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Checking Volt-Ampere Characteristics Of Ultrasonic Sensor For Analog And Digital Control In Electronics Engineering

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Abstract: *The article deals with the study of ultrasonic sensors for parameters of the device for ionization water softening, automatic control and regulation of quality indicators using sensors. As a result of the experiments, it was revealed that a change in the voltage of the sensors is observed with a change in the ultrasonic sensors of the parameters. The sensor allows you to control the sensor through a microprocessor, by programming the signals from the sensors; you can control and monitor the capacitive parameters of the water softener and automatic process control. The content of salts in natural waters can be judged by the amount of dry residue and weight loss during ignition. The dry residue resulting from the evaporation of a certain volume of water, previously filtered through a paper filter, consists of mineral salts and non-volatile organic compounds. The amount of organic compounds in the dry residue of water is determined, but the loss of its mass on ignition. A large amount of salts dissolved in the will impairs the taste of water, as a result of which it can acquire a salty, bitter, sweet and sour taste, as well as various flavors. Non-carbonate hardness is due to the presence of calcium and magnesium salts of sulfuric, hydrochloric and nitric acids and is not eliminated during boiling. Although Mg2 + and Ca2 + ions do not bring any particular harm to living organisms, their presence in water in large quantities is undesirable, since such water is unsuitable for household needs. In hard water, soap consumption increases when washing clothes, meat and vegetables slowly boil down. Hard water is also unsuitable for recycling water supply systems, for powering steam boilers, etc.*

Keywords: *Ionization, device, water softening, capacity sensor, microprocessor, automatic control, automatic control, chemical technologies, softening of water, standard indicators, float, ionization, device, water softening, ultrasonic sensor, microprocessor, automatic control, automatic control.*

1 Introduction

In industrial applications, the invention of ionization water softening technology is one of the most important factors in excess performance. There are a number of ways to soften water: Methods: Ion exchange, Magnetic treatment, Polyphosphates, Organic antiscalant. There has been and is being carried out a lot of research on the analysis of water softening methods. On the basis of these studies, recommendations are given, which are still widely used in practice. Automatic control of the process of ionization softening of water is largely reflected in the quality of products of industrial enterprises. The degree of ionization softening of water is determined by the following indicators: Norms Very soft: <1 mg-eq / l Soft: 1-3 mg-eq / l medium soft: 3-5 mg-eq / l Hard: 5-7 mg-eq / l very hard:> 7mg-eq / l Average for the CIS: 6mg-eq / l. In industrial enterprises, special attention will be paid to the storage and maintenance of standard indicators of softened water, since this will directly affect the quality of products. For this, the enterprises pay special attention to the preservation of the climate of the environment of production facilities. With the help of softened water, a meproclimate is created in the workplace. The control and measurement of indicators is carried out by various sensors and sensors [1].

Statement of the problem

In water softening technology, a special method is assigned to the determination of capacitive parameters, depending on the nature and principle of operation

Ultrasonic transducers

Ultrasonic transducers, also known as proximity sensors, are devices that measure distances. The sensor consists of two elements.

transmitter and receiver.

The transmitter transmits an audio signal with a frequency that the person cannot hear ^ and the second element receives (it receives either the transmitted signal or its echo, which is a signal with the same physical characteristics that is generated by the surface on which the original sound signal is applied) ... The distance between the two elements is calculated by multiplying the speed of sound in air (about 340 m / s) by the flight time, that is, by the time taken until the first useful signal reaches the receiver (Fig. 1).

If the emitter and the receiver are in the same device, the flight time takes into account the entire flight range, that is, the sum

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of the time to reach the obstacle and the time to return to the receive sensor. To solve this problem, the result obtained must be divided by 2 . The sound wave in this case returns to the transducer of the emitter-receiver after its reflection on the obstacle. Here we may have problems with its alignment, and the ability of the obstacle to reflect the sound impulse.

The wave is fully reflected at the receiver if the angle between the perpendicular to the obstacle and the transmitter / receiver normal is 0 degrees. For wider angles, there is a risk that the wave will return to the receiver in a distorted manner or not even return.

The problem with the physical characteristics of the obstacle is its temperature: if its temperature is too high, the wave may not even bounce according to normal physical laws (Fig.1).

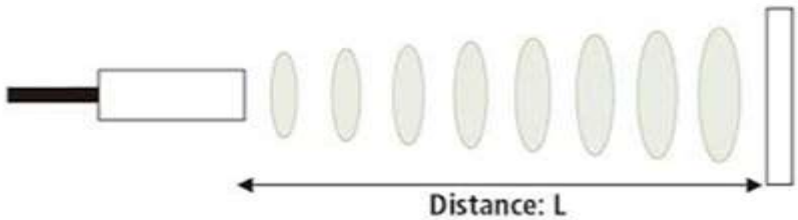


Figure 1

Therefore, the transmitting ultrasonic sensors generate sound pulses at a high frequency which, in the case of a single device for both transmitting and receiving, when reaching an obstacle, are reflected on the sensor as "echoes". The pick-up sensor detects a return sound wave. If we calculate the return time of the echo from the intercepted obstacle, we can accurately determine the position of the obstacle. For production reasons, there is an initial dead zone where the sensor signal is irrelevant. [2]

For this reason, the distance range of ultrasonic sensors never starts from zero, for example, its range is 51 to 965 mm. Sensors of this type intercept any obstacle, regardless of the type of material, reflectivity, transparency, color difference.

SIGNAL FORMER FOR ULTRASONIC CONVERTERS

A schematic diagram for ultrasonic transducers is shown in Fig. 2 and Fig.3.

Ultrasonic applications use a pair of transducers, a transmitter (signal generator) and a receiver. Note that for the transmitter to work, it must be driven by a 40 kHz signal. In this case, rectangular voltage is used. Operational amplifier IC1A is configured as an oscillator that generates a symmetrical square-wave voltage with a frequency of 40 kHz. Operational amplifier IC1B is wired as a buffer and acts as an exciter for the transmitter. The frequency of the rectangular voltage is determined by the constant R1C1; R2 and R3 provide positive feedback so that the output signal is rectangular. ... The square-wave output voltage across R1 charges the capacitor C1, which, since it is connected to the inverting input of the op-amp, causes switching when the voltage across it is higher than that of the non-inverting input. The square wave voltage is connected through R4 to the non-inverting input of the op-amp IC1B. Two series-connected zener diodes (Z1 and Z2) are used to prevent voltage from being fed through the buffer to the transmitter due to exceeding the maximum transmitter limit (± 10V).

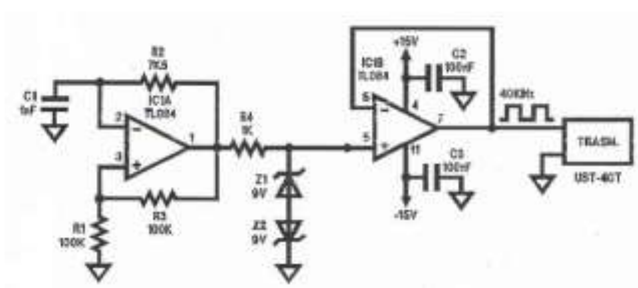


Fig. 2 - Signal conditioning instrument for ultrasonic transducers

The receiver circuitry consists solely of a 1C 1C operational amplifier connected in a BUFFER configuration and serves to apply a high impedance to the receiver so that it does not interfere with the signal generated by the receiver. 1C 1C chip output signal can be connected to measuring instruments or other circuits for processing without interfering with the receiver [3,4,8,9].

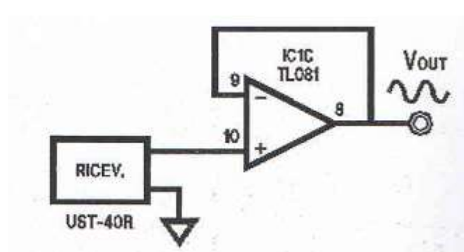
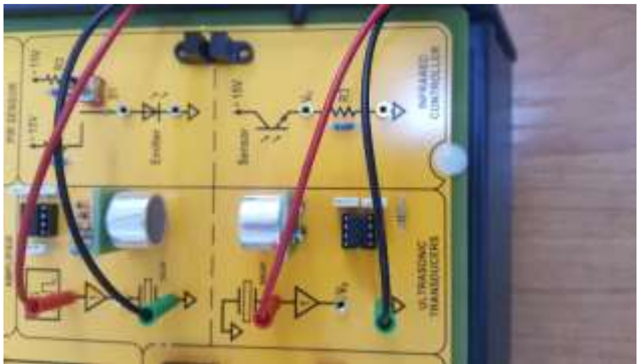
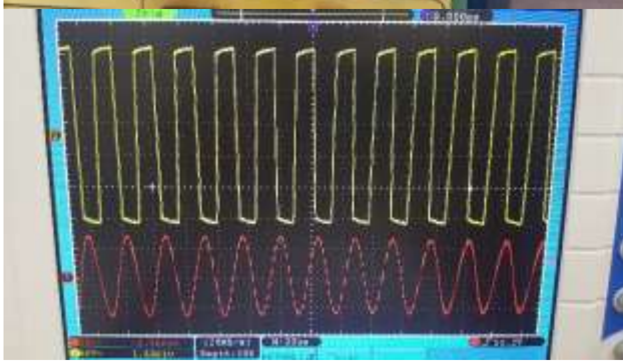


Fig. 3 - Signal conditioning instrument for ultrasonic transducers





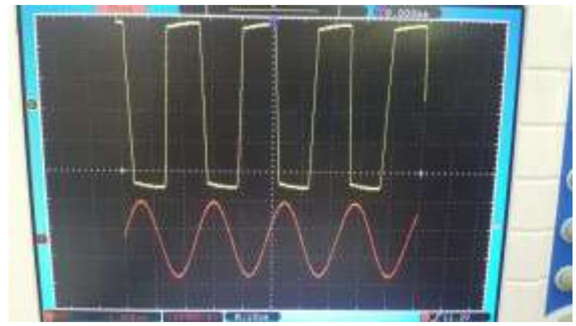


Fig.4. Experiment results

Table 1: Results

№	Sound narrowing (mm)	Time (seconds)	voltage (volts)
1	0	0	0.55
2	1,1	3	1.19
3	2,6	6	1.33
4	3,4	9	1.41
5	7,8	1,2	1.25
6	11,2	1,5	1.87
7	16,5	1,8	2.34

The results of the experiments show that the voltage of the sensor changes over a certain period of time as the parameters of the ultrasonic transducers change. In turn, this allows automatic control and adjustment of ultrasonic sensors parameters of the water softening device using the program and microprocessor tools.

The most common water softening method is sodium cationization. The method is based on the ability of ion-exchange materials to exchange ions of other substances that do not form scale for calcium and magnesium ions. Due to the availability and relative cheapness of sodium chloride, it was he who was chosen as a reagent for the regeneration of the cation exchanger. In addition, the regeneration products - CaCl2, MgCl2 are readily soluble in water, unlike, for example, CaCO3 (regeneration with sodium carbonate (Na2C03) or CaSO4 (regeneration with sodium sulfate (Na2S04)) [5]

Ion exchange reactions (R is a complex of a cation exchanger, simply called the anionic part of a cation exchanger):

2 NaR + Ca (HCO3) 2 ----- CaR2 + 2NaHCO3

2 NaR + Mg (HCO5) 2 ---- MgR2 + 2NaHCO3

2NaR + CaCl2 ---- CaR2 + 2NaCl

2NaR «MgSO4 --- MgR2 + Na2SO4

2NaR + CaSiO3 --- CaR2 + Na2SiO3

The equations for the reactions with the salts MgCl2, CaS04, and MgSiO3 are similar. As water passes through the cation ex-changer layer the amount of sodium ions capable of exchange decreases, and the amount of calcium and magnesium ions retained on the resin increases, that is, the cation ex-changer is "depleted".

Then it should be regenerated - a sodium chloride solution is passed through the cation ex-changer layer, and the exchange capacity of the cation ex-changer is restored. Ion exchange processes are reversible. Therefore, if sodium ions in water became more and more than the amount of calcium and magnesium ions, then the process of absorption of Ca2 + and Mg2 + ions slows down, that is, it shifts more and more to the left side of the reactions and can be depicted as follows:

The ion-exchange method of water demoralization is based on the sequential filtration of water through a hydrogen-cation ex-changer, and then HCO3-, OH- or CO32- - anion ex-changer. In hydrogen cation exchange filters, the cations contained in the source water, mainly Ca2 +, Mg2 +, Na +, are exchanged for hydrogen cations. An equivalent amount of acid is formed in the filtrate from the anions to which the cations were bound. The CO2 formed in the process of decomposition of hydro-carbonates is removed in calciners. [6,7]

In anion exchange filters (hydroxide an-ionization), the anions of the formed acids are exchanged for OH- ions (retained by the filter). The result is demineralized (demineralized) water.

This method is a schematic series of combinations of varying degrees of complexity depending on the purpose of water treatment - hydrogen cat ionization and hydroxide an-ionization. Ion-exchange plants should be supplied with water containing salts - up to 3 r / l, sulfates and chlorides - up to 5 mmol / l, suspended solids - no more than 8 mg / l, color - no higher than 30 degrees, permanganate oxidization - up to 7 mgO / l. In accordance with the required depth of water desalination, one-, two and three-stage installations are designed, but in all cases, strongly acidic hydrogen cation ex-changers are used to remove metal ions from water. BEST TEXTILE INTERNATIONAL UZBEKISTAN will be using this technology and one of the key features is stream selection. Most of the rivers and lakes have already been selected using the analyzed components. Other streams of water can be added to the extensive library. An example of water demineralization is given in the instruction manual. This helps show how the software is being used. Another key feature is economic comparison of options. As a design engineer, comparing cost opportunities is essential when making systemic recommendations.

Water treatment is the treatment of water coming from a natural water source to bring its quality up to the required parameters. Water treatment includes the following main treatment methods:

clarification (removal of colloidal and suspended impurities from water by coagulation, settling and filtration):

softening (elimination of water hardness by precipitation of calcium and magnesium salts, lime and soda, or their removal from water by cat ionization);

desalination and desalinization (ion exchange or distillation in evaporators);

removal of dissolved gases (thermal or chemical method) and iron and copper oxides (filtration).

biological water purification from bacteria, viruses and other microorganisms. Currently, chlorine, ozone and UV sterilization are mainly used.

improvement of the organoleptic properties of water (removal from water of substances that impart odor to water (hydrogen sulfide, chlorine), and a number of organic substances).

The tasks of water treatment include:

Removal of suspended particles.

Insoluble substances in water can be present in solid or colloidal forms, entering the water either from the soil, or during one of the technological stages, for example, when filtering through filters with a filler. As a rule, the removal of such particles is carried out by retention, before which, if necessary, the water is saturated with oxygen and / or coagulation. Basically, modern technologies allow almost any water to be brought to drinking quality. In fig. 9.3 is a diagram illustrating the application areas of various separation technologies for water purification. Depending on the available financial capabilities, various technological solutions can be applied, incl. and their combination.

You can see a huge variety of cleaning methods. Water treatment methods include physical (coagulation, flocculation, sedimentation, filtration), physicochemical (ion exchange, reverse osmosis, etc.) distillation methods, adsorption on activated carbons, natural and synthetic ion exchangers and other highly porous materials, extraction, evaporation, froth flotation. , oxidation (liquid phase, electrochemical, biological, treatment with chlorine, ozone, chlorine dioxide, etc.).

An important feature of the DIK / 1AR dynamic clarification technology is that it is possible not only to clarify the source water very well (at the ultrafiltration level), but also to provide 100% periodic (1-2 times a day) cleaning of the floating inert charge due to its preliminary blowing compressed air (due to the effect of friction of the grains and cleaning from dirt adhering to them in the water layer) and subsequent water washing of heavy contaminants with a downward flow.

In addition, this treatment technology provides a small volume of wash water (less than 3%), in contrast to traditional filters (contact clarifiers) with heavy granular loading (quartz sand, hydr anthracite) or ultrafiltration, in which the amount of waste water is 10-25% on the performance of the installation.

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