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 CLICK ON THE CODE or SCAN THE CODE to view a short video clip on the topic.

**“DewPoint 6210 Operator Training” link to the right**

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DEWPOINT TECHNOLOGY

Precision Moisture Control for Hay Baling Operations
will change the way you make hay

Introduction:
This handbook is provided 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 Technology is changing dry baled hay operations around the world. The ability to schedule hay 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, and takes away 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 to ask any questions you have. Hundreds of our customers across the Western United States, and in Australia, Canada, Mexico, and Argentina, are also happy to share their experience 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 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 unless you saw 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 technology to a major ag equipment manufacturer to take the DewPoint Technology 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 went back 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, and 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 in a hay barn for commercial sale, 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 completely unique to our personal life experience. 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 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. That 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 of 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.

The main point is to decide how many acres you want to bale each day. Consider the growing days you have in the growing season and how to get the most crop growth out of those days. Most farm operators who implement DewPoint Technology into their operations, 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 can shave off the harvest of each crop, is a day you can add to the growth of your final cutting at the end of the season 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 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 even less if desired. You never have to miss a day of baling because of a lack of natural dew, and in many cases, you can beat rain storms with the ability to create your own baling moisture, even in the dry, windy conditions that often precede a weather front coming your way.

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

After you decide the acres you want to bale each day, you simply calculate how many DewPoint Steamer/Balers, Windrowers, Rakes, and bale moving machines you will need, 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 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-up your crop cycle, especially if you can get down to the “3 day” cycle. Your Windrower operators can become Rake Operators on the 3rd day out, 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 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 to achieve 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 to maintain efficient operation of the DewPoint Machine.

Water Source Selection and Water Sampling

- An appropriate water analysis is required
- SELECT the best water sources possible 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 – 40 PSI minimum.
    - A 120 VAC 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 – 40 PSI minimum.
    - 240 VAC 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 that recommendation to your Dealer who will help you get the Water Softener or RO Unit or other recommended equipment from Staheli West

Water System Equipment Set-up

- Set up 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 to 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 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 Water Softener or Reverse Osmosis Unit
  - Set up 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 of 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
    - LEAVE THIS WATER SUPPLY ON ALWAYS 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

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

- It is a good idea to 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 about an average of 60 tons/hour with a Large Rectangular Baler and that 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 liquid transfer pump is normally used to transfer water from the Water 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.

Water Quality/Blow-down Principles on your DewPoint Machine

- Boiler Blow-Down
  - When steam is consumed from 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 levels in an acceptable range during operation.
- Manual “Bottom Blow-downs” are performed at the beginning of each Day where 30–50 gallons of water is drained from the boiler in a safe location using a 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.

Remember that a DewPoint Machine will operate from 3-6 hours on one load (1000 gallons) of water.
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 THAT 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 empty is over 16,000 lbs. and 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 bale 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 pedals.
- 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

Crop Management and Operating Principles

General Considerations

When using DewPoint Steam Technology to bale your hay, 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 anytime the hay is dry except in very hot afternoon hours in some climates.

Irrigation

COMMON PRACTICE: Irrigation Timing

- In arid climates many hay producers using conventional balers leave their irrigation water on very close to the time they cut their hay to draw some ground moisture into windrows of hay for baling after it is cured.
- This practice can cause more machine tracking and crop damage when cutting, raking, baling and hauling hay. It also slows the hay curing process, causes inconsistencies in dry-down, and increases bleaching and the possibility of wet slugs in windrows of hay.

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: How Many Acres to Cut
- Hay producers often limit the acres of hay they cut each day because they are not sure how much baling they can actually get done each day with unpredictable natural dew conditions.

CONSIDER THIS CHANGE: How Many Acres to Cut
- Since DewPoint technology allows operators to bale 12-24 hours per day, (almost anytime the hay is dry) hay producers can “schedule” their harvest
- Simply decide how many acres you want to bale each day and go ahead and cut that many acres each day
- 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 their irrigation water on very close to the time they cut their hay to draw some ground moisture into windrows of hay for baling after it is cured.
- This practice can cause more machine tracking and crop damage when cutting, raking, baling and hauling hay. It also slows the hay curing process, causes inconsistencies in dry-down, and increases bleaching and the possibility of wet slugs in windrows of hay.

CONSIDER THIS CHANGE: Cut on Drier Ground
- 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 cutting hay 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 prior to Cutting
- You should also consider the rotation of Pivot Irrigation systems leading up to the time you plan to cut hay.
- 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, creating a natural dew effect within the windrow for raking, even in very dry conditions.
- In humid climates or conditions, avoid double raking hay too soon, perhaps even waiting until the morning you bale. Double raking a day or two ahead of baling in high humidity conditions when there are 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 it is 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 on the ground during the raking process resulting in expensive crop loss
- Double Raking hay that is too green causes serious dry-down problems.

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 in improving baling conditions for Alfalfa Hay in a variety of ambient conditions.

- The use of steam when baling Alfalfa hay will:
  - Decrease crop dust during the baling process and when feeding this hay to livestock
  - Increase bale density by increasing leaf retention and by softening the stems which will cause the stems to collapse and flatten when each flake of the bale is pressed into place by the baler plunger.
  - 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, conformation 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 be from 6-10% starting moisture in the windrow (depending on your climatic conditions). It is wise to 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

- 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 it is wise to 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
- Be aware of the difference in windrow moisture in high and low areas of a field. You should become familiar with your field characteristics with relation to how moisture typically sets into windrows of hay throughout 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 the 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 you can 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 you can 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 proportioning as needed to keep windrow moisture consistent. You have good flexibility in the way you proportion the 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 more 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

DewPoint Steam application is very effective in improving baling conditions for Cereal Grain crops which are cut green and cured for baling as forage. These crops can include Oat (Oaten) Hay, Wheat Hay, Mixed Grains which use 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 this hay to livestock
  - Increase bale density by softening the stems which will cause the stems to collapse and flatten when each flake of the bale is pressed into place by the baler plunger.
  - Reduce the “springy” characteristics of baled Cereal Grain Forages by softening the stems which will cause the stems to collapse and flatten when each flake of the bale is pressed into place by the baler plunger.
  - 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, conformation and shape
  - Improve processing characteristics when Cereal Hay is processed through hay press machinery

- Condition of Cereal Grain 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 be from 6-10% starting moisture in the windrow (depending on your climatic conditions). It is wise to 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
    - 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 it is wise to 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

- Be aware of the difference in windrow moisture in high and low areas of a field. You should become familiar with your field characteristics with relation to how moisture typically sets into windrows of hay throughout 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 the additional steam moisture is needed.
  - When dew is coming on in the evening the bottom of the windrow is generally still dry. In this case you can 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 you can 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 proportioning as needed to keep windrow moisture consistent. You have good flexibility in the way you proportion the 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
  - Please be sure all necessary steps are taken to assure 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. Proper conditioner settings on your windrower should crack the nodes to allow even dry-down.
  - If the heads of the Cereal Grain crop have not fully emerged from the boot they will 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 dry before baling.
Grass and Mixed Grass/Alfalfa Hay

DewPoint Steam application is effective in 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 ratio in the overall crop profile 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 this hay to livestock
  - Increase bale density by softening the stems which will cause the stems to collapse and flatten when each flake of the bale is pressed into place by the baler plunger.
  - Reduce the “springy” characteristics of baled Grass and Mixed Grass/Alfalfa forages by softening the stems which will cause the stems to collapse and flatten when each flake of the bale is pressed into place by the baler plunger.
  - 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, conformation 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 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 be from 6-10% starting moisture in the windrow (depending on your climatic conditions). It is wise to 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

- 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 it is wise to 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

- Be aware of the difference in windrow moisture in high and low areas of a field. You should become familiar with your field characteristics with relation to how moisture typically sets into windrows of hay throughout 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 the additional steam moisture is needed.
  - When dew is coming on in the evening the bottom of the windrow is generally still dry. In this case you can 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 you can 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 proportioning as needed to keep windrow moisture consistent. You have good 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!
  - Please be sure all necessary steps are taken to assure a complete dry down of your Grass and Mixed Grass/Alfalfa hay prior to baling
Baling Management with the DewPoint Machine

General Baling Considerations

- Nearly all 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 changes in humidity, temperature and wind patterns
- If the top or bottom of the windrow has a higher moisture content, you can adjust the proportions of the Steam Valves on the DewPoint machine feeding the top and bottom manifolds to match those conditions, and you can change these proportions as conditions change while you are baling hay
- Set the main steam rate to an appropriate starting level. This will adjust all steam valves in the proportions 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 around 60%, and where there is some natural dew you should start at a lower steam rate
- Then increase the steam rate a little at a time over the first 4-5 bales until you reach the desired bale moisture level. It is better to have a few starting bales a bit on the dry side as you work up to your desired bale moisture level, than to start out too wet.
- Monitor bale moisture with the GAZEEKA Moisture Gauge and make steam rate adjustments as needed to maintain bale moisture at an acceptable level

Baling in Very Dry Conditions

- Bale temperature should be checked periodically when baling with high rates of steam during hot afternoons, to keep bale temperatures below 135°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 7:00pm in the evening after the air starts to cool, and NOON the next day, before the afternoon sun, temperatures and winds combine to create more adverse conditions.

Baling in Relatively “Normal” Conditions

- In relatively normal conditions where dry-down conditions are good and there is a light to moderate amount of dew at night you will have several baling options
  - To conserve fuel and water, many DewPoint Machine operators choose to start baling in the early evening and continue into the night time hours until they are finished with their baling for the day
  - Other operators will start baling very early in the morning and run into the middle of the day or until they have completed their baling for the day
  - Steam rate adjustments are made by simply 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 will wait until the night time 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 the natural dew sets in too heavily.
- Normally you will be able to bale hay with steam throughout the day and maintain good moisture in these higher humidity conditions.

Baling in High Humidity Conditions/with Steam Moisture

- In high humidity conditions when you are unable to cure the hay completely and stem moisture is present, the use of a 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 overall moisture level of the hay being baled
  - Use of the GAZEEKA Moisture Gauge is very helpful to be sure your bales are within a tolerable moisture range.
- We do not recommend baling with “Steam 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 that you observe the following instructions:
  - When you come to a thin spot in a windrow as you are baling, it is best to turn OFF the Top Rear Manifold, and if the windrow is very thin, the Bottom Rear Manifold also, as you pass through these thin areas.
  - This will prevent making a “wet flake” in the Stuffer Chamber of the Baler. 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 ON all manifolds again.
  - It is best to make a few flakes a bit too dry than making flakes that are wet.

**When you arrive at the field**

- EXAMINE the windrows to determine your initial steam rate. If there is any question regarding the ambient moisture condition of the windrows of hay, you should verify that 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:
    - Start your baler and bale 2 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 Observations:
    - 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 dry enough.
    - 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 and you have that flexibility.
  - 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 the main steam rate at around 60%.
  - Then increase the steam rate a little at a time over the first 4-5 bales until you reach the desired bale moisture level.
  - It is better to have a few starting bales a bit on the dry side as you work up to your desired bale moisture level, than to start out too wet.

**Field Speed**

- FIELD SPEED should be as fast as necessary to feed the baler to full or nearly full capacity with the stuffer cycling on every plunger stroke.
  - When using steam during Field Operation, Bale Flake Counts can be reduced below the Flake Density setting by increasing field travel speed.
    - Conventional Bale Flake Counts of 40 flakes/bale can typically be reduced to around 30 flakes/bale when using steam while maintaining excellent bale conformation and higher bale density, because the crop is softened by the steam and packs more easily.
    - When baling with steam, Plunger load targets can also be reduced somewhat while achieving similar or higher bale weights compared to conventional baling.
    - Baling with steam will allow you to increase your field speed 15-25% higher than conventional baling.
    - Do not exceed the speed at which your baler is able to pick up the windrow clean from the ground.

**Monitor and Manage Bale Moisture**

- MONITOR BALE MOISTURE and adjust steam rate to meet your bale moisture target. It is your responsibility to determine the desired moisture level you want to maintain in your bales. For more complete information on “Bale Moisture” principles and practices, Please See “Managing and Judging Bale Moisture” below.
Managing/Judging Bale Moisture
Managing and 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 bale density, flake wafering, and other characteristics can be controlled according to the demands of your hay market. We recommend that you and your hay buyers, and end consumers become familiar with the characteristics of hay baled with steam at different moisture levels to determine what best suits the needs of all concerned parties.

The beauty of DewPoint Technology is that you can choose the way you want to bale your hay and the bale formation characteristics you and your market want in the finished product.

Judging Bale Moisture: with the GAZEEKA Moisture Gauge

- Use a Baler mounted GAZEEKA Moisture Gauge, on the Baler
- 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
- However, 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 dry hay, and in dry hay is much less than in water. Thus, if measured correctly, these measurements can be a very sensitive method of measuring moisture in a bale of hay.
- Whether the moisture detected in hay is from Steam, Natural Dew or Stem Moisture, the GAZEEKA Moisture Gauge provides an accurate moisture reading when properly calibrated.
- Calibration should be done prior to putting hay in the baler the first time. Follow all directions with the GAZEEKA instrument to calibrate and establish proper settings for safe and reliable operation.

- MONITOR Bale moisture using the GAZEEKA Moisture Gauge and adjust steam rate to meet your bale moisture target
- It is your responsibility determine acceptable bale moisture parameters
- 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

  - In climates with low humidity fully cured hay that has 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 effect than the actual moisture percentage that is applied.
    - FOR EXAMPLE: Hay that is 8% moisture in the windrow can be baled at around 12% 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 Climates with high humidity fully cured hay that has some moisture will normally range from 12-14% 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 16-18%.
  - REMEMBER: Steam applied to hay using the DewPoint Machine will simulate a higher moisture effect than the actual moisture percentage that is applied.
  - FOR EXAMPLE: Hay that is 8% moisture in the windrow can be baled at around 13% using steam from the DewPoint Machine but will look like it was baled at 16-18% with natural dew.

We highly recommend the GAZEEKA Moisture Gauge as your primary moisture measuring instrument while baling hay using the DewPoint system.

We also recommend that you watch Bale Chamber Pressure readings and visually observe the bales you are making as you pass them on the next windrow. These redundant observations will help assure that you are making the best hay possible.

For Example: Hay that is 8% moisture in the windrow can be baled at around 12% using steam from the DewPoint Machine but will look like it was baled at 16-18% with natural dew.

The next few pages contain information regarding different ways to judge bale moisture.
• 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 effect than the actual moisture percentage that is applied.
  • FOR EXAMPLE: Hay that is 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 more humid climates and during monsoon conditions
  • REMEMBER: Steam applied to hay using the DewPoint Machine will simulate a higher moisture effect than the actual moisture percentage that is applied
    • 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 rate over the first 5 to 10 bales to achieve the desired moisture level in your bales
  • MONITOR and make adjustments throughout the operating time 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 would use them 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 and at night, Bale Chamber Pressure is fairly accurate in DewPoint 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 tolerances using similar readings as he would use 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 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 Plunger Load Target settings even though the bale moisture is sufficient.
  • An operator using this method of moisture judging would do well to 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 baler monitor
  • ADJUST the steam rate over the first 5 to 10 bales using the Master Steam rate slide switch and/or the individual valve proportioning slide switches
  • INCREASE Steam Rate to lower Bale Chamber Pressure readings
  • DECREASE Steam Rate to raise Bale Chamber Pressure readings
• If using aftermarket “Bale Ski’s” in your bale chamber, you will not be able to judge bale moisture with 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

You should always observe the bales within a field while you are baling

- Bales with proper moisture levels will exhibit the following characteristics:
  - **Leaf Pattern**
    - Leaves should be attached to stem and/or somewhat “wafered” into the flakes in the bale
    - The front (plunger end) of the bale represents the top of the windrow of hay and will normally not look as good as the rear end of the bale simply because of 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 of hay and will normally show less mechanical damage since the Plunger does not come in direct contact with it. When observing the rear end of a bale with the correct moisture level you should expect an excellent leaf pattern. Leaves should be attached to stem and/or somewhat “wafered” into the flakes in the bale.
  - **Bale Conformation**
    - The sides of bales with a good moisture level should be compressed, smooth, and may be slick but of good color
    - Bale shape should be consistent, with firm corners and ends
  - **Bale Color**
    - The sides of bales with a good moisture level should be compressed, smooth, and may be slick but of good color
    - 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 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 wafering 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 very familiar with the typical “off-set” of the moisture reading of this instrument compared to the actual moisture in the bale he 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 of hay has some degree of natural dew and a small amount of steam is added to the hay 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 very dry, requiring a higher rate of steam to bring the bale moisture to an optimum 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 when baling 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 which 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 when 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

- If you use a conventional Baler Mounted Moisture Sensor such as a “star wheel” sensor or other “contact type” sensor mounted in the bale chamber 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 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 RE-CHECK BALE MOISTURE with a hand-held moisture probe a day or two after hay is baled to be sure the moisture reading has “settled”
  - If hay is dried completely 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 your limits and bale moisture characteristics on your own 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° F when baling with steam.
  - When bale temperatures approach 135° F, either reduce steam 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 1–200° F range of measurement
  - Insert thermometer into bale and allow to equalize for a few minutes 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 below 135° F

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°F inside the bale.
- As a general rule please 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 of hay 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 the bales from the field using your normal method.
  - DO NOT leave bales on a Truck, Bale Mover etc. for more than the time it takes you 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 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 stack when bales have cooled enough to stack conventionally (below 115°F).
Marketing DewPoint Steam Baled Hay

Forage Producers who use DewPoint Steam Re-hydration technology have a distinct advantage in the market compared with those who rely on conventional methods.

Bale to Order

There is an acceptable range of bale moisture where bale density, flake wafering, and other characteristics can be controlled to meet the demands of your market.

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

Some DewPoint Steamer owners have made sample bales at various moisture levels from which they can cut small samples to send or show to their hay buyers and consumers, so they can choose the characteristics they prefer long before the harvest season. Such a proactive approach to marketing and pre-selling your hay is only possible by using the DewPoint Steamer in your baling operation. Growers who “Bale to Order” are getting 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 “well cured hay” with steam and using the Gazeeka Moisture Gauge to monitor bale moisture as you go.

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

11-12% baling moisture characteristics
- After a few days the moisture level in this hay will drop to around 9-10%
- Good leaf retention
- Good bale density
- Solid bale conformation
- 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 the moisture level in this hay will drop to around 11-12%
- Very good leaf retention
- Higher bale density
- Solid bale conformation 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 still connected to stems with good stem lengths for digestion even after TMR processing.
- Hay Press operators especially like the way that 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 conformation with slick sides.
  • The color of the slick sides of the bale is 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
  • There are some customers who 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 rime it is ready to cut, until it is delivered to the manger.
### 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.

<table>
<thead>
<tr>
<th>State</th>
<th>Name</th>
<th>Phone</th>
<th>Location</th>
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<tbody>
<tr>
<td>Arizona</td>
<td>Travis Gable</td>
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<td>Arizona</td>
<td>Efrain Alvarez</td>
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<td>Arizona</td>
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Customer Testimonials
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