

METHODS OF MEASURING THE WATER LEVEL IN STEAM GENERATORS

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Annotation:The article presents an analysis of water level measurement methods used in industry and modern methods of water level measurement in steam boilers of steam generators.

Key words :Water level, reservoir, measure, level gauge .

Currently, all existing methods of liquid level measurement can be divided into contact (mechanical, hydrostatic, electrical) and non-contact (acoustic, microwave).

Contact measuring instruments are used in any environment. These devices are easy to install in or near reservoirs of any shape and factor. In addition, it has several advantages, such as low cost, ease of installation, and high mechanical durability.

Mechanical level gauges are divided into the following types: Displacer level gauge (Fig. 1) and float (Fig. 2).

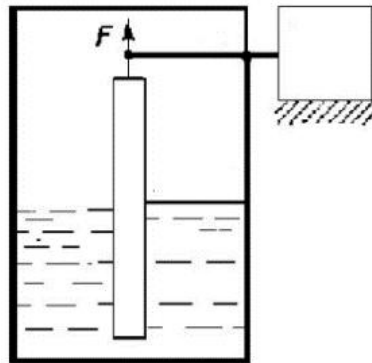
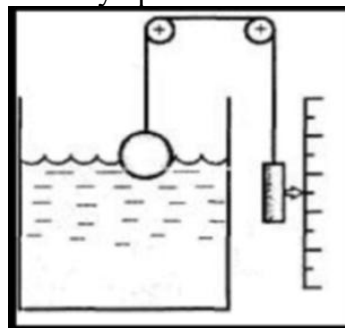


Figure 1. Displacer level gauge.

Displacer level gauges performance Archimedes to the law is based on To him according to , anchor grass liquid to the surface pushing standing strength the same that's it anchor stick with replaced of liquid to the weight suitable will come . Own in turn , moved of liquid mass of the displacer to water burial level and in the container level depends will be So measured by _ degree sensitive to the element have converter using measurable and suitable coming floating to power linear depends measures. Displacer level gauges of liquids level level when measuring own place found also high pressure and product temperature with at work in practice is the only option .



Frame 2. Float level gauge.

Float level gauges measurable liquid on the surface is located moving in the water floating poka with equipped . His mobility because of level change measure to the movement take will come . This device the most simple and economic in terms of cheap has been level measure from tools is one Float level gauge level sensor part right choose for around and measured of the environment features account get need.

The hydrostatic method (Fig. 3) according to formula (1). liquid column hydrostatic pressure from detection consists of

$$P = \rho * g * h \tag{1}$$

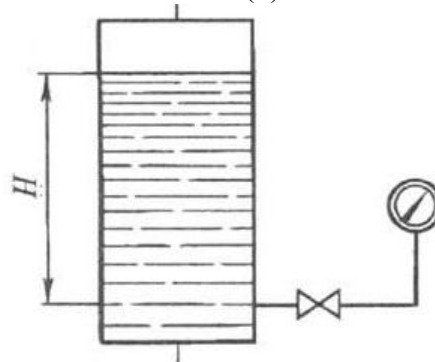


Figure 3. Hydrostatic level gauge

The bottom line is this: hydrostatic pressure, the pressure of the column, acts on an elastic sensing element, the deformation of which is converted into a current signal. These devices can be used for any measured media, but the need for installation at the bottom of the tank is not always possible.

The group of electrical level meters includes devices in which information about the level of the medium being measured is transformed into an electrical signal. If the resistance or capacitance of the sensing element of the level gauge reacts to level measurement, such a level gauge is called conductometric or capacitive, respectively.

The principle of operation of capacitive (Fig. 4) level meters is to change the capacitance of the capacitor when the level changes. Due to a change in level, the dielectric constant of the space between the plates of the capacitor changes, which leads to a change in the electrical capacitance of the sensor.

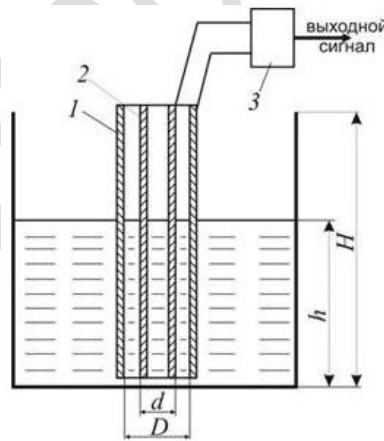


Figure 4. Capacity level gauge .
 1, 2 - electrodes ; 3 - electron block

The basis of conductometric level meters (Fig. 5) is an open electric circuit, the closure of which works due to the flow of electric current through a controlled liquid medium that is part of an electric circuit with a certain ohmic resistance.

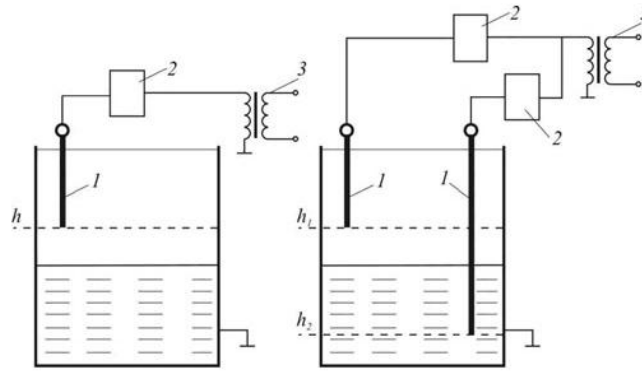


Figure 5. Conductometric level meter : a – one level _ b - two level _ 1 - electrode ; 2 – electromagnetic relay ; 3 - power source _

Non-contact level measurement is carried out by sensing with radar, electromagnetic and sound radiation. In acoustic (Fig. 6) level meters, the level of the monitored medium works due to the reflection of ultrasonic waves from the surface of the liquid. This type of level meter measures the time it takes for a sound wave to travel from the source of radiation (the sensor itself) to the reflective surface of the medium to be measured and back. If the receiver is installed above the liquid level, it is called acoustic, and the lower the liquid level, the longer the measured time. If the level meter is installed in the liquid to be measured, the lower the liquid level, the shorter the measuring time. The electronic unit generates ultrasound signals, measures the time from the moment of wave radiation to the return, and converts this time into an electrical signal.

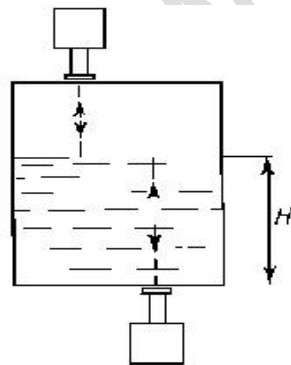


Figure 6. Acoustic level gauge .

Microwave level meters generate a radio frequency signal that varies linearly with time. A microwave is radiated from it and a part of it returns to the antenna. The emitted and reflected signal are mixed to form a signal whose frequency is proportional to their difference, the propagation time, and the distance from the antenna to the surface.

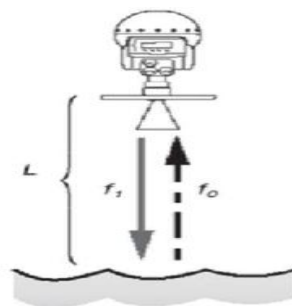


Figure 7. Microwave level gauge .

The variety of currently produced level meters is explained by the fact that there are more tasks for level control and measurement: it consists in measuring the level of a liquid medium in different working conditions, with variable accuracy and measurement range.

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