Hay Heating, Hay Sweat and Spontaneous Combustion

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Making hay in central Kentucky can be one of the most trying on farm endeavors a producer can undertake. Our plentiful moisture, rolling topography, and climate make Kentucky ideal for producing high quality forage for either grazing or hay making. However, that same moisture either in the form of rain or high humidity can sometimes make it devilishly hard to make quality hay here in Kentucky.

Many of you, like myself can remember, when farmers use to put salt between layers of hay in order keep it from spoiling while going through a sweat or heating process. That’s because even after hay is cut, it still generates heat and moisture.

Today tools like mower conditioners, preservatives, tedders, multiple packaging options, etc give us the opportunity to make high quality hay here in Kentucky. Use of these new innovations and tools does not however totally eliminate the possibility of producing some “wet” hay.

After you cut your hay, the question then becomes, “When do I bale the hay and at what moisture level will it keep?” Research tells us that for small square bales we need to have our moisture levels between 18 and 20% moisture and for round bales between 15 and 18% moisture. Even if we reach those levels sometimes we can still have problems with hay heating especially if not stored properly.

“The heat generated by plant cell respiration in hay bales is normal and generally of little consequence. However, if bale moisture levels are too high (greater than 20 percent), the heat and moisture will provide a suitable environment for the growth and multiplication of mesophilic (warm temperature) bacteria that are present on forage crops. The respiration of mesophilic bacteria releases additional heat in the bale and interior bale temperatures can reach 130° to 140°F. At this temperature range, most mesophilic bacteria die and interior bale temperatures start to decline.”

How do we check for moisture in hay that we need to bale? The most reliable and accurate way is by using the microwave method. (See paper at the end of these proceedings). There are also commercially available moisture meters that do a good job of telling moisture levels. Bale a couple of small square bales or a couple of round bales and then use the moisture meters according to the supplied directions. (Some commercial testers also come with a temperature reading on them). This should give a
fairly accurate moisture reading. If the hay is above the previous mentioned percentages put off baling until those levels are within the desired range. Preservatives will allow for baling at higher moisture levels however special care should always be taken when using preservatives and ALWAYS read and follow label directions.

Now that the hay is in the bale, is it dry enough and cool enough to put in the barn? Most hay goes through one or more heating cycles (a sweat) immediately after baling. It is not unusual for internal bale temperature to exceed 100° F and it may goes as high as 130° F to 140° F if enough moisture and oxygen are present. As moisture levels increase in the baled hay, the probability of heating increases also.

As temperatures increase in the hay the risk of fire also begins to come into the picture. If you see temperatures rising above that 130° F level, it would be imperative to continue to monitor that hay on a daily basis. If temperatures continue to rise, begin to think about moving the hay out of your storage structure. When temperatures reach 150° F, start moving the hay immediately. If temperatures reach over 160° degrees and are still climbing, call the fire department before moving the hay. At these higher temperatures, an influx of oxygen can ignite a fire and then it is probably too late to call the fire department for fire prevention but rather you will be calling them to put out the fire that is burning your hay as well as your storage structure.

When building a hay storage structure be very careful to insure adequate ventilation which will allow for the proper curing of your hay crop. As hay cures, it emits warm moist air. That air rises and needs an escape route at the top of the building. That air needs to escape in order to prevent condensation on the roof which will in turn fall back onto the hay which can cause storage losses and can contribute to the risk of fire. If possible, it is desirable to allow for the inflow of air from the bottom of the building which can help with air flow to remove the warm moist air from the top of the building.

In order to facilitate the proper curing of your hay, store small square bales on edge with the cut side up. This will allow the warm moist air to escape the bale better and rise to and out of the top of the building. Rounds bales (or mid-size square bales) should be left outside until temperatures have approached ambient temperature.

In closing, moisture management is critical in packaging and storing hay. The two moisture levels that need to be monitored baling are at the point of baling and when the hay is put into storage. If you are relentless in your moisture management, your chance of producing a high quality hay crop is greatly enhanced and your chance of fire via spontaneous combustion is greatly reduced.

Reference