Hay preservatives may reduce haystack fires!

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Haystack fires last season (2007) were more prevalent last season and the 2002/03 drought in failed cereal crops and pasture species. It is thought that some of these self-ignited (spontaneous combustion) fires, particularly in large square bales of failed cereal crops, were due to abnormally high sugar levels in the plants themselves.

It is possible that these high sugar levels led to increased plant respiration in the bales resulting in even more moisture being produced from sweating which leads to mould growth and extra heat. In a normal year, these sugars would have been converted to starch in the grain kernels during grain formation and harvested as grain leaving behind stubble with negligible sugar. Due to the high density of large rectangular bales and the large volume of round bales, also much denser these days, renders them very difficult to dissipate heat.

However, many other haystack fires were due to excess moisture at baling. This excess moisture could have been due to such factors as canola crops with “difficult to dry” thick stems, cereal crops at the boot stage with moist heads in the boot and nodes, baling before the crop was cured enough, baling material with excess dews and even worse on cereals with high sugar levels in the plants, etc. Also over summer, many fires can be start due to unseasonably heavy rainfall events which soak deeply into uncovered stacks.

Could hay preservatives have prevented some of these haystack fires?

It is highly likely that reputable hay preservatives applied at the correct rate and ensuring sufficient coverage of the material on the pick up will have prevented many, but not all the fires. There were anecdotal reports of some stacks still “going up” which had been treated with preservatives. Were they applied at the correct rates, given the crop was actually quite a bit heavier due to its higher moisture content?

How well was the hay preservative integrated into the material? Spraying the preservative on top of the windrow just before baling, especially thick windrows, will not ensure adequate coverage. Was the particular product suitable for the hay being baled in these specific circumstances? Even when the job was done right in many instances spontaneous combustion still occurred in some cereal crops cut for hay.

Table 1 shows the recommended moisture contents for safe baling.

Table 1. Recommended moisture contents (%) for safe storage of hay bale types

Bale Type	Recommended Moisture Content Range (%)*
Small rectangular bales	16 – 18
Round bales (Soft core)	14 – 16
Round bales (Hard core)	13 - 15
Large rectangular bales	12 - 14

Export Hay	Under 12

*Hay stored slightly above the maximum moisture content in each range will lose DM and nutritive value due to plant respiration and possibly mould growth and is recognised by heating of the bale/stack and/or internal browning of the bales or stacks .

Hay preservatives (inhibitors) are added at baling, preferably as material passes over the pick up or near the throat of the baler, to allow safe baling at slightly higher moisture contents. Their mode of action is to reduce plant respiration microbial activity (mould and yeast growth) and heat during storage. Their application rate is on a fresh weight basis so when moisture content of the hay is higher, so must be the application rate!

There are a range of preservatives which include bacterial inoculants, buffered organic acid salts and a product based on sulphur and enzymes. There are a few other hay preservatives which use different modes of action to these listed above.

The inoculant types (eg. *Bacillus* species, *Lactobacillus buchneri* 40788, etc.) promote faster curing, stop plant respiration and prevent growth of mould, so reducing heating and losses. They are suitable for hay baled up to 20 – 25% moisture. They are safe for animals, non-corrosive and easily handled.

The organic acid types (eg. proprionic acid) are now mainly available as buffered acid salts to minimise corrosion and for safer handling. These inhibit mould growth which subsequently minimises heating. These are applied via an applicator, the rate being dependent on the active ingredient and moisture content of the hay. Machines should 3be washed after use.

The sulphur based product produces gases which “ties up” the oxygen and greatly affects the yeasts and mould which cause the heating.

Most hay preservatives are designed to be effective in hay moisture contents up to 25% but I would suggest this applies to small squares and so moisture limits for guaranteed success of the preservatives should be dropped substantially for rounds and large rectangular bales. However, always follow the manufacturer’s instructions as they are all different.

Be aware that hay treated with preservatives containing ethoxyquin and butylated hydroxytoluene produce hydrogen cyanide gas at about 115º C). This gas is deadly, so use extreme caution when fighting a fire in this hay. A common acid salt used is propionic and does not produce these poisonous gases.

The use of these products allowing baling at slightly higher moisture contents will result in shorter curing time, reduce leaf shatter and leaf loss (resulting in higher quality hay), helps retain greener colour and maintains good palatability, ie. tastes great.

Don’t forget, the preservative must cover all the cured forage and the application rates adjusted for increased moisture content. Don’t be complacent once baling is finished and the hay is stacked, keep an eye on the stack temperature for some time afterwards, just in case!