DESIGN AND IMPLEMENTATION OF A CONTROLLED TEMPERATURE OF ENVIRONMENT FOR CULTURE OF MICROORGANISMS APPLY THE ANALYSIS OF WATER QUALITY

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Abstract: With population growth, along with some other factors, rivers, streams and areas of wetlands have become polluted. Among the contaminants can be found, bacteria, protozoan and fungal pathogens, toxins produced by algae or decaying animal or waste (slurry), and nitrates. In addition, all sorts of chemicals that are harmful to life, due to industrial waste, can occur, such as phenols, chlorinated compounds used in the paper industry, hydrocarbons present in solvents and paints and many others. Anyway can also be found heavy metals dissolved in the water forming ions such as chromium (VI), which are highly carcinogenic compounds and lead and mercury, which can cause different kinds of illnesses. Water is considered to be of good quality when it has less than a thousand fecal coliforms and less than ten pathogenic microorganisms per liter which is made by means of bacteriological analysis. The water analysis laboratory uses a closed equipment , electronic oven , able to stabilize at a desired value the air temperature, allowing the simulation of a suitable environment for the cultivation of relevant bacteria to the process of analysis, which require a stabilized temperature at 35 ° C ± 0.5 ° C accurately , with three touch buttons for plus and minus adjustment. Central theme of this work was to build an automated project to create a controlled temperature environment that contains electronic system that controls and stabilization system temperature.

Keywords: Water Quality; Microorganisms; Controlled Temperature.

1. INTRODUCTION

Water is an essential element of life, all known life forms in need of water. The human consume drinking water, or water compatible with the features of our body. In the human body water is the main constituent (70% to 75%) and their amount depends on several factors established during an individual's life, including the age, sex, muscle mass, weight gain or loss , adipose tissue, and even pregnancy or lactation. It is an essential component for the general good functioning of the body, helping in some vital functions such as body temperature control, for example. Water is the most characteristic constituent of the Earth, essential for the existence of life, it is a natural resource of inestimable value and is directly linked to human history and had important role in the rise of civilizations, even the decimation of some people . Perhaps the first relationship between disease and water that has been scientifically proven, it was in the middle of the last century (cholera epidemic in London).

This pollution can occur in several ways, and the most common forms of contamination occur due to the presence of dumped pollutants in water sources or microorganisms such as contamination of ground water by pesticides or even by the dumping of organic matter in rivers that contaminate and also serves as food for microorganisms and algae blooms. The concentration of these pollutants in water, gives specific toxicity for humans and individual susceptibility, which is the one person variable.

Water is considered to be of good quality when it has less than a thousand fecal coliforms and less than ten pathogenic microorganisms per liter which is made by means of bacteriological analysis. In developing countries, due to poor sanitation and poor water quality, diarrheal waterborne diseases, eg, typhoid fever, cholera, salmonellosis, shigellosis and other gastroenteritis, polio, hepatitis A, worms, amebiasis and giardiasis, have been responsible for several outbreaks and the high infant mortality rates related to drinking water.

The control of water quality is a great need to measure particularly for ensuring the health of the population, while recalling the economic losses that can result from poor quality of drinking water. This control is a dynamic character of activity that must be exercised both in urban as in rural and urban areas devoid supply utility.

Therefore, the water should be clean look, like purity and be free from pathogenic microorganisms, which is achieved through their treatment, since the withdrawal of the rivers until the arrival in urban or rural residences.

The water analysis laboratory uses a closed equipment , electronic oven , able to stabilize at a desired value the air temperature, allowing the simulation of a suitable environment for the cultivation of relevant bacteria to the process of analysis, which require a stabilized temperature at 35°C ± 0.5°C accurately , with three touch buttons for plus and minus adjustment.

The main idea was to create a project with the possibility of creating a controlled temperature environment containing specific electronic components in an attempt to stabilize the voltage and consequently the system temperature.

2. MATERIALS AND METHODS

Water has physical, chemical, and biological characteristics that can be changed by contamination. These properties are examined by analytical method.
For the bacteriological analysis becomes possible to use a tightly isolated environment from the external environment, with the ability to maintain a stable temperature of 35°C so that the temperature of the external environment does not destabilize the process.

A own environment dedicated to isolate the strain and provide temperature stabilization requires a suitable design for the housing design and the temperature control required for the process of cultivation of the bacteria for the purpose of analysis of the water. It is possible to build a system with existing components on the market, able to stabilize the temperature at 35°C for a period of 48 hours to within ± 0.5°C?

As secondary issues this product can meet the expectations of cost and maintainability? Based on the fact that you can control the temperature, with features that are available on the market and the scientific basis offered by electronics, it is believed that it is possible to control the temperature in a greenhouse with the desired accuracy.

In the design of an environment for the incubation of samples of water able to stabilize the temperature at 35°C with accuracy of ± 0.5°C.

- Building the physical structure of the system "greenhouse " , suitable for the process;
- Design the electronic structure process control;
- Specifying the components necessary for assembling the temperature control structure;
- Design and draw the wiring diagram of the electronic circuit;
- Mount the prototype breadboard;
- Test the prototype;
- Test the performance of the stove;
- Produce the operation and maintenance manual ;
- Compare the costs;
- Build on the printed circuit board.

For proper water treatment, it is necessary some physical-chemical and bacteriological analyzes. These bacteriological analyzes requires temperature stability as well as some other factors.

The greenhouse to be built will have a much lower final cost and can be installed in most public facilities of the Water analysis region that do not have their own greenhouses, decentralizing water analysis in the central office unit and avoiding the overhead that happens in public regional unit that given municipality responsible for analysis of other smaller units.

The aim of such initiatives to be more responsive bacteriological analyzes with greater reliability within each distribution center, and also may increase the collection rate with greater control resulting in a significant improvement in the quality of analysis.

Initially, we made a survey of gathering information necessary for the development of the project in compliance with the standards specified by the central office unit SANEPAR situation in the municipality of Ponta Grosa-PR, Brazil.

Lakatos and Marconi (1986, p. 79) point out that more concrete steps of research, with more restricted purpose, in terms of general explanation of phenomena, and less abstract, can be computed as a method of procedures for the realization of this project, We follow some procedures: Gathering information on the environment for the culture of microorganisms necessary for the analysis of water, the search is based on books that address the subject matter and technical manuals of the units. Study of existing technologies to develop an environment where temperatures necessary for the process, the largest field of research should be the Internet, using it to explore equipment manufacturers manuals and used items.

The materials used in the project were achieved with some scrapping no longer used plates, so recycled components aimed at the reuse of materials, which targets the storage inventory and later returned to the factory of origin. Other components were achieved with the purchase in stores specializing in electrical and electronic components, which are located in the city of Ponta Grossa-PR, Brazil, after market research. Appointment of components as well as the exact or approximate amount of each.

Semiconductors

- ***1 - tip112a transistor Darlington npn***
- ***4 - 1N4001 diode rectifier***
- ***1 – LED***
- ***Resistors 1/8 Watt 5 % :***
- ***1 - 10k***
- ***2 - 330Ω***
- ***2 - 4k7Ω***

Capacitors

- ***1 - 100 nF ceramic***
- ***2 - 33pF ceramic***
- ***1 - 100uF electrolytic***

Miscellaneous

- ***1 - lm35***
- ***1 - operational amplifier 741***
- ***3 - push button keys***
- ***1 - Crystal 4Mhz***
- ***1 - temperature transmitter***
- ***1 - PIC16F84A / 4MHz microcontroller***
- ***1 - transformer***
- ***Wires , breadboard , styrofoamores.***

Research has been done through books and internet searches on existing components and greenhouses. Several books have been of great help to study the assembly of the prototype. The manuals of the components were obtained on the Internet in the electrical component manufacturer site.

The assembly was made with the knowledge acquired in the classroom because the breadboard requires prior knowledge of its shape to better use, it was aimed at saving space, thus providing ease of arranging consistently available components, as some are It is strategically positioned as microcontroller to the center where there is a channel that separates the sides of the breadboard, so there is no short circuit between the other pins contained therein.

The components require a great knowledge for its use have been studied deeply and used correctly to avoid burning or not operation of the component.

It was also accomplished the acquisition of photos of the assembly step by step, the assembly needs to exercise great caution in handling because they are fragile nature and risk of burning with static electricity that the human body has.

The language used is in assembly, the program or source code was written in a build own program and tools for recording and recorded in the pic through a pic recorder.

Below is the language that inside the pic, ie, recorded on the PIC, which generates the PWM control.

The system was put into operation in a mini greenhouse made internally with glass wool and coated externally with galvanized steel. After being connected to the system, it was done measurements and achieved satisfactory results being very close to the existing unit SANEPAR in Ponta Grossa-PR, Brazil, fulfilling the expectations of maintaining 35°C for 48 hours to perform the analysis of the water.

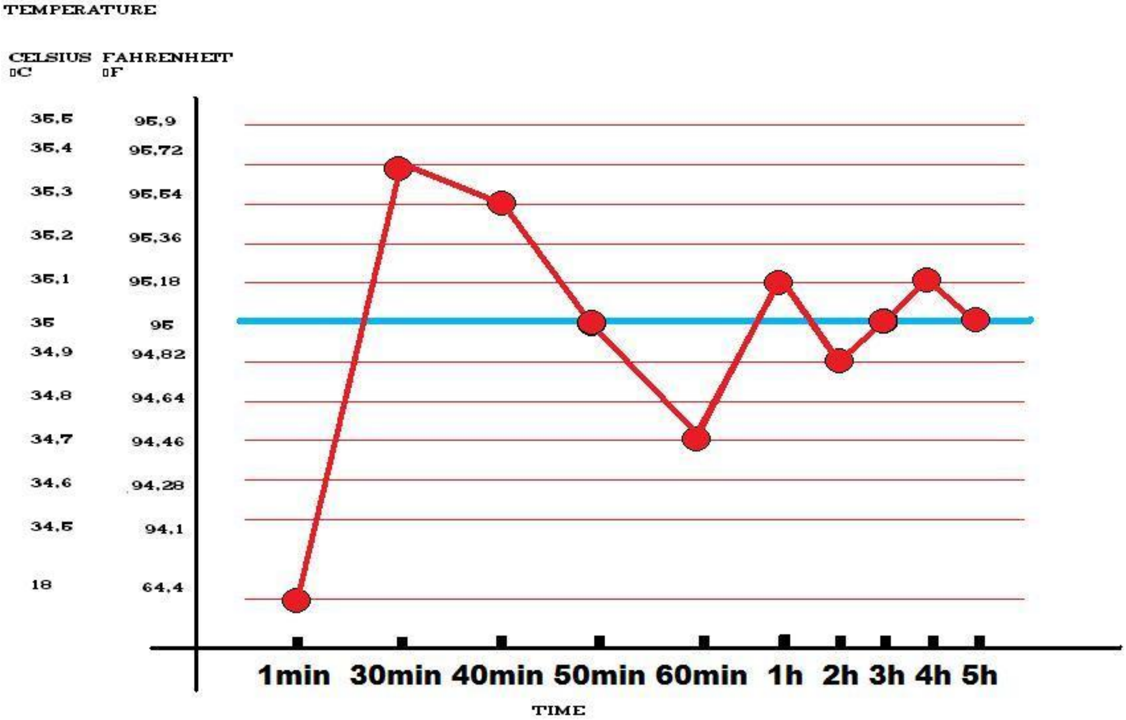
Figure 1 - COMPLETED GREENHOUSE Source: Authors own , 2010

3. RESULTS AND DISCUSSION

Research electronics market were made in the city Ponta Grossa-PR, Brazil . After making the purchase of components and made the assembly of the project we can see that the alternative product offers a lower price of R $ 150.00 reais while existing greenhouses on the market cost between R $ 3,000.00 to R $ 10,000.00 real.

After placing the acquired operating circuit, was achieved satisfactory results, the temperature was maintained at 35 ° C ranging 0.5 ° C after 30 minutes. The stove can achieve stability over a period of time as shown in the following chart:

Table 1 - TEMPERATURE -TIME FUNCTION



Compared with the stove SANEPAR the municipality of Ponta Grossa-PR, Brazil, was shown to be equivalent for the purpose of bacteriological analysis. As for building a graph (temperature vs. time) of the oven SANEPAR cannot be made by the fact that the process cannot be stopped due to overloading samples also no greenhouse model information nor manual.

4. CONCLUSION

The greenhouse project made it possible to develop a form of easy operation for analyzes and cost-effective. Compared to the central greenhouse, allows an effective water analysis, with an effective tool for the sub-units.

With the option of electronic design used at work, this project can help students Technology in Industrial Automation course, using the idea to control a thermostat through a PIC microcontroller, this device in the circuit of the greenhouse.

The implementation of the analysis of water in the sub-units may allow a change in the overall process, avoiding now the accumulation of analysis in one unit, which would be the center.

The circuit description made this work possible to know the characteristics, working principle and understand the function of each equipment in this project and may be the basis for the expansion of this, or the development of new projects.

The electronic circuit can generate an effective learning for students and a complement practical knowledge of microcontrollers, power electronics and instrumentation.

The oven provides also a means to other designs, serves once again as a true source of education.

The materials for the work of the study helped efficiently, the activities required for project completion. With a simple produce user manual is an important tool for users.

The use of solutions runs a circuit whose main difficulty in controlling the temperature in a certain amount, proved to be an efficient and attractive way to accomplish this temperature control project.

There are possible implementations for the continuation of this project as the expansion of the controlled value change, ie, you can change the temperature in the amount you want to be controlled, change the tempo, duration analysis, etc. Another continuity through improvements and implementations of the source code, recorded on the PIC microcontroller, as the addition of one or more liquid crystal displays for viewing the status of the process, as well as the use of a greater number of resources that the PIC microcontroller offers.

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