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GENERAL TERMS FOR MODERN MEASURING INSTRUMENTS NECESSARY FOR CONDUCTING ENERGY SURVEYS AND ENERGY AUDITS.

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Abstract: Energy audit and the tools needed to conduct it. Their brief explanations, working principles, features, and functions.

Key words: Energy audit, efficiency, infrared surface, thermal imager, temperature, measurement .

Energy auditing differs from other areas of activity related to energy-consuming equipment, primarily in two most important parameters:

1. Comprehensive approach. During the audit, the energy auditor pays equal attention to all types of energy sources and types of energy-consuming equipment. When evaluating and developing energy-saving projects, the external and internal relations of the objects under study are taken into account.

2. Economic analysis. There is a single criterion for selecting energy-saving measures and projects - this is economic efficiency. One of the main stages in organizing energy audit activities is the correct and effective selection of measuring instruments for energy auditing.

Types of energy audit laboratories.

1. Mobile energy-ecological measurement laboratory. The basic set of such a laboratory consists of the following basic measuring instruments:

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• weather station (measurement of temperature, ambient humidity, wind speed);

• ultrasonic flowmeter for liquids (gases, mixtures);

• power consumption analyzer (measurement of current, voltage, power, etc.);

• oscilloscope (viewing measurement signals);

• infrared surface temperature meters;

• thermal imager (infrared video camera for drawing temperature fields of objects);

• water quality meters;

• sensors for measuring the density of heat flux through the surface;

• temperature measuring conductors and thermoelectric thermometers;

• pressure measuring transducers.

2. A set of portable measuring instruments in autonomous mode. The main requirements for such devices:

• when measuring the mode of electrical circuits - no impact on the operation of the electrical circuits under test;

• portability - weight not exceeding 15 kg, protected execution or the presence of a protective film;

• autonomous operation - the presence of a built-in power supply that provides several hours of operation;

• the ability to record data - the presence of an internal storage device

or a unified lemma for connecting an external storage device;

• communication with a computer - the presence of a port and

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software for transferring data to a computer;

• the presence of a valid calibration certificate or approval certificate.

Figure 1Pyrometer FLUKE 561

The pyrometer allows you to measure temperature without direct contact with the measuring object. The FLUKE 561 model has a laser designator, which makes it easy to accurately target a distant measuring object**.**

Figure 2. PCE EM-882 combined measuring instrument.

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The PCE EM-882 multi-function instrument is designed to measure humidity, light, temperature, noise levels. Thickness measurement of flat, cylindrical and spherical parts and assemblies is provided by the MT 8812 thickness gauge.

Figure 3. Ultrasonic thickness gauge MT 8812.

Figure 4. Ultrasonic liquid flow meter Portaflow 330 A + B. The Portaflow portable instrument is used to measure the flow or consumption of any liquid using

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clip-on sensors without connecting it to the pipeline.

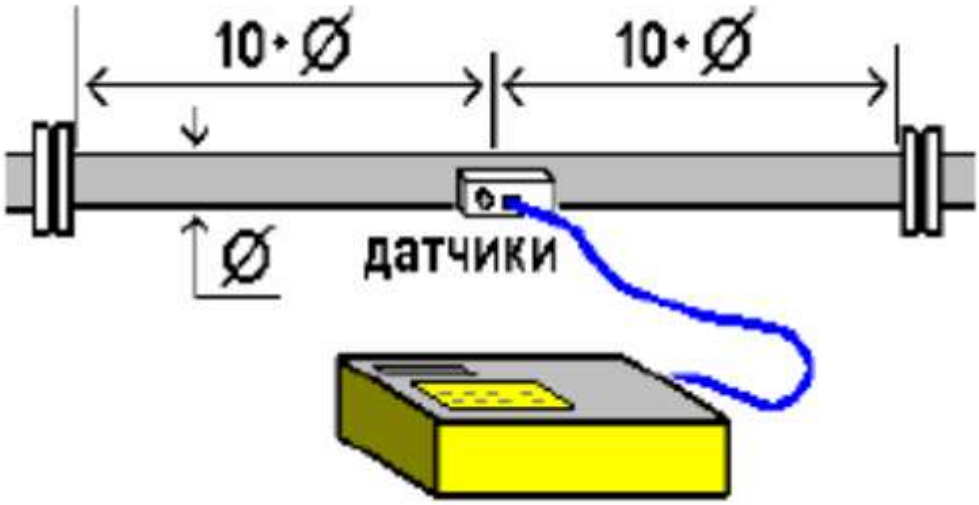

Figure 5. Scheme of installation of sensors when measuring the speed of the heat carrier.

One sensor emits an ultrasonic signal in the direction of fluid movement in the pipeline.

This signal is received by the second sensor. The second sensor emits an ultrasonic signal in the direction of fluid movement. The electronic circuit of the device (based on digital signal processing) includes an algorithm for calculating the difference in the transit time of signals through a moving medium (fluid). This value is directly related to the average velocity of the fluid in the pipeline section. This process necessarily involves procedures that are difficult to formalize and therefore not subject to automation:

- choosing a place to install sensors in the pipeline;
- installing sensors in the pipeline;
- ensuring acoustic communication with the pipeline wall;
- determining the outer diameter of the pipeline;
- determining the thickness of the pipeline wall at the measurement site.

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Almost any of these procedures can introduce relevant errors in determining the true flow rate.

Figure 6. Testo 340 SO2 gas analyzer

The Testo 340 SO2 gas analyzer is an automatic, continuous measuring instrument for measuring the concentration of gases in ambient air and process gas mixtures. Measurement of the composition of exhaust gases for adjusting heat and power plants, monitoring NOx emissions (adjusting combustion modes, environmental control); monitoring and signaling the presence of toxic, explosive gases in the air of the working area.

A thermal imager is a scanning infrared device for viewing and measuring thermal fields. It provides non-contact temperature measurement by (infrared) radiation of solid (free-flowing) substances; visualization, recording, processing, analysis of thermal field images.

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