

## THE HARDWARE PART OF THE AUTOMATIC SYSTEM WITH FIBER OPTIC SENSOR UNDER DEVELOPMENT

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### **Annotation**

*In this article, a small project of a system for automatic monitoring of the condition of water basins, which provides warning and prevention of losses in the event of a risk of dam failure in water basin dam constructions, is developed.*

### **Key words**

*Optical fiber, concentration, technology, protection, security*

## АППАРАТНАЯ ЧАСТЬ АВТОМАТИЧЕСКОЙ СИСТЕМЫ С ОПТОВОЛОКОННЫМ ДАТЧИКОМ НАХОДИТСЯ В СТАДИИ РАЗРАБОТКИ

### **Аннотация**

*В данной статье разработан небольшой проект системы автоматического мониторинга состояния водоемов, обеспечивающей предупреждение и предотвращение потерь в случае риска прорыва плотин в водохранилищных плотинных сооружениях.*

### **Ключевые слова**

*Оптическое волокно, концентрация, технология, защита, безопасность.*

## ISHLAB CHIQILUVCHI OPTIK TOLALI SENSORLI AVTOMATIK TIZIMNING APPARAT QISMI

### **Annotatsiya**

*Ushbu maqolada suv xavzalarini to'g'on inshootlarida to'g'on buzilishi xavfi yuzaga kelganda bu xaqida ogoxlantirish berish va talofatlarning oldini olishni amalga oshiruvchi, suv xavzalarini xolatini avtomatik monitoring qiluvchi tizimning kichik loyixasi ishlab chiqiladi.*

### **Kalit so'zlar**

*Optik tola, konsentratsiya, texnologiya, himoya, xavfsizlik*

In the development of such a project, possible hardware and software tools are used. The most feasible platform for the development of automated systems is the Arduino platform. With its help, we will be able to start an actuator that makes an automatic decision and starts a certain device based on the signals coming from a certain sensor or sensors.[1].

The content of the project being developed is to develop an automatic system that quickly detects the appearance of cracks in dam structures of water bodies and their damage, and sends a suitable warning signal. For this, it is planned to use optical fiber as a sensor device. In this case, continuous radiation is sent from the source of optical radiation along the optical fiber. On the receiving side, the photodetector performs the task of constantly monitoring the power of the received optical signal. Optical fiber is used as a sensor in this system. Optical fiber sensors laid along the dam parts of the reservoirs allow to detect the water in the dam.

Today, water bodies, in particular, reservoirs, are formed by damming the bed of rivers on one or several sides with dam structures, or by damming a certain depression perimeter with dam structures. In this case, the dam construction will mainly consist of a soil layer.[3]. The reason for this is that the length of the dam constructions is extended to a great distance. The time and material for the construction of dams with a soil layer is considered the optimal solution compared to dams with other types of structural structures. But one of the main disadvantages of earthen dams is that the soil layer can erode, move and shift under the influence of water and other natural and artificial external influences. B can cause damage to dam structures and, as a result, catastrophic events such as floods.[2]. The first solution to prevent such catastrophic events is the use of modern technological solutions in the construction of earthen dam structures, and secondly, in the event of damage to such earthen dam structures, quick emergency warning signals can be issued, and as a result, the extent of damage can be reduced.[4].

For this purpose, it will be possible to lay optical fiber sensors along earthen dam structures and monitor the changes in earthen dams in real time with their help. Figure 3.1 below shows the system in use.

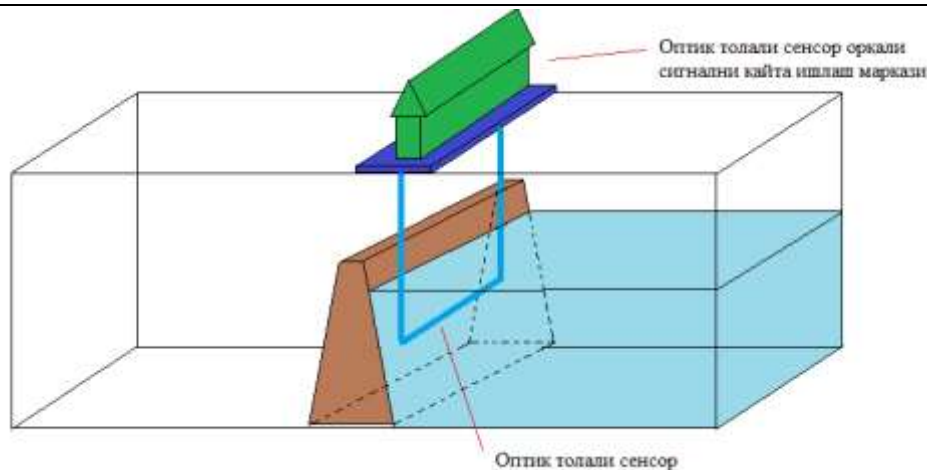


Figure 3.1. The use of optical fiber sensors in earth layer dam constructions

The main components of such a system will be optical fiber sensors, a data processing center and warning and activation systems. The function of optical fiber sensors here is to continuously transmit the constant radiation from the light source to the receiver. The principle scheme of such a system is shown in Figure 3.2 below.

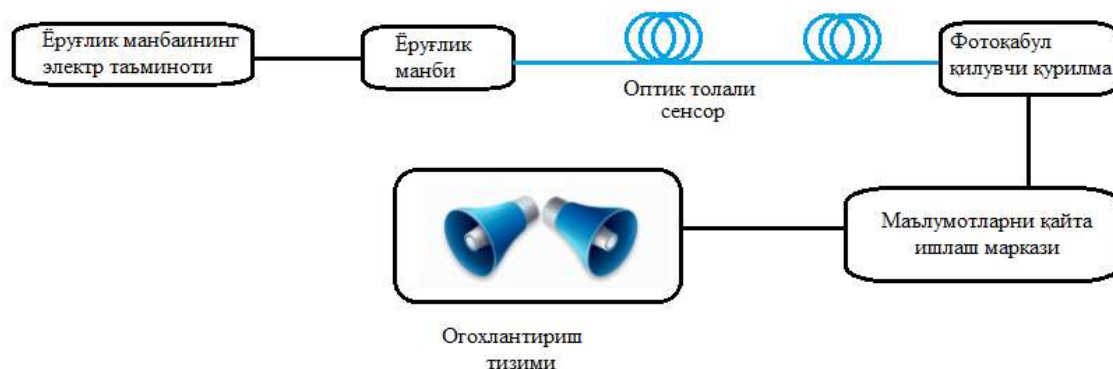


Figure 3.2. Device for automatic detection of damage to soil layer dam structures using an optical fiber sensor system[3].

The following components can be used in the development of such an automated system as described in Figure 3.2 above:

- LD (laser diodes) as a light source;
- Optical fiber unarmored cables;
- A photoresistor, phototransistor or photodiode can be used as a light receiving device.[5].

An LED is a light emitting diode. That being said, we designed this system with other warning elements in mind. In it, energy is released in the form of light during the recombination process of electrons with holes at the junctions of N and P doped semiconductors (Fig. 3.1). An LED is a p-n semiconductor device that emits light when a voltage is applied to its two terminals. Excitation occurs by

applying an external voltage, and recombination can occur, or it can be excited as another photon. It makes it easy to connect the LED light to the optical device.

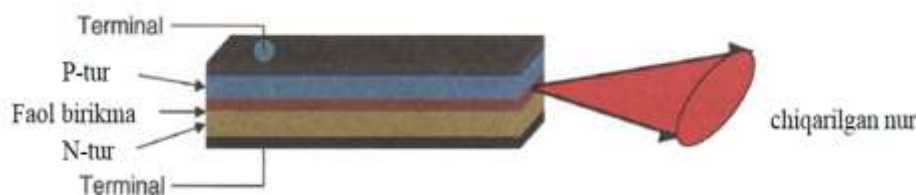


Figure 3.3. LED lighting

Light can be represented as a wave oscillating horizontally and vertically. Fiber-optic sensors almost always use LEDs (light-emitting diodes) as their light source. The light emitted by LEDs oscillates in vertical and horizontal directions and is called unpolarized light. There are optical filters that limit the oscillation of polarized light to only one direction. These are known as polarizing filters. Light from an LED that passes through a polarizing filter vibrates in only one direction and is called polarized light (or more precisely, linearly polarized light). Polarized light that oscillates in one direction (say, the vertical direction) cannot pass through a polarizing filter that limits oscillations in a perpendicular direction (for example, the horizontal direction).

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