STAHELI WEST

Changing Agriculture. Changing Lives.

Hay Maker Management Handbook

"Raising individual, family and community standards
while revolutionizing the Agricultural Industry"

Handbook Purpose:

This HayMaker Handbook is designed to give both current and prospective Staheli West customers an overview of how DewPoint steam-rehydration technology is typically implemented into a conventional forage operation.

We do not attempt to address general irrigation principles, soil fertility, pest, weed and disease management, etc. We leave that to your experience and to university and industry research.

This handbook will give you unique crop management, hay harvest and marketing information you cannot find anywhere else. You will learn about the revolutionary impact DewPoint technology will have on your forage operation, and your ability to meet the desires and demands of your hay buyers and consumers.

When you see a QR Code in this handbook

Please SCAN THE CODE with your hand-held device to view a short video clip on the topic.

"DewPoint 6210 Operator Training" link to the right

Scan this QR Code to view DewPoint 6210 Operator Training video

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DEWPOINT TECHNOLOGY

Precision Moisture Control for Hay-Baling Operations Will Change the Way You Make Hay

Introduction:

This handbook is designed to help the serious forage producer understand one of the most revolutionary new concepts in the hay baling industry in recent decades. As a hay producer, you will recognize that we speak your language. A thorough study of this information will teach you how to integrate and utilize DewPoint technology in your operation, and how to implement cultural practices and harvest methods that will significantly modernize and streamline your forage operation.

DewPoint steam re-hydration is changing dry-baled-hay operations around the world. The ability to schedule baling and control bale moisture from start to finish each day affects irrigation management, cutting, raking, baling, hauling, stacking, storage, marketing, shipping, and feeding of baled forages. It also mitigates much of the risk forage producers have faced for decades.

Operation of the DewPoint machine combined with your baler is very simple. If an operator is already familiar with the operation of his baler, the addition of the DewPoint machine only simplifies the operation and removes much of the stress related to hay making in the widely varying and challenging conditions that are part of that process.

We are careful to not make exaggerated claims. We prefer that your experience be better than what we say. Seeing it for yourself or talking to others who use the DewPoint machine is the best way to evaluate this technology.

Staheli West, Inc. is dedicated to making your operation more profitable and your life better. We produce many educational resources you can access online at www.staheliwest.com. You may also contact us directly at 435-586-8002, 8:00am-5:00pm, Monday-Friday for further inquiry. Hundreds of our customers across the Western United States, and in Australia, Canada, Mexico, and Argentina, are also happy to share their experiences with you. (See partial list at the end of this booklet)

Staheli West Answers: 435-586-8002

Who We Are:

Staheli West, Inc. was founded by Dave Staheli while managing Brent Hunter Farms in Cedar City, Utah. The Summer of 1994 was predominantly hot and dry, and Dave had grown weary of not having any natural dew. He was faced with the decision to bale dry hay that would shatter the leaves and lower the value of the hay or continue to wait for dew and risk further loss of quality. After seeking inspiration from above, he recalled seeing a tortilla steamer at a taco restaurant, and the idea to apply steam to hay was born. He gathered a box of dry hay from the field and took it into his wife Shelly's kitchen, where he used her pressure cooker to produce steam. Dave was amazed at how the steam softened the hay without making it too wet.

In 1995, after some trial and error, Dave successfully developed the first steamer that would be placed between a tractor and baler. It worked great, and the results in raising the quality and appearance of baled hay were hard to believe without seeing it. In 1996, Dave built the first steamer to be used with a large square baler. The next year, with the help of his brother Mike, he built 9 more machines for both small and large balers.

In 1998, Dave licensed the DewPoint technology to a major ag equipment manufacturer so it could be taken to market. Dave worked with this manufacturer for 8 years. In 2006, development and marketing circumstances allowed Staheli West to receive the license back. Dave returned to the drawing board, and with the original concept in mind, combined with 12 years of field experience, he redesigned the DewPoint machine from the ground up. After two years of successful operation, the machines were ready to be brought to the market.

In 2010, Staheli West built the first five DewPoint 6110 machines for commercial sale in a hay barn, and the rest is history. Today, with hundreds of machines delivered and operating, Staheli West is changing lives and the forage industry all over the world. From the United States and Canada, to Mexico, South America, and Australia, Staheli West's brand is recognized for its innovative and revolutionary technology.

Our Principles:

Our story has been shaped, and continues to develop, based on five key elements:

- Observation: Our perspective on things around us is unique to our personal life experiences. The variety of things we have seen, in everything we have ever done or observed, regardless of how great or small these may appear, may be combined in a way only we as individuals can understand.
- Inspiration: Our Great Creator knows far more about everything than we do, so it is wise to talk to Him often. He also knows, and in many cases has guided, our experience and observation to give us the ability to accomplish things that no one else can do.
- Education: God does not give us ALL the answers. In His wise purposes, He wants each of us to develop faith, character and intelligence. He will, in many cases, give us combinations of our own experience to "prime the pump", but we must DIG and LEARN through both formal and continuous personal education, and through practical application of what we learn.
- Motivation: The "Why" in what we do, determines our joy in what we do, and how we do it. Pure motivation is the fuel that keeps us moving when things get tough.
- Application: Acting on what we experience, receive, and learn, creates an environment where all these elements can work together to develop solutions to many problems and challenges we encounter in our work and in our lives.

Staheli West, Inc. is a family-owned business, and family is very important to us. This culture runs deep in our company. Our families are the foundational unit of society and are most successful when established and maintained "on principles of faith, prayer, repentance, forgiveness, respect, love, compassion, work, and wholesome recreational activities." (The Family, A Proclamation to the World) We believe our work should always give families better tools to fulfill that objective and more time to do the things that matter most.

Our vision, "Changing Agriculture, Changing Lives" guides us in all we do. "Raising individual, family, and community standards while revolutionizing the agricultural industry" is our mission. With every new supplier or employee, and every new customer or dealership, our family gets a little bigger. Our greatest hope is that your association with us makes your life better and helps raise standards in your productivity, your profitability, your work, your faith, and your family.

Dave Staheli
President,
Staheli West, Inc.

How to Balance Your Hay Operation:

Staheli West encourages owners of forage operations to assess the machinery and labor balance of their operations, and to harmonize each step of their hay production and harvest to increase efficiency, reduce capital outlay, increase yields and farm profits, and improve employee satisfaction.

DewPoint technology becomes a centerpiece for this type of planning. Baling hay has always been a pinch point of productivity. Not anymore. In nearly every climate where dry hay is baled, DewPoint machines open a 12-24 hour/day baling window with consistent bale moisture and quality, from the first bale to the last each day.

When implementing DewPoint technology into your operation, start by deciding how many acres you want to bale each day. Consider the growing days you have in the season and how to get the most crop growth out of those days. Most farm operators who implement DewPoint technology choose to reduce the number of harvest days on each crop by as much as 50%, because with the DewPoint machine you can schedule your baling according to your needs, without the limits of natural dew. Each day you eliminate from the harvest cycle throughout the season is a day you can add to the growth of your final cutting, adding from ½ to 1 ton of yield per acre. Some operations report getting an extra cutting of hay each year because of the efficiencies made available with DewPoint technology.

Since one tractor/DewPoint steamer/baler combo can cover up to 250 acres in an 8-12-hour day, a 1000-acre operation can be baled in 4 days or less if desired. You never have to miss a day of baling caused by a lack of natural dew. In many cases, you can beat rain storms because of the ability to create your own baling moisture, even in the dry, windy conditions that often precede a weather front.

Operators of many alfalfa operations like to bale from 25-35% of their total alfalfa acreage each day so they have a 3-4-day baling window. These farms see substantial yield increases on their last crop of the season, which in turn increases profits.





After you decide how many acres you want to bale each day, simply calculate how many DewPoint steamer/balers, windrowers, rakes, and bale-moving machines you will need in order to cut, rake, bale and haul the same number of acres per day.

The last major consideration is to balance your labor resources to complete all of these operations on time. This is where it pays to stop and think about what to do. Good help is hard to come by. You will find that you can normally run a smaller crew when you shorten your crop cycle, especially if you can get down to a 3-day cycle. Your windrower operators can become rake operators on the 3rd day, and then can operate steamer/balers and haul hay off the fields when the baling starts. Some good planning here will pay big dividends during your harvests, will make life easier, and will make your work more profitable.

Call Staheli West to help you assess the balance of your farm operation, 435-586-8002

Prerequisites to Operation

Supply Water Requirements for DewPoint Machines

Water quality is one of the most important considerations for achieving successful implementation of DewPoint technology in your operation.

The following information will assist you in understanding the necessary water treatment equipment and boiler chemical treatment for maintaining efficient operation of the DewPoint machine.

Water Source Selection and Water Sampling

- An appropriate water analysis is required.
  - Select the best water sources in your area and, where possible, avoid poor water sources that cause iron stains, heavy scale deposits, or smell bad.
    - Most sources of water will require a water softening system to be installed. This will require:
      - A culinary or other water source where there is a continuous pressurized supply of water available – 50 PSI minimum
      - A 120V AC electrical outlet to operate the softener control system
      - An enclosed, insulated area which is protected from freezing
      - An area or drain where bypass water consumed in the softener re-charge process can be discharged
    - Some areas with lower water quality may require a Reverse Osmosis (RO) system to remove impurities from the water. This type of system will require:
      - A culinary or other water source where there is a continuous pressurized supply of water available – 5-10 GPM @ 50 PSI minimum
      - 240V AC electrical service to operate the RO control and pumping system
      - An enclosed, insulated area which is protected from freezing
      - An area or drain where bypass water consumed in the RO flush process can be discharged
  - Under the direction of your Staheli West dealer, you will collect the water sample(s) from your selected location(s) and ship the sample(s) to the test lab on the label.

Water Analysis and Treatment Equipment Specification

- The test lab will analyze your water sample(s) and send a report to Staheli West.
- Staheli West will recommend the necessary water treatment equipment and send the recommendation to your dealer. Your dealer will then help you order and implement the water softener or RO Unit or other recommended equipment.

Water System Equipment Set-up

- Set up a Bulk Water Storage Tank
  - You will need 2500-3000 gallons of water storage for each DewPoint machine that you plan to service from your water source.
  - Select black plastic or other light-restricting tank(s) which will eliminate light infiltration. This will prevent algae growth. Black plastic will also help absorb heat from the sun into the water in the tank.
  - Install valve and hose fittings at the bottom outlet fitting on the tank, and a float valve near the top of the tank to receive water from your water softener or RO unit.
- Set up a Water Transfer Pump
  - A 2-inch, engine-driven transfer pump is normally used to transfer water from the bulk water storage tank into the DewPoint machine or a water transport vehicle.
- Set up a Water Softener or Reverse Osmosis Unit
  - Set up your water treatment equipment in an enclosed, insulated area which is protected from freezing, and connect to a continuous culinary water supply, electrical service, etc. per instructions provided with the unit.
  - Connect the softener or RO "clean water discharge hose" to the float valve fitting on the bulk water storage tank.
- Fill Bulk Water Storage Tank(s)
  - Turn water supply ON to the softener or RO unit.
    - Always leave this water supply ON to supply the water pressure necessary to flush/regenerate the softener or RO unit.
  - The float valve on the bulk water storage tank will control the water flow to the bulk water storage tank to keep it full during the season.

Black Water Tank

Water Softener

RO Unit

* Above images are not to scale or in proportion to one another.

Water Transportation

- Consider your water logistics well ahead of the harvest season.
  - Decide whether you will need to use a water truck or trailer to transport water to the fields where the DewPoint machine(s) will be working.
    - Remember that a DewPoint machine will operate from 3-6 hours on one load (1000 gallons) of water.
    - Consider the distance to the field from the water source.
    - Remember that you can typically bale an average of 50-60 tons/hour with a large square baler, and road transport time to refill with water will affect your overall baler productivity.

  - On the water transport vehicle, it is best to use a tank made of either a black plastic, steel, or other light-blocking material which will eliminate light infiltration to prevent algae growth.
  - A 2-inch transfer pump is normally used to transfer water from the transport vehicle into the DewPoint machine.
  - Tailor your water/service transport vehicle to your own needs. Some operators also carry extra diesel fuel, twine, and other service items on their water truck or trailer.

Remember that a DewPoint machine will operate from 3-6 hours on one load (1000 gallons) of water

Water Quality/Blow-Down Principles on Your DewPoint Machine

- Boiler Blow-Down
  - When steam is produced in a boiler system, all contaminants in the boiler water are left behind and will become more and more concentrated over time.
  - The blow-down process removes some of the concentrated water in a controlled manner and allows new, clean supply water to replace the old.
- Automatic Field Operation "Surface Blow-Down" Settings
  - Boiler surface blow-downs are done automatically during field operation. An electronic blow-down valve and surface skimmer tube in the boiler are controlled by the DewPoint control system to keep boiler water quality at an acceptable range during operation.
- Manual bottom blow-downs are performed at the beginning of each day, where 30–50 gallons of water are drained from the boiler in a safe location using the boiler drain valve at the rear-bottom end of the boiler. On-screen reminders will appear at each new start-up of the DewPoint machine.

Tractor Hydraulic Trailer Brake Valve Requirements

DO NOT OPERATE A DEWPOINT MACHINE WITHOUT PROPERLY INSTALLING A HYDRAULIC TRAILER BRAKE VALVE ON YOUR TRACTOR AND ENSURING THE BRAKE SYSTEM IS ADJUSTED AND WORKING PROPERLY. FAILURE TO PROPERLY INSTALL THE HYDRAULIC TRAILER BRAKE VALVE AND CONNECT IT TO THE BRAKE HOSE ON THE DEWPOINT MACHINE MAY RESULT IN SERIOUS INJURY OR DEATH AND/OR PROPERTY DAMAGE.

Why Trailer Brakes are Essential

- The weight of the DewPoint 6210 machine when empty is over 16,000 lbs. When fully loaded with water and fuel, the weight is about 29,000 lbs.
- Your baler will weigh between 20,000-25,000 lbs. with bales in the chamber.
- The combined weight of the two machines could be as high as 54,000 lbs.
- The DewPoint machine is equipped with hydraulic brakes. These brakes will operate properly only if your tractor is equipped with a hydraulic trailer brake valve, which is automatically actuated when you depress your tractor brake pedal.
- You can contact your tractor dealer and get a hydraulic trailer brake valve installed on your tractor.
- Follow all directives in your owner/operator manual regarding brakes.

Hydraulic Trailer Brake Valve

Your baler will weigh between 20,000-25,000 lbs. with bales in the bale chamber. The combined weight of the two machines could be as high as 54,000 lbs.

Crop Management and Operating Principles

General Considerations

When using DewPoint steam technology to bale, you should update your crop management practices to increase efficiency in your overall operation. Baling is no longer the limiting factor in your operation, since you are generally able to open the baling window up to 12-24 hours per day, if needed. You can bale any time the hay is dry, except in very hot afternoon hours in some climates.

Irrigation

COMMON PRACTICE: **Irrigation Timing**

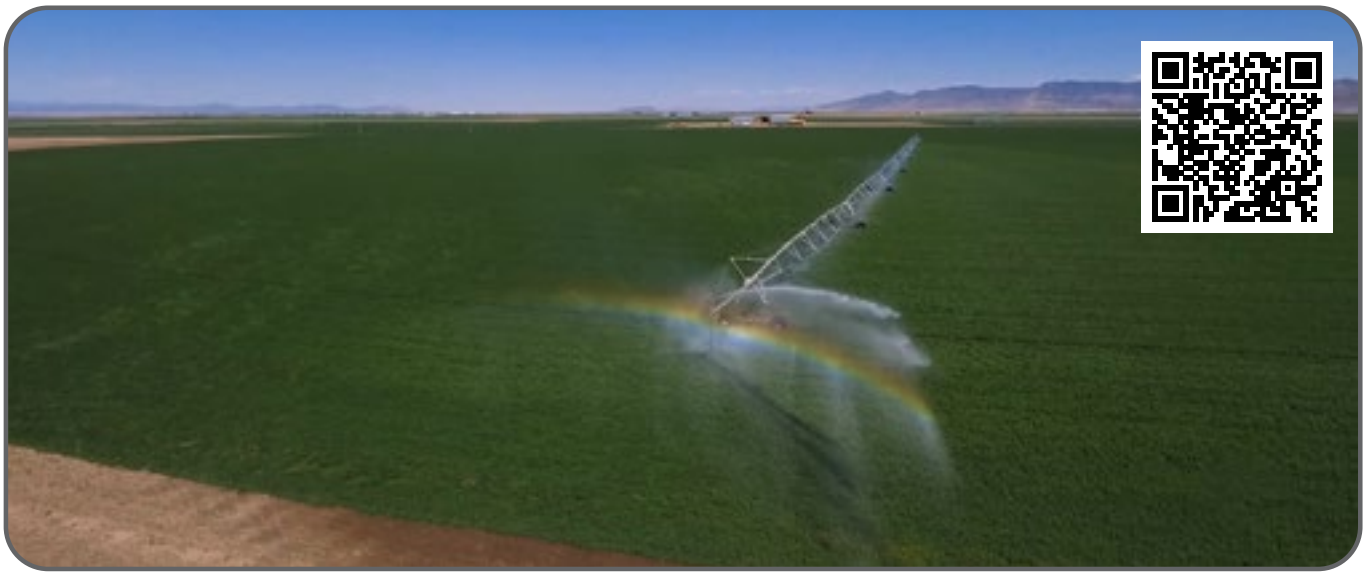
- In arid climates, many producers using conventional balers leave irrigation water on until a day or two before cutting. This practice can draw ground moisture into windrows for baling when the hay is cured.
- This practice can cause excess tracking and crop damage when cutting, raking, baling and hauling hay. It also slows the curing process, causes inconsistencies in dry-down, and increases bleaching and the possibility of wet slugs in windrows.

CONSIDER THIS CHANGE: **Irrigation Timing**

- When using DewPoint steam technology, you can re-hydrate very dry hay for baling with no problem.
- We recommend shutting off your irrigation water several days ahead of your hay harvest to allow the ground to dry more thoroughly before cutting.
- This will reduce hay curing time, reduce tracking during harvest operations, improve dry-down consistency, and decrease bleaching.

CONSIDER THIS CHANGE: **Pivot Rotation**

- You should also consider the rotation of pivot irrigation systems leading up to your hay harvest.
- Since natural dew tends to form more heavily in low areas of a field, it is a good practice to water the low side of the field first and the high side last during the final rotation before your hay harvest. This will make your dry-down more consistent across the entire field.



Cutting

COMMON PRACTICE: **Limiting the Acres You Cut**

- Hay producers often limit the acres of hay they cut each day because they are not sure how much baling they can get done in unpredictable natural dew conditions.

CONSIDER THIS CHANGE: **Cutting More Acres Per Day**

- Since DewPoint technology allows operators to bale 12-24 hours per day, (almost anytime the hay is dry) hay producers can "schedule" their harvest.
- Decide how many acres you want to bale each day and then cut that many acres.
- Each DewPoint/baler combo can typically bale up to 250 acres in 10-12 hours, depending on yield.

COMMON PRACTICE: **Cutting on Wet Ground**

- In arid climates, many hay producers using conventional balers leave irrigation water on until a day or two before cutting. This practice draws ground moisture into windrows for baling when the hay is cured.
- This practice can cause excess tracking and crop damage when cutting, raking, baling and hauling hay. It also slows the curing process, causes inconsistencies in dry-down, and increases bleaching and the possibility of wet slugs in windrows.

CONSIDER THIS CHANGE: **Cutting on Drier Ground**

- When using DewPoint steam technology, you can re-hydrate very dry hay for baling with no problems.
- We recommend shutting off your irrigation water several days ahead of cutting to allow the ground to dry.
- This will reduce hay curing time, reduce tracking during harvest operations, improve dry-down consistency and decrease bleaching.

CONSIDER THIS CHANGE: **Pivot Rotation Prior to Cutting**

- You should also consider the rotation of pivot irrigation systems leading up to your hay harvest.
- Since natural dew tends to form more heavily in low areas of a field, it is a good practice to water the low side of the field first and the high side last during the final rotation before your hay harvest. This will make your dry-down more consistent across the entire field.

Raking

Proper raking is one of the most critical elements in maintaining the value of your harvested hay crop. Poor raking practices can cause substantial crop loss.

Timing

- Hay should be double-raked when it has enough moisture to hold the leaves during the raking process, but not so much moisture that the double windrow is too dense to allow airflow through the windrow.
    - In dry conditions, when rapid dry-down occurs and natural dew is scarce or non-existent, consider raking your hay while there is still a little green stem moisture. At night, the evaporative effect of a windrow which still has some stem moisture cools the air and raises the humidity level in the windrow. This creates a natural dew effect within the windrow for raking, even in very dry conditions.
    - In humid climates or conditions, avoid double raking too soon. You may even wait until the morning you bale. Double raking a day or two ahead of baling in high-humidity conditions with heavy dew at night causes the dew moisture to sink to the bottom of the windrow after sunrise. This moisture is very slow to migrate out of the windrow, and sometimes makes it necessary to "flip" the double windrow to get enough dry-down for baling.
- Double raking hay that is too dry will result in excessive leaf loss during the raking process, resulting in expensive crop losses.
- Double raking hay that is too green causes serious dry-down problems, further leading to crop losses.

Soil Moisture

- Some hay producers cut their hay too soon after the irrigation water is turned off (see "Irrigation" section).
- Double raking on ground with excessive soil moisture will cause an increase in dry-down time and inconsistent dry-down characteristics in the windrow.
    - Moisture from the soil will percolate up into the bottom of a double windrow, particularly when yields are heavy.
    - In this case it may be necessary to "flip" the double windrow to get sufficient dry-down for baling.

Rake Adjustments and Maintenance

- Your hay rake should be set to sweep the crop from the ground without the rake teeth touching the soil. This requires careful daily attention to rake adjustment.
- Maintaining rake teeth and the rake in general, including careful daily adjustments, pays dividends in reducing crop loss, reducing ash content, and increasing hay quality.

Condition of Hay Before Baling

Alfalfa Hay

DewPoint steam application is very effective at improving baling conditions for alfalfa in a variety of ambient conditions.

- The use of steam when baling alfalfa will:
  - Decrease crop dust during the baling process and when feeding to livestock.
  - Increase bale density by increasing leaf retention and by softening the stems. Softened stems collapse and flatten when each flake is pressed inside the baler.
  - Expand the baling window by allowing the operator to add moisture with steam to keep bale moisture at acceptable, consistent levels through a variety of ambient conditions.
  - Increase the consistency of bale weight, formation, and shape.
  - Improve processing characteristics when alfalfa hay is processed through TMR equipment and hay press machinery.

Condition of Alfalfa Hay Prior to Baling

- Fully-Cured Alfalfa Hay
  - We highly recommend, when and where possible, that hay be fully cured prior to baling with steam.
  - Fully-cured hay allows the operator to apply more steam to the hay while it is being baled, which greatly improves bale quality and leaf retention.
  - Using steam to bale fully-cured hay will not require the use of a hay preservative.
  - If there is no natural dew in the windrow, fully-cured hay will generally have 6-10% starting moisture in the windrow (depending on your climatic conditions). Check moisture in the hay by pressing a handful tightly around the end of a hand-held moisture probe to obtain a reading.
  - You should check hay in the late afternoon

or early evening, prior to the setting of any natural dew, to determine how well-cured it may be prior to baling later in the evening or the following morning when natural dew may be present.

- When there is natural dew in a windrow of fully-cured hay, check the moisture in the hay by pressing a handful tightly around the end of a hand-held moisture probe to obtain a reading.
- Be aware of differences in windrow moisture in high and low areas of a field. Become familiar with your field characteristics in relation to how moisture typically sets into windrows throughout the field, particularly in evening, night time and morning hours.
- You can add steam to augment a less-than-perfect natural dew in fully-cured hay by checking the windrows to see where additional steam moisture is needed.
    - When dew is coming on in the evening, the bottom of the windrow is generally still dry and subject to leaf loss. In this case, adjust the steam valves on the DewPoint machine to apply more moisture to the bottom of the windrow and less to the top.
    - When dew is coming off later in the morning, the top of the windrow is generally drier than the bottom. In this case, adjust the steam valves on the DewPoint machine to apply more moisture to the top of the windrow and less to the bottom.
    - Be aware of changing conditions in windrow moisture throughout the operating period and make adjustments to the steam application rate as needed to keep bale moisture consistent. You have a lot of flexibility in the way you proportion steam application to the top and bottom of the windrow as you bale.
- Alfalfa Hay with Stem Moisture
    - Some producers have successfully baled with some stem moisture in the daytime, while adding a proven hay preservative and a moderate amount of steam to hold leaves. This practice is more common in humid climates and during monsoon conditions.
    - We do not recommend baling with stem moisture, whether using steam or not, UNLESS:
        - You are using a proven hay preservative product.
        - You have tested the preservative product on a small scale and you know your limits.

Cereal Grain Hay

Steam application is very effective at improving baling conditions for cereal grain crops that are cut green and cured for baling as forage. These crops can include oat (oaten) hay, wheat hay, mixed grains (made up of triticale, beardless barley, oats, wheat, etc.), and other cereal grain crops.

- The use of steam on cereal grain crops will:
    - Decrease crop dust during the baling process and when feeding to livestock.
    - Increase bale density by softening the stems. Softened stems collapse and flatten when each flake is pressed inside the baler.
    - Reduce the "springy" characteristics of baled cereal grain forages by softening and flattening the stems.
    - Expand the baling window by allowing the operator to add moisture with steam to keep bale moisture at acceptable, consistent levels through a variety of ambient conditions.
    - Increase the consistency of bale weight, formation, and shape.
    - Improve processing characteristics when cereal hay is processed through hay press machinery.

Condition of Cereal Hay Prior to Baling

- Fully-Cured Cereal Grain Hay
    - We highly recommend, when and where possible, that cereal grain hay be fully-cured prior to baling with steam.
    - Fully-cured hay allows the operator to apply more steam to the hay while it is being baled, which greatly improves bale quality.
    - Using steam to bale fully-cured hay will not require the use of a hay preservative.
    - If there is no natural dew in the windrow, fully-cured hay will generally have 6-10% starting moisture in the windrow (depending on your climatic conditions). Check the moisture in the hay by pressing a handful of the hay tightly around the end of a hand-held moisture probe to obtain a reading.
    - Check hay in the late afternoon or early evening, prior to the setting of any natural dew, to determine how well-cured it may be prior to baling later in the evening or the following morning when natural dew may be present.
    - When there is natural dew in a windrow of fully-cured hay, check the moisture in the hay by pressing a handful tightly around the end of a hand-held moisture probe to obtain a reading.
    - Be aware of the difference in windrow moisture in high and low areas of a field. Become familiar with your field characteristics in relation to how moisture typically sets into the windrows

throughout the field, particularly in evening, night time and morning hours.

- You can add steam to augment a less-than-perfect natural dew to fully-cured hay by checking the windrows to see where additional steam is needed.
    - When dew is coming on in the evening, the bottom of the windrow is generally still dry and subject to leaf loss. In this case, adjust the steam valves on the DewPoint machine to apply more moisture to the bottom of the windrow and less to the top.
    - When dew is coming off later in the morning, the top of the windrow is generally drier than the bottom. In this case, adjust the steam valves on the DewPoint machine to apply more moisture to the top of the windrow and less to the bottom.
    - Be aware of changing conditions in windrow moisture throughout the operating period and make adjustments to the steam rate as needed to keep bale moisture consistent. You have a lot flexibility in the way you proportion steam application to the top and bottom of the windrow as you bale.

- Cereal Grain Hay with Stem Moisture
    - We do not recommend baling cereal grain hay with stem moisture, whether using steam or not. Be sure you know your limits.
    - Cereal grain hay can be difficult to dry-down because of:
        - Very heavy crop yields
        - Inadequate conditioning
        - Poor windrow formation
    - Be sure all necessary steps are taken to ensure a complete dry-down of your cereal grain hay prior to baling.
- Don't be tricked!
    - The nodes of cereal grain stalks can still be green and contain substantial moisture, even when the rest of the plant appears dry. Correctly adjusted conditioners will crack the nodes to allow for an even and complete dry-down.
    - If the heads of the cereal grain crop have not completely emerged from the boot, they will also retain significant amounts of moisture, even when the rest of the plant appears dry. This condition can cause spoilage and a risk of stack fires. Be sure the crop is fully-cured before baling.

Grass and Mixed Grass/Alfalfa Hay

DewPoint steam application is effective at improving baling conditions for grass and mixed grass/alfalfa crops. These crops can include Timothy and other grass and mixed grass/alfalfa forages.

Lower steam rates are generally used in grass and mixed grass/alfalfa hay because the large leaf surface area of this hay absorbs steam at a higher rate than other types of hay. Moisture readings on the Gazeeka moisture gauge should be followed, as with any other type of hay.

- The use of steam on grass and mixed grass/alfalfa crops will:
    - Decrease crop dust during the baling process and when feeding to livestock.
    - Increase bale density by softening the stems. Softened stems collapse and flatten when each flake is pressed inside the baler.
    - Reduce the "springy" characteristics of baled grass and mixed grass/alfalfa forages.
    - Expand the baling window by allowing the operator to add moisture with steam to keep bale moisture at acceptable, consistent levels through a variety of ambient conditions.
    - Increase the consistency of bale weight, formation, and shape.
    - Improve processing characteristics when grass and mixed grass/alfalfa forage is processed through hay press machinery.

Condition of Grass and Mixed Grass/Alfalfa Hay Prior to Baling

- Fully-Cured Grass and Mixed Grass/Alfalfa Hay
    - We highly recommend, when and where possible, that grass and mixed grass/alfalfa hay be fully-cured prior to baling with steam.
    - Fully-cured hay allows the operator to apply more steam to the hay while it is baled. This greatly improves bale quality.
    - Using steam to bale fully-cured hay will not require the use of a hay preservative.
    - If there is no natural dew in the windrow, fully-cured hay will generally have 6-10% starting moisture in the windrow (depending on your climatic conditions). Check the moisture in the hay by pressing a handful of hay tightly around the end of a hand-held moisture probe to obtain a reading.

- Check hay in the late afternoon or early evening, prior to the setting of any natural dew, to determine how well-cured it may be prior to baling later in the evening or the following morning when natural dew may be present.
- When there is natural dew in a windrow of fully-cured hay, check the moisture in the hay by pressing a handful tightly around the end of a hand-held moisture probe to obtain a reading.
- Be aware of the difference in windrow moisture in high and low areas of a field. Become familiar with your field characteristics in relation to how moisture typically sets into windrows hroughout the field, particularly in evening, night time and morning hours.
- You can add steam to augment a less-than-perfect natural dew in well-cured hay by checking the windrows to see where additional steam moisture is needed.
    - When dew is coming on in the evening, the bottom of the windrow is generally still dry and subject to leaf loss. In this case, adjust the steam valves on the DewPoint machine to apply more moisture to the bottom of the windrow and less to the top.
    - When dew is coming off later in the morning, the top of the windrow is generally drier than the bottom. In this case, adjust the steam valves on the DewPoint machine to apply more moisture to the top of the windrow and less to the bottom.
    - Be aware of changing conditions in windrow moisture throughout the operating period, and make adjustments to the steam rate as needed to keep bale moisture consistent. You have a lot of flexibility in the way you proportion the steam application to the top and bottom of the windrow as you bale.
- Grass and Mixed Grass/Alfalfa Hay with Stem Moisture
    - We do not recommend baling grass and mixed grass/alfalfa hay with stem moisture, whether using steam or not. Be sure you know your limits.
    - Be sure all necessary steps are taken to ensure a complete dry down of your grass and mixed grass/alfalfa hay prior to baling.

Baling Management with the DewPoint Machine

General Baling Considerations

- DewPoint machine operators will encounter a variety of conditions listed in this section at one time or another.
    - Baling conditions will change throughout the harvest season due to changes in weather patterns from dry seasons to monsoon seasons, etc.
    - Baling conditions will also change considerably throughout a 24-hour day with differences in humidity, temperature, and wind patterns.
- If the top or bottom of the windrow has a higher moisture content, adjust the steam valves on the DewPoint machine that feed the top and bottom manifolds to match those conditions. You can modify these proportions as conditions change while you are baling.
- Set the master steam control to an appropriate starting level. This will adjust all steam valves in proportion to what you have set on the individual valve controls.
- You should start with a conservative steam application rate and work up to an acceptable level over the first several bales.
    - In windrows that are dry, we recommend starting at a rate of around 60%. In windrows where there is some natural dew, you should start at a lower steam rate.
- Increase the steam rate incrementally over the first 4-5 bales until you reach the desired bale moisture. It is better to have a few starting bales on the dry side as you work up to your desired bale moisture, than to start out too wet.
- Monitor bale moisture with the GAZEEKA moisture gauge and make steam rate adjustments as needed to maintain your desired bale moisture.

Baling in Very Dry Conditions

- REVIEW: “Managing/Judging Bale Temperature During Field Operation” for information regarding bale temperature.
- Bale temperature should be checked periodically when baling with high rates of steam during hot afternoons. Make sure bale temperatures stay below 135 degrees F.
- In very dry conditions where there is no natural dew and where wind, high temperatures, or other factors contribute to adverse baling conditions, it is best to bale with steam in the cooler parts of the 24-hour day.
- Many operators like to bale sometime between 7:00 pm, after the air starts to cool, and noon the next day, before the afternoon sun, temperatures, and winds combine to create more adverse conditions.

- There may be times when you will need to bale in adverse daytime conditions due to impending rainstorms or other threatening weather events.
- When you do have to bale during very dry and/or windy conditions, you can still make good hay with acceptable bale moisture.

Baling in Relatively "Normal" Conditions

- In relatively normal conditions where dry-down is good and there is a light-to-moderate amount of dew at night, you have several baling options.
  - To conserve fuel and water, many DewPoint machine operators start baling in the early evening and continue into the night hours until they are finished for the day.
  - Other operators start baling very early in the morning and run into the middle of the day or until they are finished.
  - Steam rate adjustments are made by watching the GAZEEKA moisture gauge and adjusting the steam rate as needed.

Baling in Moderate-Humidity Conditions

- In moderate conditions where the moisture from natural dew is too high at night, many DewPoint machine operators wait until the dew is gone in the late morning or early afternoon, and then start baling.
- In these conditions, most baling will be done in the afternoon and early evening hours, before natural dew sets in too heavily.
  - Normally you will be able to bale with steam throughout the day and maintain good moisture in moderate-humidity conditions.

Baling in High-Humidity Conditions with Stem Moisture

- In high-humidity conditions, when you are unable to cure the hay completely and stem moisture is present, the use of hay preservative along with steam treatment to maintain leaves can be effective.
  - In these conditions it is advisable to bale during the daytime hours, when the hay is as dry as possible.
  - Steam can be applied at moderate rates to hold the leaves while baling.
  - Hay preservative can also be added at appropriate rates to meet the requirements of the overall moisture in the hay being baled.
  - Use of the GAZEEKA moisture gauge is very helpful to be sure your bales are within a desired moisture range.
- We do not recommend baling with stem moisture with or without steam unless:
  - You are using a proven preservative product
  - You have tested the preservative product along with the use of steam, and you know your limits.

Baling in Thin or Inconsistent Windrows

- At times you may encounter thin or inconsistent windrows. When you do, it is important you observe the following instructions.
  - When you come to a thin spot in a windrow while baling, it is best to turn OFF the top-rear manifold. If the windrow is extra thin, also turn off the bottom-rear manifold.
  - This will prevent wet flakes in the bale. You will still be able to run the top-front and bottom-front manifolds where the hay is passing over the baler pickup in these thin areas.

  - Once you are back into a normal windrow, you can turn all manifolds ON again.
  - It is better to make a few flakes too dry than to make flakes that are wet.

When You Arrive at the Field

- Examine the windrows to determine your initial steam injection rate. If there is any question regarding the ambient moisture condition of the windrows, verify the hay is dry enough to bale. There are a few ways you can do this.
  - Using a hand-held moisture probe
    - Take a handful of hay from the windrow that represents the average moisture of the windrow and squeeze the hay tightly around the end of the probe to obtain a moisture reading.
    - If there is no natural dew, the reading should be below 10%. In climates with higher humidity, this reading may be higher.
    - Learn your limits!
  - Using your GAZEEKA moisture gauge
    - Make two bales of hay WITHOUT STEAM and observe the reading on your GAZEEKA moisture gauge.
    - If there is no natural dew, the reading should be below 10%. In climates with higher humidity, this reading may be higher.
    - Learn your limits!
  - Other ways to test moisture
    - Take a handful of hay and twist it off between your two hands. Fully-cured hay without natural dew should break in one twist. In very fine hay, this test may not provide enough information on its own, as the fine stems may break easily even when the hay is not fully-cured.
    - Scrape the skin of the stems with your thumbnail.
      - If the skin peels off, there is still stem moisture and the hay is not fully-cured.
      - If the skin does not peel, the hay is likely fully-cured.
      - If there are some stems that are dry and others that are not, you will have to judge whether the hay should be baled or whether you should wait longer.

Start Baling

- The DewPoint machine gives you the ability to apply steam where you need it. There may be times when you need more on the top or bottom of the windrow, depending on ambient conditions. The Dewpoint gives you that flexibility.
- You should start with a conservative application rate and incrementally work up to your desired rate over the first several bales.
  - In windrows that are dry, we recommend starting the main steam rate at around 60%.
  - Increase the steam rate incrementally over the first 4-5 bales, until you reach your desired bale moisture.
  - It is better to have a few bales on the dry side as you work up to your desired bale moisture, than to start out too wet.

Field Speed

- Field speed should be as fast as needed to keep the baler at full or nearly-full capacity, with the stuffer cycling on every plunger stroke.
  - When using steam during field operation, you can reduce bale flake counts by increasing field travel speed.
    - Conventional bale flake counts of 40 flakes/bale can typically be reduced to around 30-35 flakes/bale when using steam, while maintaining excellent bale formation and higher bale density. This happens because the crop is softened by the steam and packs more easily.
    - Baling with steam allows you to increase your field speed by as much as 15-25% over conventional baling.
    - Do not exceed the speed at which your baler is able to pick up the windrow cleanly from the ground.
  - When baling with steam, plunger load targets can also be reduced while achieving similar or higher bale weights compared to conventional baling.

Monitor and Manage Bale Moisture

- Monitor bale moisture and adjust the steam rate to meet your desired bale moisture. It is your responsibility to determine the desired moisture you want in your bales. For more information on bale moisture, principles, and practices, please read “Managing and Judging Bale Moisture”.

Managing/Judging Bale Moisture

Managing and Judging Bale Moisture is Your Responsibility

There is an acceptable range of bale moisture where density, flake formation, and other characteristics can be controlled according to the demands of your hay market. We recommend that you, your hay buyers, and your end consumers become familiar with the characteristics of hay baled with steam at different moisture levels, in order to determine what best suits the needs of all concerned parties. Learn your own limits and the demands of your hay market.

DewPoint technology allows you to create a product with the characteristics desired by your market.

REMEMBER: Steam applied to hay using the DewPoint machine simulates a higher moisture effect than the actual moisture percentage that is applied.

- For example, hay at 8% moisture in the windrow can be baled at around 12% using steam from the DewPoint machine. However, it will look like it was baled at 16-18% with natural dew.
- This moisture effect allows a producer to bale hay that has superior leaf retention, higher density, and relatively low bale moisture.

The next few pages contain information regarding different ways to judge bale moisture.

We highly recommend the GAZEEKA moisture gauge as your primary moisture-measuring instrument while using the DewPoint machine.

We also recommend that you watch bale-chamber-pressure readings and visually observe the bales you are making. These redundant observations will help ensure that you are making the best hay possible.

Judging Bale Moisture is Your Responsibility

LEARN YOUR OWN LIMITS AND THE DEMANDS OF YOUR HAY MARKET

There is an acceptable range of bale moisture where density, flake formation, and other characteristics can be controlled according to the demands of your hay market. We recommend that you, your hay buyers, and your end consumers become familiar with the characteristics of hay baled with steam at different moisture levels, in order to determine what best suits the needs of all concerned parties. Learn your own limits and the demands of your hay market.

DewPoint technology allows you to create a product with the characteristics desired by your market.

Judging Bale Moisture with the GAZEEKA Moisture Gauge

- Use a baler-mounted GAZEEKA moisture gauge
  - Whether the moisture detected in hay is from steam, natural dew or stem moisture, the GAZEEKA moisture gauge provides an accurate reading when properly calibrated.
  - Calibration should be done prior to loading the baler with hay for the first time. Follow all directions to calibrate and establish correct settings for the GAZEEKA moisture gauge to ensure safe and reliable operation.
  - Effectiveness and accuracy of the GAZEEKA moisture gauge in DewPoint-steam-baled hay:
    - The speed of microwaves through air is very close to the speed of light through space, and the speed of microwaves through dry hay is a little slower than through air.
    - The speed of microwaves through water is considerably slower than in dry hay. The difference in this speed is attributed to a value known as the dielectric constant (sometimes called relative permittivity). The dielectric constant for air is close to 1. For dry, fibrous material it is closer to 2, while for pure water it is approximately 80. Similarly, the amount of microwave energy absorbed in air is less than in dry hay, and in dry hay is much less than in water. Thus, if measured correctly, the measurments taken from a GAZEEKA are a very sensitive method of determining moisture in a bale of hay.

- Monitor bale moisture using the GAZEEKA moisture gauge and adjust the steam rate to meet your desired bale moisture.
  - It is your responsibility to determine acceptable bale-moisture parameters.
  - Generally, you will add 1%-4% moisture to the hay you are baling, depending on the ambient conditions and the steam rates used to meet the existing conditions.
    - **In climates with low humidity,** fully-cured hay with no natural dew will normally range from 8-10% moisture in the windrow, depending on ambient humidity.
      - In these climates you will normally be able to make bales with very good leaf retention and density by applying enough steam to bring the bale moisture up to 12-14%.
      - REMEMBER: Steam applied to hay using the DewPoint machine will simulate a higher moisture level than the actual moisture percentage that is applied.
      - For example, hay that at 8% moisture in the windrow can be baled at around 11-13% using steam from the DewPoint machine, but will look like it was baled at 16-18% with natural dew.

- **In climates with moderate humidity,** fully-cured hay that has no natural dew will normally range from 10-12% moisture, depending on ambient humidity.
    - In these climates you will normally be able to make bales with very good leaf retention and density by applying enough steam to bring the bale moisture up to 13-15%.
    - REMEMBER: Steam applied to hay using the DewPoint machine will simulate a higher moisture level than the actual moisture percentage that is applied.
    - For example, hay at 10-12% moisture in the windrow can be baled at around 13-15% using steam from the DewPoint machine, but will look like it was baled at 16-18% with natural dew.
- **In climates or seasons of high humidity,** where hay cannot be fully cured, you may choose to use hay preservative along with steam application. The steam application will reduce leaf loss and the preservative will prevent hay spoilage.
    - We do not recommend baling with stem moisture, whether using steam or not, unless:
        - You are using a proven preservative product.
        - You have tested the preservative product along with the use of steam, and you know your limits.
        - Some producers have successfully baled with some stem moisture in the daytime, while adding a proven preservative and a moderate amount of steam to hold leaves. This practice is more common in humid climates and during monsoon conditions.
        - REMEMBER: Steam applied to hay using the DewPoint machine will simulate a higher moisture level than the actual moisture percentage that is applied.
        - For example, adding just 1-3% more moisture with steam will reduce leaf loss and improve bale quality while keeping the bale moisture within an acceptable range, where a proven hay preservative will prevent spoilage.
- IN ALL OPERATING CONDITIONS YOU MUST FIND YOUR OWN LIMITS
    - WATCH the moisture reading on the GAZEEKA monitor.
    - ADJUST the steam injection rate over the first 5-10 bales to achieve the desired moisture.
    - MONITOR and make adjustments throughout the operating period to keep bale moisture at the desired level.

Judging Bale Moisture by Bale Chamber Pressure

- Use bale-chamber-pressure readings in large square balers in a similar fashion as you normally would to judge natural dew conditions. This is a good, redundant method of bale moisture measurement.
  - Effectiveness and accuracy in DewPoint steam-baled hay:
    - During the cooler hours of the day, as well as at night, bale chamber pressure is fairly accurate in steam-baled hay. During these hours, an operator who is accustomed to judging bale moisture conventionally by the bale chamber pressure reading should be able to keep within reasonable bale moisture parameters using similar readings as he would while baling fully-cured hay with natural dew.
    - If baling with stem moisture combined with either steam or natural dew, the bale-chamber-pressure method of judging moisture is not accurate, and is even risky.
    - When baling with steam in the hot part of the day, bale chamber pressure will nearly double to maintain the friction necessary to reach the plunger load target settings, even though the bale moisture is sufficient.
    - An operator using this method of moisture judging should become very familiar with the characteristics of this method before becoming dependent upon this method.
  - If you use the bale chamber pressure reading to monitor bale moisture during operation:
    - You must determine the acceptable bale moisture parameters you are comfortable with.
    - Generally, you will add from 1%-4% moisture to the hay you are baling, depending on the ambient conditions and the steam rates used to meet the existing conditions.
    - Watch bale-chamber-pressure readings on the baler monitor.
    - Adjust the steam injection rate over the first 5 to 10 bales using the master steam slide switch and/or the individual valve proportioning slide switches.
    - Increase the steam injection rate to lower bale chamber pressure readings.
    - Decrease the steam injection rate to raise bale chamber pressure readings.
- If using aftermarket BaleSkiis® in your baler chamber, you will not be able to judge bale moisture by bale chamber pressure effectively. In this case, you should use the GAZEEKA moisture gauge and visual methods to judge bale moisture.

Judging Bale Moisture Visually

Always observe the bales within a field while you are baling.

- Bales with optimal moisture levels will exhibit the following characteristics:
  - Leaf Pattern
    - Leaves should be attached to stems and/or somewhat "wafered" into the flakes in the bale.
    - The front (plunger end) of the bale represents the top of the windrow and will normally not look as good as the rear end of the bale. This is due to the action of the plunger against the front face of the bale on each plunger stroke. When observing the front of the bale, you should expect a little surface damage from the plunger; however, if you brush away the surface you should see a good leaf pattern.
    - The rear end of the bale represents the bottom of the windrow and will normally show less mechanical damage, since the plunger does not come into direct contact with it. When observing the rear end of a bale with optimal moisture level, you should expect an excellent leaf pattern. Leaves should be attached to stems and/or somewhat "wafered" into the flakes in the bale.
  - Bale Formation/Color
    - The sides of bales with optimal moisture levels should be compressed, smooth, may be slick, and will have good color.
    - Bale weight and shape should be consistent, with firm corners and ends
  - Bales that are too dry will exhibit one or more of the following characteristics:
    - Appear ragged and shattered along the sides
    - Leaves will be detached from stems
    - Corners and ends will be soft and shattered
    - Bale weights will be low
  - Bales that are too high in moisture will exhibit one or more of the following characteristics:
    - Sides of bale may be dark or slightly discolored, and overly slick or smeared
    - Leaf retention will be good, but the flakes in the bale may be caked too tightly

NOTE: There is an acceptable range of moisture where bale density, flake formation, and other characteristics can be controlled to meet the demands of your hay market. You should become familiar with these characteristics.

Judging Bale Moisture with a Hand-Held Moisture Probe

- If you use a hand-held moisture probe to monitor bale moisture during operation:
  - You must determine acceptable bale moisture parameters.
  - Be aware that the accuracy of this type of moisture sensor in steamed hay is not suitable for a true, real-time reading of bale moisture during the baling process. The surface moisture on steamed hay causes the moisture to read several points higher than the actual moisture, because the sensor depends on electrical conductivity between two points. This conductivity always looks for the path of least resistance and any type of surface moisture will carry conductivity more readily than the entire profile of the crop being baled.
    - Fully-Cured Hay: If an operator becomes familiar with the typical off-set of the moisture reading of this instrument compared to the actual moisture in the bale, they can learn to use a hand-held "contact type" moisture sensor with reasonable effectiveness when baling fully-cured hay using steam. Various conditions at the time of baling can affect the performance of this type of sensor. The off-set reading will vary, depending on ambient conditions in the windrow.
      - If the windrow has some natural dew and a small amount of steam is added to bring it up to an optimum moisture level, there will be only a small off-set in the moisture reading compared to the actual moisture in the bale.
      - If the windrow is extra dry, requiring a higher rate of steam to bring the bale moisture to an optimal level, there will be a much larger off-set in the moisture reading compared to the actual moisture in the bale.
    - Hay with Stem Moisture: When baling hay with stem moisture, a hand-held "contact type" moisture sensor is not accurate, and will normally read lower than the actual moisture content of the hay.
      - A stem of hay that is not fully cured may be relatively dry on the outside, but green on the inside. Therefore, while the inside of the stem may be very conductive, the conductivity between stems is typically much lower. This insulates the signal between the measuring points on the sensor, resulting in a lower overall reading at the time of baling. Moisture readings with a hand-held probe a few days after baling will be higher, after the moisture from the stems migrates more fully throughout the bale profile.
      - This type of moisture probe is effective several hours after the hay has been baled, as the applied moisture diffuses throughout the plant tissue more completely.

Judging Bale Moisture Using a Baler-Mounted "Contact Type" Moisture Sensor

- When you use a conventional baler-mounted moisture sensor, such as a star wheel sensor or other "contact type" sensor, y"ou must determine acceptable bale moisture parameters.
  - Be aware that the accuracy of this type of moisture sensor in steamed hay is not suitable for a true, real-time reading of bale moisture during the baling process. The surface moisture on the steamed hay causes the moisture to read several points higher than the actual moisture, because the sensor depends on electrical conductivity between two points. This conductivity always looks for the path of least resistance, and any type of surface moisture will carry conductivity more readily than the entire profile of the crop being baled.
  - The same principles noted in the "Hand-Held Moisture Probe" section apply to these baler-mounted "contact type" sensors.

Judging Bale Moisture After Baling

- Regardless of the method you use to judge moisture during the baling operation:
  - Always recheck bale moisture with a hand-held moisture probe a day or two after the hay is baled to be sure the moisture reading has settled.
  - If hay is fully-cured with no stem moisture before baling with steam, the moisture level reading on a hand-held moisture probe will normally begin to drop within a few hours after baling. Learn the limits and bale-moisture characteristics of your operation.
  - If hay is baled with stem moisture (whether you use steam or not), the moisture reading will generally increase significantly over the first 24-48 hours as the stem moisture migrates from the stems into the overall bale profile.
    - If you notice rising bale moisture readings over several days after baling, you should monitor the bale moisture and temperature daily until these readings peak and begin to fall.
    - If bale temperature and moisture readings continue to rise to dangerous levels, you should consult your local hay association and/or fire department to avoid a stack fire. In this case, you should find a reliable source of information to guide your actions.

Managing/Judging Bale Temperature

- Bale Temperature
  - When using steam, heat is added to the hay.
  - Bale temperatures can become excessive during high, ambient temperatures when a high rate of steam is used to bale hay.
  - Excessive bale temperatures will deteriorate bale color in the center of 3x3, 3x4 and 4x4 bales.
  - Do not raise bale temperatures above 135 deg. F, or 57 deg. C, when baling with steam.
  - When bale temperatures approach 135 deg. F, or 57 deg. C, either reduce steam injection rates or wait until a cooler time of day to bale.

- How to Judge Bale Temperature
  - Use a combination hand-held bale moisture/temperature probe.
  - Use a probe-type dial thermometer, 18-24" long, with a 0-200 deg. F or 0-93 deg. C range of measurement.
  - Insert thermometer into bale and allow a few minutes to to get a stable bale temperature reading.

- When baling with high rates of steam in high ambient temperatures, take regular bale temperature readings to be sure you are baling within a safe temperature range of below 135 deg. F or 57 deg. C.

Judging Bale Temperature is Your Responsibility

LEARN YOUR OWN LIMITS

Some types of hay may be more sensitive to heat than others. We recommend that you define temperature levels that are acceptable on your operation.

Hauling, Stacking, and Storage of Steam-Treated Hay

Hauling/Stacking Steamed Hay During Normal Harvest Operations

- To avoid discoloration of the hay in the stack, you should not stack hay that is above 115 deg. F or 46 deg. C inside the bale.
  - As general rules, observe the following:
    - Hay baled in the evening or night time can be hauled and stacked the next morning.
    - Hay baled in the early morning to mid-morning, before high steam rates are used, can be hauled and stacked later the same day.
    - Hay baled from mid-morning through the early evening at high steam rates should not be hauled and stacked until the next morning.

Stacking High-Temperature Steamed Hay When Weather is a Threat

- If bales must be moved off the field immediately after baling to avoid weather damage, but they are too hot to stack conventionally, you can consider the following procedure:
  - Pick up and haul bales from the field using your normal method.
  - DO NOT leave bales on a truck, bale mover etc. for more time than it takes to drive a short distance from the field to the stack yard or field side. Long-distance hauling or stopping for more than a few minutes may cause bale discoloration.
  - Dump hay in the stack location and immediately re-stack the hay in a configuration that allows heat dissipation from all four sides of the bales.
    - Use a tele-handler to stack hay in a staggered pattern with 18-24" of space between each bale on each layer.
      - Start the first layer with 18-24" between the sides of each bale.
      - Add each layer with each bale straddling the spaces between the bales in the layer below.
      - This allows heat dissipation through all four sides of each bale.
      - Allow the stack to remain in this configuration for a few days to cool.
      - Re-stack the hay in a tight formation when bales have cooled enough to stack conventionally (below 115 deg. F or 46 deg. C).

Marketing DewPoint Steam-Baled Hay

Forage producers who use DewPoint steam re-hydration technology have a distinct advantage in the market compared to those who rely on conventional methods.

Bale to Order

We recommend that you, your hay buyers, and consumers become familiar with the characteristics of fully-cured hay baled with steam at different moisture levels, ranging from 11-16% moisture, to determine what best meets the needs of each consumer of the hay.

Some DewPoint owners have made sample bales at various moisture levels from which they cut small samples to send or show to their hay buyers and consumers. This allows them to choose the characteristics they prefer long before the harvest season. This proactive approach to marketing and pre-selling hay is only possible by using the DewPoint machine in your operation. Growers who bale to order are receiving higher premiums for their hay because their customers know what they are getting ahead of time.

As mentioned earlier in the handbook, the Gazeeka moisture gauge is the preferred method of judging bale moisture during the baling process. The following guidelines are based on baling fully-cured hay with steam and using the Gazeeka moisture gauge to monitor bale moisture.

Here are some general bale characteristics you can expect when baling with steam at the levels shown on the Gazeeka:

- **11-12% baling moisture characteristics**
  - After a few days, moisture in this hay will drop to around 9-10%
  - Good leaf retention
  - Good bale density
  - Solid bale formation
  - Good crop dust and crop loss suppression when baling, handling, and feeding
  - Good for export market/press hay that requires good leaf retention with moisture requirements at 12% or less to prevent sweating and spoilage while being transported in shipping containers.
  - Flakes are somewhat wafered, but come apart easily in TMR feed mixers with some separation of leaves and stems.
- **13-14% baling moisture characteristics (most common baling moisture level)**
  - After a few days, moisture level will drop to around 11-12%.
  - Very good leaf retention

- Higher bale density
- Solid bale formation with slick sides but good, green color
- Good crop dust and crop loss suppression when baling, handling, and feeding
- Still ideal for export market/press hay that requires good leaf retention with moisture requirements at 12% or less to prevent sweating and spoilage while being transported in shipping containers.
- Flakes are wafered, but tend to break easily into small wafers (4-8"x ½-1" thick) in TMR feed mixers. Many dairymen like this characteristic best, as it provides whole leaves connected to stems with good stem lengths for digestion, even after TMR processing.
- Hay press operators especially like the way hay baled at this moisture level runs through press machinery.
- Flake-wafering characteristic minimizes crop waste during handling and press operations.
- Leaves stay well connected in flakes after pressing and when feeding.

- **15-16% baling moisture characteristics**
  - This is as high as you should ever bale hay with steam, unless you are also using a hay preservative that you have proven to be effective.
  - After a few days, the moisture level in this hay will drop to around 13-14%.
  - Very good leaf retention

- High bale density
- Solid bale formation with slick sides
- The color of the slick sides of the bale are generally still good, but may exhibit a slightly darker "smeared" appearance on the sides of some bales.
- Excellent crop dust and crop loss suppression when baling, handling, and feeding
- Not as good for export market/press hay, as the moisture may be high enough to cause sweating and spoilage while being transported in shipping containers, unless it is allowed to cure out in the bale for a few weeks or months.
- Flakes are tightly wafered and may be a little more difficult to break up in TMR feed mixers.
- Some customers will prefer this higher-moisture hay

Let Your Hay Speak for Itself

It does not hurt to experiment a bit and find what works best for you and your customers, and then show it.

Summary

Making high-quality hay generally consists of preserving and protecting what you have worked so hard to grow. Every stage of the harvest presents some measure of risk of damage or crop loss. DewPoint technology helps you minimize those risks at every stage when you implement updated crop management practices that enable more consistent handling of the crop from the time it is ready to cut, until it is delivered to the manger.

Staheli West Answers

Staheli West specializes in consulting with forage growers to help them raise their operation standards, efficiencies and profits. Our consultations cost you nothing except a little time and willingness to think outside the box, but the concepts we teach and help you implement will change your life.

You are welcome to call us directly anytime during business hours for answers to your questions.

Mountain Time Zone in the United States
8:00am to 5:00pm
Monday through Friday
435-586-8002

Online Resource Links

A Bracken Farms Story - Part 1 of 2
What Led Them to Buy a DewPoint Hay Steamer
https://www.youtube.com/watch?time_continue=331&v=l8YxdTVfeX4

A Bracken Farms Story - Part 2 of 2
How the DewPoint Hay Steamer Allows Them to Dew More With Less
https://www.youtube.com/watch?time_continue=3&v=yiXLlUwOIvA

Staheli West, Inc. Website
https://www.staheliwest.com/

Call a Current DewPoint Machine Owner (Owner List from Many Western States)

These DewPoint machine owners are happy to talk to anyone about their experience.

State	Name	Phone	Location
Arizona	Travis Gable	602-370-5356	Buckeye, AZ
Arizona	Efrain Alverez	520-507-3823	Pearce, AZ
Arizona	Daniel Hardison	520-723-4181	Buckeye, AZ
Arizona	Rueben Wood	623-764-2121	Buckeye, AZ
California	Mike Boyle	530-640-8406	Alturas, CA
California	Steven Maddox	559-903-0051	Riverdale, CA
California	Matt Tacherra	559-380-6176	Riverdale, CA
California	Joey Armstrong	661-816-5514	Lancaster, CA
Colorado	Jack Gilleland	719-580-5790	Alamosa, CO
Colorado	Casey Caldon	719-588-4481	Alamosa, CO
Colorado	Paul Faucette	719-588-5548	Alamosa, CO
Colorado	Jason Benton	719-850-1977	Monte Vista, CO
Colorado	Clay Corzine, Moonlight Farms	719-850-2548	Monte Vista, CO
Colorado	Brandon Boxberger	970-817-3530	Windsor, CO
Idaho	Perry VanTassel	208-312-1620	Paul, ID
Idaho	Ben McIntyre	208-573-1778	Marsing, ID
Idaho	Eric Webb	208-431-7753	Declo, ID
Idaho	Logan Driscoll	208-317-8155	American Falls, ID
Idaho	Coy Crapo	208-313-6323	St. Anthony, ID
Idaho	Jerry Cenarrusa	208-823-4633	Carey, ID
Idaho	James Carlson	208-201-2380	Carey, ID
Idaho	Ken Millsap	208-741-0015	Fruitland, ID
Kansas	Darin/Corwin Smith	620-277-5428	Lakin, KS
Kansas	Jordan Hickle	620-786-4913	Great Bend, KS
New Mexico	Doug Whitney	575-420-3000	Roswell, NM
New Mexico	Ryan Schwebach	505-269-1231	McIntosh, NM
Nevada	Arlow Nielsen	775-304-7780	Orovada, NV
Nevada	Grant St. Clair	208-250-0451	Orovada, NV
Nevada	Kim Summers	775-304-6214	Denio, NV
Nevada	Mark Dunn	775-412-8678	Rachel, NV
Oregon	Marwyn Peaster	541-216-0094	Ontario, OR
Oregon	Chris Payne	208-739-0601	Ontario, OR
Oregon	Mark Owens	541-589-2379	Burns, OR
Texas	Sy Olson	806-570-3481	Hereford, TX
Texas	Jeremy Giesbrecht	806-315-1731	Farwell, TX
Utah	Brandon Yardley	435-691-4438	Milford, UT
Utah	Brandon Hunter	435-592-3178	Cedar City, UT
Utah	Chess Burmester	208-380-5552	Snowville, UT
Utah	Kirby Bracken	435-231-1926	Beryl, UT
Utah	Eric Jones	435-231-1049	Beryl, UT
Utah	Randall Holt	435-231-2514	Enterprise, UT
Utah	Jeff Wood	435-590-2571	Parowan, UT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$15.00 US Dollars