digestible nutrients (TDN). (Baling when too dry resulted in a 5 percent loss.) If alfalfa was both raked and baled too dry, the loss increased 10 percent over the raking loss.

Airbag System

The airbag system is unique in the fact that you have infinite adjustment. Sometimes one or two pounds can make the difference when managed closely.

The airbag system is a closed system that you fill like a tire. You adjust the air pressure according to the condition of the forage product. You must get out of the machine to check for the perfect conditioning. Once properly adjusted, changing the air pressure will not be necessary until you change conditions or product.



Examples of single & double Baffle Airbags designed for use with the Super Conditioner.

The air bags are mounted directly above a pivoting bearing plate at each end of the top roll. This allows the top roll to float freely resting on the bottom roll. Air pressure is then applied with the air bags to create linear pressure between the conditioner rolls. This differs from conventional conditioners, they maintain a gap between their rolls and linear pressure is not obtained until a mat of



Typical mounting for airbag system on the Super Conditioner. Air pressure pushes down on the bearing plate, creating linear pressure between the conditioner rolls.



Airbags are filled easily using a pump or compressor much like filling a tire. The gage informs the user of the actual air pressure in the system, allowing him to adjust the pressure to the crop being cut.

product greater than the gap forces the rolls to open. The conventional pressure is applied with torsion system and is difficult to adjust and is usually not bothered with. Therefore conditioning management is not very often a practice of the farmer and must be taught.

Conditioner rolls

The super conditioner rolls are built from the highest quality steel tubing and shaft material. The rubber quality surpasses that of a semi-tractor radial road tire. The rubber application process is state-of-the-art and is carefully quality controlled. It is not molded or laminated. It is a raw rubber compound that is baked on and vulcanized under pressure. The rolls are then machined



Super Conditioner Rolls are made to the highest standards using the finest steel tubing, rubber, and shafts available on the market.

perfectly round. Groove patterns are then machined into the rubber for gripping and feed-ability. The final process, "balancing" is done with great care and accuracy as this process allows the rolls to run together without vibration. All of these processes are machine and labor intensive.

Our conditioner rolls have even more unheard of features in the forage industry. The shafts are easily replaceable in case of damage. The rubber is also replaceable. The rolls can be sent back to us after several years of dependable use and we can recover and rebalance them. They are returned to the customer in brand new condition for a fraction of the original cost. No other manufacturer of rolls can offer such quality or service. They sell "disposable rolls". We have a core that is repairable and keeps a high resale or trade in value.



The bearings used with the Super Conditioner are made to handle the intense linear pressure exerted by the air bag system. Normal bearings would be destroyed in a matter of minutes under these conditions.

Bearings

The bearings used with the Super Conditioner rolls are the best quality we can find in the industry for this application. The bearings are a friction fit bearing with a removable inner race for easy removal. Standard conditioner rolls use economy style bearings that usually have to be cut off with a torch or worse because of fret corrosion.

Complete instructions for installation and care of the bearings are provided with each kit along with a phone number for technical help from our service team.

Super Conditioner roll kits are replacement rolls for most new model Mower Conditioner and Windrowers. This offers the most efficient way of conditioning. There is at this time no other after-market competition that can do what we do.

There is absolutely no question our conditioner rolls do exactly what we say they can do. It is a revolutionary new concept that works for any forage conditioning. We can prove it and we have proven it.

Maintenance of the Super Conditioner

Once the installation is complete, it is very important that you run the machine for twenty (20) minutes at operating rpm with 65 lbs. Of air pressure. After 20 minutes--shut down the machine and carefully check the bearing temperature by feeling the bearing. If there are one or more bearings that are hot compared to the rest, slowly add a small amount of grease, then retighten the adjusting nut according to the bearing installation instructions. If the adjusting nut is loose you will only be able to feel a very slight movement because of the lock ring, but you will feel it. It's also important that the set screws for the adjusting nut lock rings are tight and do not vibrate loose. We recommend the use of "blue" medium strength locktite on the set screws.

If, after resetting the bearing, it continues to heat up, replace the bearing and contact customer service at 1-800-367-1847.

If bearing failure occurs, it could be considered improper installation and may not be covered under warranty by the bearing manufacturer.

Daily Bearing Check Procedures

Bearings must be checked by the operator daily!

Lubrication of bearings: The 4 main roller bearings, one at the end of each roll, are pre-greased. They **Do Not** require greasing during installation or before start-up.

**USE ONLY EXTREME PRESSURE
NLGI GRADE 2 LITHIUM GREASE**

Read the enclosed Instruction manual for Dodge Unisphere II spherical roller bearings for detailed guidelines on greasing amounts and intervals. (One pump ever 100 hours). This manual is found either in the bearing box or included with the information packet. If it is missing, please contact customer service at 1-800-367-1847. Circle C Equipment recommends pumping the grease in slowly to reduce the risk of forcing out the seals.



Check the bearings by grabbing the adjustment nut and turning it back and forth like a doorknob. You should not feel any movement of the nut.

Care of the Rolls

Let the air out of the air bags when the windrower is not in use for more than 1 week. Clean and inspect the rolls at the end of the season, taking care to remove any foreign objects that are wedged in the grooves. **DO NOT** apply any petroleum product such as grease, motor oil, hydraulic oil, gasoline, or diesel to the rolls. Do not store rolls where they can come in contact with any of these products. **PETROLEUM PRODUCTS CAN CAUSE SEVERE DAMAGE TO THE RUBBER.**

Long-term exposure to ultraviolet light can damage the rubber. When storing the header, make sure the rolls are not exposed to direct sunlight.

Further Reading

Circle C Equipment recommends the following publications:

Intermountain Alfalfa Management -- University of California Division of Ag & Natural Resources.

Reducing the Risk of Rain-Damaged Hay -- Michael Collins, Department of Agronomy at the University of Kentucky.

Proceedings of the 1998 and 1999 California/ Nevada Alfalfa Symposium. Contact University of California, Davis CA. Phone (530) 752-1703 or fax (530) 752-4361.

History

Circle C Equipment has been marketing super conditioners since 1998. The first buyer is still a very satisfied customer. The first years were successful and super conditioner sales have more than doubled every year. The Super Conditioner was originally designed to help solve an ongoing problem with Mother Nature. It was designed to work on alfalfa in our local



The Super Conditioner was originally designed to solve an ongoing problem with drying alfalfa in the Northwest Environment. It has since gone through extensive R & D to meet the needs of all environments.

environment. However as the Super Conditioner began to be used across the country we found that it was working on a variety of forage products. As this product list grew so did the obstacles that we had to overcome. Feedability and durability became an issue in many different types of environments and products. These issues were all handled with speed and accuracy. We learned a great deal while solving these problems. The Super Conditioners we manufacture now are a product of our education. The results are a very high quality product that we are proud to stand behind.

Service



Our excellent service team is another good thing that developed during our early learning process. We learned about different challenging environments first hand. We also learned a great deal about the different types of Windrowers and Mowers. Our service team is very experienced and knowledgeable and can help with environment and equipment challenges. They are always eager to help with any situation that may arise.

Questions?

Contact us toll-free at 1-800-367-1847 or (541) 567-2992.

E-mail us at: ccesupport@uci.net

Your Own Notes: