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NECESSITY OF GRADUATION AND CALIBRATION OF MOISTURE METERS

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ABSTRACT:

Checking the humidity meters means that the metrologist determines its true error and draws a conclusion about the suitability of this device for use. Since most moisture meters are based on indirect measurement methods, the most important task is its high-quality grading, i.e., to create a functional relationship between a certain amount and the moisture content of that material.

Keywords: Graduation, calibration, humidity, measuring instrument.

INTRODUCTION:

One of the important tasks in measuring and monitoring humidity is to create high-precision, fast, reliable, resistant to external interference, linear static and dynamic measuring devices. As a measuring instrument, a moisture meter must have a number of characteristics. Since most moisture meters are based on indirect measurement methods, the most important task is its high-quality grading, i.e., to create a functional relationship between a certain amount and the moisture content of that material. Typically, this relationship is statistical, and the average value of this moisture is obtained at calibration. As a result, the average nominal calibration characteristic of the humidity meter is obtained.

Figure 1 shows the calibration characteristics of a high-frequency moisture meter obtained from [1-3]. In this case, none of the moisture dependence of the capacity fully corresponds to the average (nominal) characteristic of the humidity meter, ie the humidity measurement error for this instrument is not considered a constant value. This can be normalized not by a certain value but by a certain probability limit.

Thus, when inspecting humidity meters, it is necessary to check the error of the nominal calibration characteristic of the humidity meter and thus determine the serviceability of the instrument. In case of exceeding the permissible deviation, it should be recalibrated.

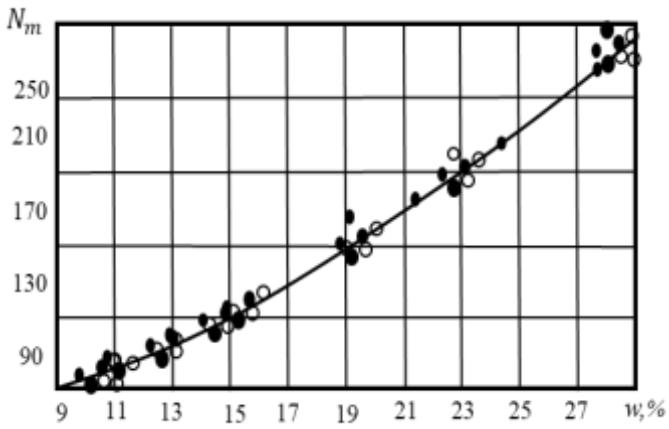

Figure 1. Graduation characteristics of high frequency humidity meter

Moisture meters of spray materials, unlike other measuring instruments, should be tested as a tool for measuring physical quantities that are functionally related to humidity, as well as as a device for measuring moisture.

It should also be taken into account that all humidity meters have a multiplier error, which usually increases with increasing humidity.

The purpose of the dissertation work is to develop and study an intelligent device for measuring the moisture content of friable materials, so it is necessary to update or develop

a method of calibration and determine the allowable measurement error.

The following conclusions can be drawn from the analysis: the calibration of instruments is associated with the need to check the error of the nominal calibration characteristic and determine the serviceability of the device.

When a deviation from the allowable value is observed, it is necessary to recalibrate it taking into account the multiplicative errors (changes in humidity and ambient temperature).

Analysis of work on calibration of measuring instruments. Calibration of measuring instruments is a set of operations performed under certain conditions to determine the metrological characteristics of measuring instruments by determining the ratio between the value obtained using the measuring instrument and the value of the corresponding magnitude restored by the standard. Calibration of measuring instruments is a feature that usually characterizes the accuracy of the measurement results obtained during their use.

Calibration is carried out in order to determine the metrological characteristics of measuring instruments by performing a set of operations that determine the ratio between the magnitude values obtained using calibrated measuring instruments under certain conditions and the corresponding values of the standard measuring instruments and standards. In this case, the calibration of measuring instruments is carried out using standard measuring instruments, ie standards and auxiliary calibration instruments, which have direct or indirect metrological observations up to the units of the international system of units. Periodicity of calibration of measuring instruments, calibration methods are determined in their technical parameters, provided that the specified period should not exceed the interval between the comparative intervals of the respective measuring instruments. The calibration process may use methods published in normative documents in the field of technical regulation or described in authoritative technical organizations or relevant scientific articles or journals, or recommended by the manufacturer of the measuring instrument and developed or modified by the laboratory in the form of quality system management document.

Theoretical and practical analyzes and recommendations for calibration of measuring instruments are detailed in [4,7,8]. From the above, it is known that the development of calibration methods does not specify the prohibited requirements for manufacturers of measuring instruments. Therefore, in some cases it is necessary to develop new calibration tools and methods. These are:

- Not intended for regulation on the basis of state standards, when the uniformity of measurements is carried out by manufacturers of units or small series of measuring instruments;
- Users of measuring instruments purchased without proper documentation or imported from abroad;
- Standards and other unique equipment manufacturers whose accuracy features are the most important task. This process is very complex and depends on many factors. Conditionally can be divided into three groups.

1. With corrections to the systemic components of the error of the measuring instrument (calibration of the measuring instrument);
2. Without making corrections to the structural components of the measuring instrument error;
3. Comparison of the error of the measuring device with the allowable values.

The following conclusions can be drawn from the analysis of regulatory documents and research on the implementation of calibration:

– Development of the order and method of calibration of the experimental device for

monitoring the moisture content of the created friable materials;
- The measurement results of the developed device should be as close as possible to the results of the reference instrument or the calibration method;
- The difficulties of calibrating and calibrating instruments indicate the need to develop or apply new methods, i.e., instruments that allow automation of calibration of measuring instruments based on neural networks.
- However, the development and modernization of primary instrument designs is undoubtedly a major task to be solved.

In addition to the properties of high-precision operation, speed and constant measurement of devices used in the measurement of humidity, the following requirements can be set:
- The measuring device measures moisture in the technological process and does not damage the substance being measured;
- The absence of elements in the design of the measuring device that affect the accuracy of the measurement of loose materials;
- The sensitivity of the measuring device to the external environment is not high;
- The measuring device must be protected from various external influences, such as pulsed interference, as well as magnetic fields.

CONCLUSION:

Due to the importance of moisture in the technological processes of storage and processing of bulk materials, especially grain and grain products, high-precision moisture meters are used. Thus, according to scientific research and analysis of available moisture meters, intelligent devices based on capacity converters can meet the technical, economic requirements for measuring the moisture content of scattered materials, in particular grain and grain products.

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