

USING A DEWPOINT STEAMER TO MINIMIZE LEAF LOSS DURING HAY BALING

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ABSTRACT

Staheli West, located in Cedar City, Utah, manufactures 2 versions of hay steamers. The DewPoint 331 hay steamer is used in the 2-tie, 3-tie, and round bale markets. The DewPoint 6210 is used in the large square bale market. Both machines use a boiler and diesel fired burner to turn water into steam. The steam is applied to the cured hay during the baling process through a series of distribution manifolds mounted onto the baler. The steam is injected into the hay at the pickup of the baler and further as the hay passes through the feed chamber. Steam application during baling significantly reduces leaf loss compared to baling with natural dew. Researchers at the University of Wisconsin conducted field experiments on the effects of steam on hay during the baling process. They found that compared to dew rehydration, steam rehydration reduced baler leaf loss by an average of 58% for large square balers and 43% for 3-tie balers. In another study from the University of Wisconsin, leaf percentage was shown to account for 71% of the variation in alfalfa quality. Reducing leaf loss is important and baling with steam is proven to be very effective.

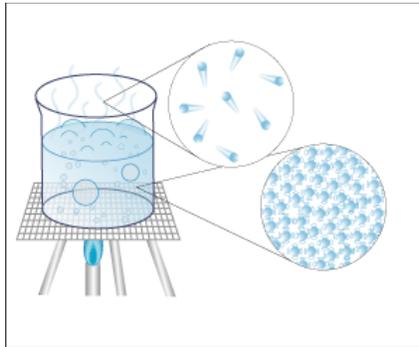
Key Words: hay baling, baling hay, steaming hay, hay steamer, dewpoint steamer, alfalfa, alfalfa leaves, rfq, forage quality, hay quality

INTRODUCTION

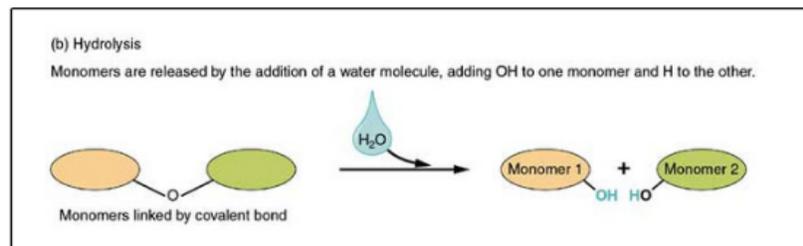
Leaf loss is one of the major factors negatively impacting harvested alfalfa forage quality. University of Wisconsin research has shown that leaf percentage accounts for 71% of the variation in forage quality. Leaves have a relative forage quality (RFQ) of approximately 550, while stems have an RFQ of only 70 to 80 (Weakly and Rodgers, 10). The DewPoint hay steamers have been proven to effectively reduce leaf loss. In studies done by both the University of Wisconsin and INTA out of Argentina, hay baled with steam is shown to contain more leaves, have a higher bale density, and better appearance. Why is steam so effective at softening the hay and reducing leaf loss? Why is leaf retention in hay so important? What do the studies say about the DewPoint hay steamer? We will discuss these questions in our presentation at the World Alfalfa Congress and in these proceedings.

WHY USE STEAM?

Steam is the hot gas that forms from water when it boils. 1 Gallon of Water Produces Around 1,700 Gallons of Steam. Unlike particles in the solid or liquid state, gas (steam) particles are widely separated and are free to move randomly and can therefore penetrate into the tiny pores of hay easier than water or even natural dew.

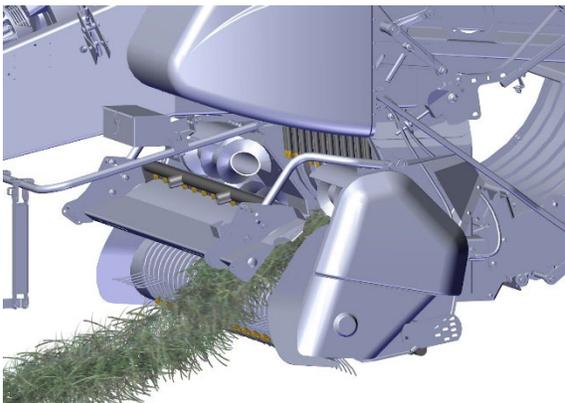


Steam breaks down and softens the hay through a process called Hydrolysis. Hydrolysis ("hydro" = water and "lysis" = break) involves adding water to one large molecule to break it into multiple smaller molecules (Bio Explorer.net).



BALER HARDWARE DESIGN

The treatment of the hay is accomplished by injecting steam through a series of distribution manifolds mounted in the baler. These manifolds are designed to reduce leaf loss. Moisture is monitored by a moisture sensor and adjustments to the steam rate are made by the operator in the cab.



UNIVERSITY OF WISCONSIN STUDY

In 1998, Researchers at the University of Wisconsin conducted field experiments on the effects of steam on hay during the baling process. Two experimental conditions were evaluated in all

tests. Baling at night when dew re-hydration was apparent (natural dew) and baling in the day with steam rehydration when the hay was less than 12% moisture. The study states:

Compared to baling with dew rehydration, steam re-hydration significantly reduced baler losses by an average of 58% (1.2% to 0.5%, respectively) for large square balers and 43% (0.7% to 0.4%, respectively) for 3-tie balers. Although not quantified, visual observation of steam re-hydrated alfalfa bales indicated that leaf retention on the stems was superior to that of bales formed with dew rehydration. Compared to bales formed with dew rehydration, steam re-hydration increased bale density by an average of 20% and 30% for large and 3-tie bales, respectively (Shinners and Schlessler).



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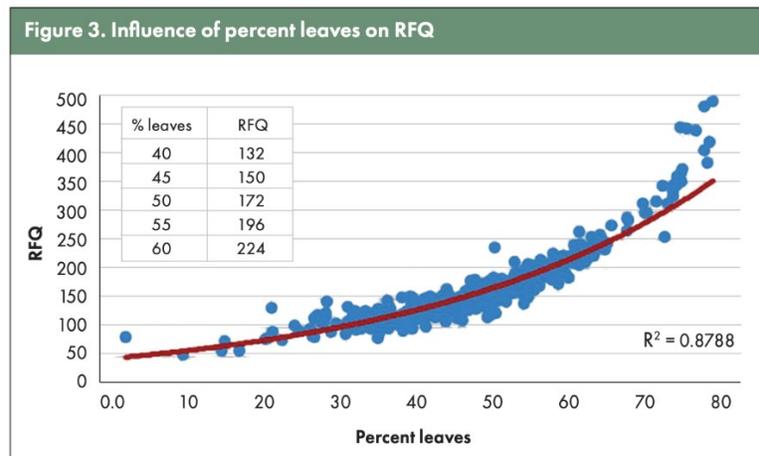
In another study performed in Argentina, INTA learned of the benefits of the DewPoint steamer. They found that the steamer adds 5% of moisture to the windrow. So, if your hay is bone dry, you can bring it up to an optimal moisture range. They also found that after 15 days from the time of baling, the steamed hay bales returned to the initial windrow moisture. This is important for operations storing hay and exporting hay in shipping containers. INTA also found a 41% reduction of dry matter loss during baling. So, there is a significant reduction of leaf loss when baling with steam. They also found a 15% increase in bale weight and density of the big bales, which is important for hay transportation and exporting. Their study also covers the increased efficiency of operations with steamers, and an increase in quality of life of all those involved. They state that steamed hay looks and holds together better, and that crude protein was 1.1% better in the steamed hay. Lastly, they found that the DewPoint hay steamer provides predictability by being able to control moisture conditions (Zavalía).

LEAF (LEAVES ENHANCE ALFALFA FORAGE)

In a study by David Weakley and Charlie Rodgers, they discuss how leaves impact the quality or RFQ of hay. They found that for every 1%-unit change in leaf percentage, there was a corresponding rise or drop in RFQ of 4.6 units. Further research by Dan Undersander found that a 1%-unit loss of leaves drops the value of the hay or haylage by \$7 per ton (Undersander). That loss encompasses both yield loss from losing the sheer weight of the leaves, and quality loss, with quality making up the highest percentage (Weakley and Rodgers). So, losing leaves means losing tonnage and quality. Typically, when an operation purchases a steamer, their big bales

weigh 100-150 lbs. more than they did before and it's not water weight. It's more leaves in each flake of the bale. These studies show that reducing leaf loss has a huge effect on the profitability of an operation.

Other takeaways from the study show that the average leaf percentage of standing alfalfa is around 50% and according to LEAF baled hay or haylage with 45% leaf percentage is ideal, 40-45% leaf percentage leaves room for improvement, and if leaf percentage falls below 40%, significant leaf loss has occurred (Weakley and Rodgers). With proper harvest practices and barring rain and other significant weather events, most farms running steamers correctly are making ideal hay all the time.



TWO HARVEST OPERATIONS THAT ARE CRITICAL

Raking

The DewPoint steamer can do some pretty amazing things, but one thing it can't do is make leafy hay bales when there aren't any leaves in the windrow to begin with. Raking is a critical process that has to be done right if you want to make ideal hay. A lot of leaves can be lost during the raking process. Many new DewPoint steamer customers become more conscientious about their raking practices after they purchase a steamer. They invest a lot of money in the steamer, so they increase their focus on their other harvest practices to get the largest ROI. A lot of money can be lost raking without proper moisture conditions.

When someone buys a DewPoint steamer, we train them to rake before the hay gets too dry. This allows the leaves to stay intact and gives the steamer the most potential to pay for itself quickly. As mentioned previously, the steamer reduces leaf loss by over 58%, so the more leaves that are in the windrow, the more leaves the steamer can preserve (Shinners and Schlessler).

Baling

Baling hay too dry to beat storms, or because of a lack of dew is another way farmers can leave a lot of leaves and money on the ground. Farmers can't always rely on mother nature for proper

moisture conditions. The DewPoint steamer allows the operator to apply the optimal amount of moisture in the form of steam to reach the target moisture percentage in each bale.



AN EXAMPLE OF WHAT THE STEAMER CAN “DEW” FOR YOU

Let’s say you bale conventionally with dew and lose 3-5% of leaves conservatively, so you’re still making good hay, maybe even ideal hay as defined by the LEAF study. However, a 3-5% loss of leaves equates to a \$21-\$35 per ton loss according to Undersander’s research. By baling with steam, a farmer can reduce their leaf loss by 58% and make an extra \$12-\$20/ton due to increased bale density and quality. Do the math on your operation. How many tons of baled hay do you produce each year and times that by \$12-20 per ton? Suddenly the steamer isn’t viewed as a cost but rather as an investment and an investment that will pay for itself repeatedly (Undersander).

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