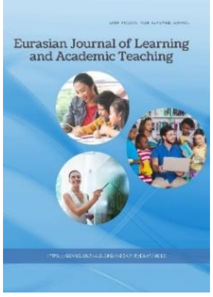

The Place and Possibilities of Digital Measuring Instruments in Cross - Fields

Karshiyev Zokhidjon
Department teacher "Metrology and standardization"
Bukhara Engineering -Technology Institute
Republic of Uzbekistan, Bukhara

ABSTRACT

In this article, the conversion of the entered measured value into a digital code in digital measuring instruments occurs automatically. Automatic conversion of the measured value into a digital code is a sign of identification of a digital measuring instrument. Based on this, the article presents some types of digital meters for the quantitative qualities of oil and oil products and you will receive a conclusion on the measurement results.

Keywords: octanometer, gas chromatography, density, octane number, aromatic hydrocarbon, analogue, detonation.

Introduction

It is known to measure something one without means done it wo n't be . Measurement of means types different. They can be simple or complex, high or low precision. Measuring instruments must have standardized metrological properties, and these metrological properties are checked periodically. The correct determination of the value of the quantity being measured in the process of measurement depends on the correct selection and operation of this measuring tool.

Measuring technology has existed since ancient times. During the millennia, the development of the commodity exchange led to the development of weighing scales and balances; primitive measuring instruments; setting a daily and daytime schedule, developing a calendar (measuring time); in astronomical observations and shipwrecks (measurement of angles and distances). In the course of scientific research, some measurements were made during the active period, for example, the angles of the rays were measured, the arc of the earth's meridian was determined. Until the 15th century, measurement techniques were not separated from mathematics, such as "geometry" (measurement of the Earth), "trigonometry" (triangle measurement), "three-dimensional area" and others [1].

Improvement of measurement technology based on experimental methods in XVI-XVIII centuries. This period includes relative clocks, microscopes, barometers, thermometers, the first electrical measuring instruments, and other measuring instruments used in scientific research. At the end of the 16th century, at the beginning of the 17th century, increasing the accuracy of measurements led to a revolutionary scientific discovery. For example, accurate astronomical measurements of T. Brop allowed I. Kepler to determine the elliptical orbit of hundreds of planets. Galileo Galilei, I. Newton, H. Huygens and others participated in the creation of large-scale instruments and the development of their theory, each physical phenomenon was manifested in the corresponding instrument, which in turn helped to determine the value of the studied quantity gave and laws of influence between different quantities [2, 3]. For example, the concept of temperature gradually developed and the temperature scale was created.

many digital measuring instruments is based on the conversion of a continuous (analog) measured quantity into a discrete (digital) quantity. Except for some instruments designed to measure discrete quantities. The process of digital coding of a continuous quantity is a set of quantization (discretization) of the quantity in terms of level and time [4].

In digital measuring devices, the conversion of the input measured value into a digital code occurs automatically. Automatic conversion of the measured quantity into a digital code. Based on this, even if the measurement results are output to the digital computing device, but because these results are generated due to manual operations, they are not included in the digital devices. For example, DC voltage compensators with manual calibration and decade-magazine resistance bridges are not considered digital instruments [5].

Digital measuring instruments include two mandatory functional links: an analog-to-digital converter and a digital countdown device.

Digital measurement is used not only as a tool joint, but also as an autonomous device.

As a result of the quantization of the measurand by level, a discrete error appears, based only on the fact that an infinite number of values of the measurand can be expressed in a limited number of indicators of [6].

Discrete error is inherent in digital measuring instruments, it is not present in analog instruments. But this error is not an obstacle to increase the accuracy of the instruments, because by choosing the number of quantization levels appropriately, the discrete error can be made much smaller. Practice shows that digital measuring instruments, as a rule, have much smaller errors than analog instruments designed to measure the same physical quantities.

Discretization of the continuous quantity x(t) in time is carried out in order to transform it into a discrete (continuous) quantity in time, which coincides with the corresponding values of ux(t) only at certain moments of time. The interval between two adjacent time moments of discretization is called the discretization step, which can be variable or fixed.

The time discretization of a continuous measurand is a source of error in digital measuring instruments. But by choosing an appropriate discretization step (such as choosing the quantization level), the observed error can be minimized.

Constructive expression digital measuring instruments can be divided into electromechanical and electronic types. In electromechanical types, contact elements (step motors , relays), and in electronic types - contact elements (electronic or semiconductor) . Development of digital measuring instruments is going by replacing contact devices with non-contact ones.

digital measuring devices, we can give an example of an octanometer based on metrological standards [7].

we stop by gas stations every day or every other day . While waiting for your gas tank to be filled with gas, have you ever wondered what the gasoline labels actually mean and how to determine its quality? Poor quality fuel will cause unpleasant situations with the engine in the future. In order to prevent this from happening, it is important to check the quality of the fuel poured into our car!

We determine the quality of gasoline

Of course, experienced drivers can determine the bad quality of gasoline from changes in the traction of the car, or from situations such as rapid combustion (detonation) in the engine . With the increase in the price of gasoline, all drivers are looking carefully at its composition and essence. To make sure that the gasoline at the gas station of your choice is of good quality, you can test it under normal conditions in effective ways.

1. Take the fuel gun and touch the inside wall of the gun tube with your finger before placing it in the tank mouth . If the gasoline has been added with diesel fuel or additives that increase the octane level, the oil stains in the place you checked will settle on your finger. If there are no such stains on the

finger, then nothing has been mixed with the fuel.

2. Another easy way to check the quality of gasoline is to drip gasoline on a plain white paper. If you lightly blow on the spilled gasoline, it will evaporate easily. If this part of the paper returns to its original state, then the gasoline is of good quality.

3. Put a few drops of gasoline on your hand. If you feel that the place where you applied the gasoline dries quickly, this indicates that there are no additives in the gasoline [8].

4. Pour gasoline into a transparent container. Pure gasoline without any additives is clear . If it looks cloudy in the tank , the fuel is of poor quality.

International standard norms:

GOST 12.1.007 System of labor safety standards. Harmful substances. Classification and general safety requirements

GOST 12.1.018 System of labor protection standards. Fire and explosion safety of static electricity . General requirements

GOST 12.1.044 (ISO 4589-84) System of labor protection standards. Fire and explosion hazard of substances and materials. Nomenclature of indicators and methods of their determination

GOST 12.4.011 System of labor protection standards. Workers' protection equipment. General requirements and classification

GOST 12.4.034 (EN 133-90) System of labor protection standards. Personal protection of respiratory organs. Classification and labeling

GOST 17.2.3.02 Nature protection. Atmosphere. Rules for determining the permissible discharge of harmful substances by industrial enterprises

GOST 511 Fuel for engines. Instrument method for determining octane number

GOST 1510 Oil and oil products. Marking, packaging, transportation and storage

GOST 1567 (ISO 6246-95) Petroleum products. Automobile gasoline and aviation fuel. Method for identification of resins by reactive evaporation

GOST 1756-2000 (ISO 3007-99) Petroleum products. Determination of saturated vapor pressure

GOST 2177 (ISO 3405-88) Petroleum products. Methods of determining the composition of a fraction

GOST 2517 Oil and oil products. Sampling methods

GOST 4039 Motor gasoline. Methods of determining the induction period

GOST 6321 (ISO 2160-85) Fuel for engines. Copper strip test method

GOST 8226 Fuel for engines. Research method for determining octane number

GOST 28781 Oil and oil products. A method for determining the pressure of saturated vapors in an apparatus with mechanical dispersion

GOST 29040 Gasoline. Method for determining the total amount of benzene and aromatic hydrocarbons [9].

Each of the above-mentioned GOST standards is quantified in today's digitized measuring devices.

For example: Gas chromatography is widely used

Figure 1. Scheme of gas chromatography

GOST 29040 Gasoline through a digital device . The total amount of benzene and aromatic hydrocarbons is determined. That is, the amount of each alkane and aromatic hydrocarbons is determined based on the standard, and it is determined whether it is suitable for consumption or not, which prevents damage to nature, living creatures, and humanity.

GOST 8226 Fuel for engines. In the research of determining the octane number, the octanometer measuring device is widely used.

Figure 2. Scheme of the octanometer measuring device

The purpose of this measuring device is to determine whether the octane number meets the standard requirement for the purpose of determining the flammability stability of gasoline.

Device for determining the density of petroleum products:

a device for measuring the density and temperature of various liquids . There are electronic density meters for oil and oil products: gasoline, diesel fuel, kerosene, etc.

Figure 3. Density meter DM-230 1A scheme

Digital multimeters are used to measure constant and alternating currents, constant and alternating voltages, resistances of resistors, frequencies of electrical vibrations, etc.

In digital measuring instruments, the following tasks are assigned to the microprocessor:

1) management of analog-digital and digital-analog conversion processes;

2) different physical quantities to electrical quantities change management (to measure them later);

3) automatic selection of the measurement limit ;

4) tool interface control ;

5) control of a digital computing device ;

6) statistical processing of measurement results ;

7) automatic correction of systematic errors and autocalibration;

8) violations diagnostic [10].

The presence of microprocessors in multimeters increases the reliability of digital measuring devices, greatly improves their metrological and operational characteristics. At the same time, the trend in the development of digital measuring techniques leads to a sharp increase in the value of digital measuring devices (the cost of digital devices is usually 2-3 times higher than the cost of a computer). The high cost makes it difficult to widely use digital measuring devices, which can be replaced by expanding the use of analog measuring devices (electromechanical and electronic), as well as using measuring-computer systems.

Conclusion

In conclusion, digital measuring devices are widely used not only in the oil and gas industry, but also in various fields. On the efficiency side, we have witnessed a high level of time and quality during our research.

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