ABSTRACT

The master's thesis consists of four sections, 90 pages, 35 illustrations, 27 tables, 18 sources of literature were processed.

The first section provided an analytical review that looked at the object of control. The methods of non-destructive testing of tanks, their advantages and disadvantages are analyzed.

In the second section, a direct combined piezoelectric transducer and a prism were calculated. The calculations of the acoustic and electroacoustic tracts were carried out. A structural scheme is developed, and a functional scheme is based on it. All nodes of the functional circuit are calculated and agreed.

In the third section, the automation system was calculated and modeled in the SolidWorks software environment.

In the fourth development of the startup project was carried out: market analysis, search for competitors, etc. Based on the calculations, an electrical circuit design was designed.

The purpose and objectives of the study

The purpose of the study is to develop an ultrasonic system for the automated control of welded joints of large objects.

During the study, solve the following tasks:

1. Analyze the object of control, determine the main types of defects welded joints that occur during operation.
2. Analyze methods of non-destructive testing of welded joints of large objects
3. To justify the choice of ultrasonic non-destructive testing based on TOFD method.
4. Calculate the receiving part of the system: piezoelectric transducer, prism, acoustic and electroacoustic tracts.
5. Develop a functional scheme of the system and calculate the main units, on the basis of calculations to develop a circuit diagram in principle.
6. To calculate the main nodes of automation, to create a model of the system in the software environment SolidWorks

Object of study - the process of ultrasonic inspection of welded joints of large objects both at the stage of their manufacture and operation

The subject of the study is methods and means of improving the accuracy and speed of weld control of large objects by the TOFD ultrasonic target by automating the system.

Research methods are based on the use of theoretical bases of ultrasonic nondestructive testing; calculations of the major parts of the system and development and modeling of the automated system construction in the SolidWorks environment.

Scientific novelty of the obtained results:

1. Improvement of the TOFD ultrasonic method by system automation

Keywords: cistern, welded joint, defect, ultrasound, diffraction, noise, amplifier, time sensitivity control, automation, electromagnet.