



## HAY MOW AND SILO FIRES

Every year there are fires caused by spontaneous heating and combustion of stored hay and silage - hay put up too wet or silage put up too dry. The resulting losses due to fire are considerable. Several millions of dollars are lost each year in North America in structures, feed and cattle from hay and silo fires. These fires can be prevented with care in harvesting and storage and an understanding of the spontaneous heating process.

Spontaneous heating and combustion occur when sufficient moisture, oxygen and organic matter are present at the same time to support the growth of bacteria and moulds. It is the rapid growth of populations of these organisms that results in heating.

Initially, hay or silage may heat to 50 to 65°C (120 to 150°F). If heat can be dissipated rapidly at this stage by opening up the hay stack or pulling apart the silage pile, the temperature may subside to normal. Remember that if forage reaches this temperature there is virtually no nutritive value remaining, even though it may be palatable to cattle.

If the moisture content of hay placed in the mow is below 26% (wet basis), it is not likely that the temperature will rise beyond 65°C (150°F). Ideally, hay should be at 15% moisture content when stored.

A secondary heating process can take place and a temperature rise of about 1°C (2°F) per day can be observed until a second plateau is reached at 80 to

150°C (180 to 220°F). This higher temperature plateau is referred to as the critical temperature. The forage temperature may stabilize for a period of a few days after which temperatures may decrease or they may increase rapidly by 10°C (18°F) per hour until an ignition temperature of about 205°C (400°F) is reached. At the critical temperature moisture is evaporated rapidly by the heat until the forage is dry enough to burn.

Temperatures and times indicated vary with the type of forage, density, moisture content, length of cut and other factors. If combustion is to occur, it will take place as soon as two weeks or up to six weeks after storage.

During the heating process, the mow will be warm and humid, wisps of water vapour can be observed and an odour similar to vinegar may be detected. At the critical temperature, a pungent, scorched stench will be noticeable.

Silage can go through a similar heating process if it is put up too dry so that it cannot be properly packed to exclude air. Silage should not be stored in a horizontal (bunker) silo at less than 65 to 70% moisture content (wet basis). A short chop should be used and the forage must be thoroughly packed with a rubber-tired tractor.

For conventional tower silos, 55 to 65% moisture contents is the lower limit. For oxygen limiting tower silos, 45 to 50% moisture contents is the lower limit for safe ensiling. Fires in tower silos are particularly hazardous and difficult to extinguish.

## Instructions in Case of Hay or Silage Heating

1. If forage appears to be heating, act quickly to determine the temperature at several spots in the centre of the mow or silo. A long temperature probe is required. If the forage has reached 50 to 65°C (120 to 150°F), the material is virtually useless as feed and it is recommended that it be moved out of storage.
2. To put off the task of moving the material:
  - open up the hay mow to get air into it for cooling
  - apply liberal quantities of hay salt to control bacterial action. Hay salt is raw sodium chloride, similar to table salt, and is safe for cattle. Rock salt, used on roads in winter, is calcium chloride which is poisonous and not to be used on hay.
3. If the forage continues to heat to the 80 to 105°C (180 to 220°F) critical temperature, do not wait for the material to cool because it probably will not. Plan to move the forage out of the storage as soon as possible. Call the Fire Department before moving anything. Have them standing by as the forage is moved out of the mow or silo. Fires will break out in the hottest spots of the mow or silo as they are exposed to air.
  - inject water into the silo hot spots to cool the material
  - after "watering" a horizontal silo, pack the material again to exclude air

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**FOR FURTHER INFORMATION, CONTACT:**

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