

## FORAGE MOISTURE TESTERS

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The quality of forage used for feed is affected by the moisture content at which it was harvested and stored. To guess moisture content from experience or by hand squeezing and wadding is not accurate enough for today's methods of putting up hay, haylage or silage.

There are several very accurate and rapid types of sophisticated moisture indicators used in various industries, but these are too complex and costly to be considered for portable use by farmers. Other smaller instruments are also available that do a less accurate but acceptable job of determining moisture content of forage. One of these can be the most useful and economical pieces of equipment a farmer can own.

Moisture testers can be divided into two general classes: those using heat and those using electricity. Those using heat are known as direct types because they drive the moisture out and measure it by weight. The electronic types are called indirect because the amount of moisture affects the amount of electricity allowed to flow in a circuit. Moisture is not removed from the material.

The standard method of moisture calculation is oven drying at 217°F for 24 hours. The obvious disadvantage of this method is the time it takes. Also, an accurate instrument is required to measure the weights of wet and dry samples. Various types of energy sources can be used for oven heat. Natural gas, propane, fuel oil, kerosene, exhaust gases from engines, heat lamps, and electric hot plates are all examples of potential heat sources.

Microwave ovens can also be used to dry forage samples. Exact time and power requirements have not been established but the time is much less than that required for a conventional oven. The general procedure is to dry samples to a constant weight. However, be careful not to operate the oven after the samples are dry because it could damage the magnetron (power unit) of the oven. In either the microwave or conventional oven methods, moisture content is calculated from the following equation:

$$\% \text{ Moisture Content} = \frac{W_o - W_f}{W_o} \times 100$$

where

$W_o$  = weight of sample before drying and  
 $W_f$  = weight of sample after drying.

The electronic moisture testers can be divided into two further classifications as resistance (or conductance) and capacitance. The resistance type is usually recognized as the simplest design using a D.C. power source, usually a small battery, and a single probe of various lengths. Generally, resistance meters are the lowest cost of any meters on the market today. The capacitance type also operates on D.C. power but requires more complex electronic circuitry. The capacitance meter is less subject to error due to uneven moisture distribution in the material than the straight resistance instrument.

With either electronic type meter, the amount of electric current is indicated on a needle or digital readout which indicates moisture content directly. A temperature correction may be automatically provided or must be read from a chart.

The advantage of electronic meters compared to the heat method is that they give instant readings. The disadvantage is that they are less accurate. However, because of their quickness, several readings can be made in a very short time and averaged out.

Some general suggestions for operating moisture testing equipment are:

1. Read the instructions that come with the equipment and follow them.
2. Take several representative samples or readings, and
3. Develop confidence in your meter through repeated use and comparison to other moisture testing methods.

The importance of sampling cannot be over-emphasized. Errors in moisture measurement may be caused as much or more by the samples than by the meter itself. Take at least 5 to 10 representative samples and take at least 2 readings on each sample if possible. Use the average of these results for your moisture content.