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Information System for Detecting Water Pollution in Jakarta Riverine Communities Using Filtration and Electro gravimetric Methods Based on the Internet of Things

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Abstract
River problems in Jakarta, from upstream to downstream, are closely related to public education and awareness followed by cultural shifts. The development of industrial centers in the Jakarta area has also made waste a significant source of pollution for rivers. The aim of this research is to build an information system for detecting water pollution in communities along the Jakarta river using filtration and electro gravimetric methods based on the internet of things. In the tool section there are sensors that can be used as indicators for collecting data which will later be processed by the Application section. Media in the form of applications on Android cell phones and also websites or dashboard platforms for cloud-based Io T device facilities such as Think speak which aims to provide convenience for users of this system. Providing information in the form of appropriate or inappropriate water quality to those who need the data in question. Provide information on the dangers of polluted water if used and consumed. Produces real data about the pH of the water and the content of the water used.

Keywords: Information Systems, Water Pollution Detection, Filtration, Electrogravimetry, Internet of Things

1. Introduction

Water pollution on the banks of Jakarta's rivers is a murky picture of the future of water availability in the region. The increase in critical land due to changes in land use combined with rubbish and waste, causes the quality and quantity of river water to decrease. Based on data from the DAS Management Agency for the Jakarta region, around 450 hectares of the Jakarta River Basin (DAS) in the upstream area is heavily polluted, this situation means that the water which originates from the clear upstream, is contaminated with dangerous/toxic materials, especially caused by heavy metals such as cadmium (Cd), lead (Pb) and copper (Cu).

River problems in Jakarta, from upstream to downstream, are closely related to public education and awareness followed by cultural shifts. It is estimated that the rubbish culture of communities located upstream enters the river at around 250,000 cubic meters per year. It is feared that it will cause shallowing and accelerate water pollution. Where people live, there are very few waste

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disposal sites (TPS). Sometimes rubbish piles up on the side of the road, so throwing rubbish into the river is considered normal.

The development of industrial centers in the Jakarta area has also made waste a significant source of pollution for rivers. Nearly 2,700 industries operate along the river, of which around 53% do not manage waste according to regulations, even data from the Jakarta Environmental Service states that 90% of industries do not have waste treatment installations (IPAL). As a result, 340,000 tons of liquid waste flows into the river every day.

Referring to data from the Medion Technical Education and Consultation team regarding the results of water quality tests in the Jakarta watershed over the last 3 years, it is known that more than 90% of water samples in the river area have problems or do not comply with applicable quality requirements. Of the 90%, the main problem that dominates is Escherichia coli contamination. But not only that, problems are also often found in terms of physical quality (clarity, smell, taste) and chemistry (pH, chloride content, nitrates and hardness above standard). Therefore, a solution is needed to overcome this problem, one of which is by means of filtration and electrogravimetry

2. Method

2.1 Systems Analysis. The linear sequential/waterfall model covers the following activities:

2.1.1. Needs Analysis. This stage is to look for all the needs needed in designing the tool, both the need for hardware design and the need for software design.

2.1.2. Tool design. This design stage aims to translate the results of the needs analysis into the design model that needs to be created, namely schematic tool design and program design.

2.1.3. Assembly and Coding. This stage is assembling the tool according to the schematic design of the tool that has been made, entering command codes into the chip so that the tool functions according to the required function.

2.1.4. Testing. A process that is carried out by testing the tool to ensure that each function (in terms of hardware and software) on the tool runs according to what has been specified.

2.1.5. Implementation of Tools. Applying or installing the tool at the workplace where it will be placed, in a location near a water source, to maintain the tool requires checking the electrolyzer and cables so that the tool continues to work optimally.

2.2 Architecture and Process Design

The electronic hardware design of the Arduino D1 Mini based electrolyzer is as follows:

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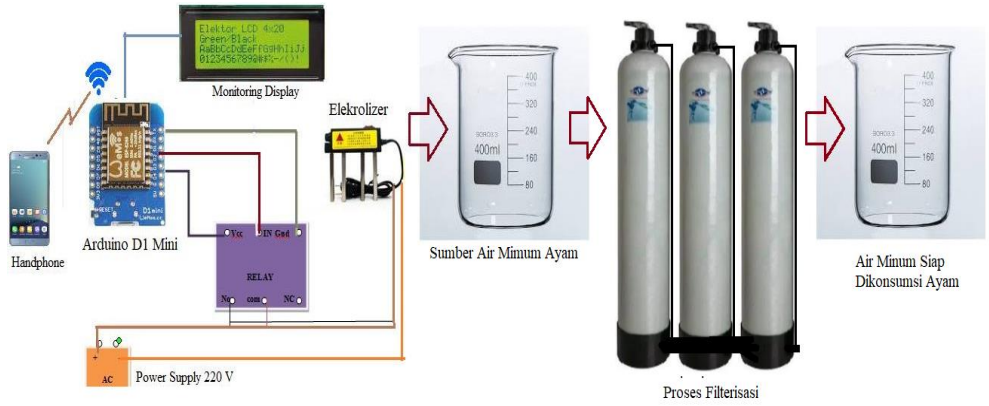

Figure 1 Electrolyzer & Filterization System Design

Table 1 Function of Components of the Electrolyzer System

No.	Unit Name Tool	Function	Remarks
1.	Arduino D1 Mini	As a center for controlling tool processes that have been programmed according to research needs.	1 Unit
2.	LCD 2 x 20	A place to display information about the electrolyzer process	1 Unit
3.	Elektrolizer	Tools for the electrolyzing process	1 Unit
4.	Handphone	For data notification to users	1 Unit
5.	Relays	Tool for setting the length of time specified by the program for the electrolyzer process.	1 Unit
6.	Measuring cup	Place for water to be analyzed.	2 Unit
7.	Power Supplies	AC-220V and DC 9-12Volt	2 Unit
8.	Small Torn Filterization	A place for water to be filtered	3 Unit

Tabel 2 Warna Endapan, Kadar Bahan Yang Terkadung dan Pengaruh Terhadap Tubuh

Precipitate Color	Levels of Materials Contained in Water	Effects on the Body If Too Much Consumed
Green	Oxidized Cuprum, Chlorine	Not good
Black	Calcium, Magnesium	Not good
White	Aluminum, Arsenic, Asbestos	Not good
Blue	Aluminum sulfate	Not good

Sumber : http://www.meteran.id/product/elektrolizer-original/

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Tabel 3 Standar Kwalitas Air Minum Ayam Di Peternakan

Parameter	Standar
Physique:	
Color	Colorless
Smell	No smell
Clarity	Clear
Chemistry:	
pH	6.5 – 8.5
Chloride	<500
Nitrate	<200
Nitrite	<1
Sobriety	<110
Fe	<0.3
Biology:	
Coliforms	<100
E, Coli	Negative
Salmonella sp	Negative

3. Result and Discussion

3.1 How the System Works

The first step is to insert the iron and aluminum legs attached to the Electrolyzer unit (iron and aluminum) into a test glass filled with water to be analyzed. The second step is, we turn on (ON) the device by giving electric current to the Arduino, namely 12 Volt DC and the power supply for the Electrolyzer, namely 220 Volts.

Wait for 1-3 minutes until the water in the measuring cup shows a color change as a result of the electrolazing reaction. If it has been 1-3 minutes, there will be lumps on the surface of the water which are analyzed with different colored deposits, depending on the water being tested.

3.2 Testing

At this stage the author tests the functions of the tool according to what was expected when it was designed. The method used is by testing each input component contained in the tool and seeing how the response or output produced is whether it is in accordance with what has been planned or not, the results can be in the form of examples of test results, namely lumps on the surface of the water which are analyzed with different deposits. -varies according to test results.

3.3 Test Results

In the tool section there are sensors that can be used as indicators for collecting data which will later be processed by the Application section. Media in the form of applications on Android cellphones and also websites or dashboard platforms for cloud-based IoT device facilities such as

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Thinkspeak which aims to provide convenience for users of this system. Providing information in the form of appropriate or inappropriate water quality to those who need the data in question. Provide information on the dangers of polluted water if used and consumed. Produces real data about the pH of the water and the content of the water used.

4. Conclusion

This water pollution detection tool can be connected to an Arduino and display and will send a notification containing the results of the water detection, whether it is suitable or not. Everything is assembled according to the scheme and tools that have been programmed via the Arduino IDE and connected to the application and connected to the internet so that all components will carry out their functions according to the program created.

References

a. Book

Arifiani, Nur Fajri dan Hadiwidodo, Mochtar,(2007), Evaluasi Desain Instalasi Pengolahan Air PDAM Ibu Kota Jakarta, *Jurnal Presipitasi*. Vol. 3 No. 2 : 78 – 85

Azwar, Azrul, drg, M.P.H, (1995), Pengantar Ilmu Kesehatan Lingkungan, Mutiara Sumber Widya : Jakarta : 31 – 37.

Effendi, Hefni, (2003), Telaah Kualitas Air, Penerbit Kanisius : Yogyakarta: 30 – 44, 179 – 182.

Harmayani, Kadek Diana dan Konsukartha, I.G.M, (2007), Pencemaran Air Tanah Akibat Pembuangan Limbah Domestik Di Lingkungan Kumuh, *Jurnal Pemukiman Tanah*. Vol. 5 No. 2 : 62 – 108.

Lubis, Halinda Sari, (2002), Toksisitas Merkuri dan Penanganannya, USU Digital Library : Sumatra Utara: 3, 4.

Ony Untung (2008), Menjernihkan Air Kotor, Jakarta ISBN : 979-8955-05-6

Rachman, Oscar (2012), Panduan Praktis Membuat Robotik Dengan Pemrograman C++, ANDI: Yogyakarta ISBN 978-979-29-3393-2.

Rachman, Oscar (2017), Cara Praktis Belajar Arduino, Gaharu Cipta Karya: Bandung ISBN 978-979-29-3393-2.

b. Website

http://Arduino.cc/en/Main#, Arduino Board (10 Oktober 2020, jam 20.00 wib)

http://caramenulisbuku.com/cara-menulis-daftar-pustaka-dari-internet.htm, Cara menulis daftar pustaka dari internet. (diakses pada 10 Oktober 2020, jam 20.30 wib)

http://elektronika-dasar.web.id/komponen/relay/, Pengertian Relay (diakses 10 Oktober 2020, jam 21.15 wib)

http://elib.unikom.ac.id/download.php, Gambar PT.Daliatex, lokasi perusahaan (diakses pada 16 Agustus 2019, jam 20.00 wib)

www.meteran.id, Definisi warna. Elektrolizer air (diakses pada 5Mei 2018, jam 20.00 wib)

http://youtube.com/djon-tablo, Cara membuat Elektrolizer air (diakses pada 12 Oktober 2020 jam 10.30 wib)

Vol. 9, No. 04; 2024

ISSN: 2456-3676

https://inviro.co.id/product/tabung-media-filter-brine-tank-regenerasi-145-liter/ (diakses pada 12 Oktober 2020 jam 21.15 wib)
https://environment-indonesia.com/articles/water-treatment-tahap-tahap-pengolahan-air/ (diakses pada 12 Oktober 2020 jam 20.00 wib)
https://www.medion.co.id/id/menjaga-kualitas-air-di-peternakan-2/