# Design of Data Acquisition Unit Using Arduino from a Flow Velocity Meter for Tides in the River

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**ABSTRACT**

The Royal Irrigation Department is responsible for managing water availability in Thailand. Many instruments are used to read the data to obtain the needed hydrological data. The instruments that it has applied to measure the velocity of the tide are the flow velocity meters A-OTT C31 that compatible with the audio and numerical displayer Z 41-00. They have been used for 30 years, (1988 - 2018).

Design of Data Acquisition Unit Using Arduino from a Flow Velocity Meter for Tides in the River was presented in this paper. It was designed to use as a substitute for the audio and numerical displayer Z 41-00 that were broken. The result of the design and the experimentation show the ability of working together with the flow velocity meters A-OTT C31 and the accuracy of the data acquired from this designed instrument are satisfactory.

**Keyword:** The Royal Irrigation Department, Flow Velocity Meter, Arduino

**Introduction**

**1. Current meters**

The water current velocities are measured by the tools that measure the speed of the tide and they are classified into two types [1-2].

1.1 Mechanical current meters

Mechanical current meters are mechanical devices that are the main components. The tools will move when the current flows and there are three types.

1.1.1 Vertical axis current meters

1.1.2 Horizontal axis current meters

1.1.3 Pendulum current meters

1.2 Electronic current meters

Electronic current meters are electronic devices that work primarily on electronic devices. These tools work better than mechanical current meters and there are three types.

1.2.1 Electromagnetic velocity meters

1.2.2 Doppler velocity meters

1.2.3 Optical strobe velocity meters

The tools that have been used by the Irrigation Department are A-OTT C31, the current flow meters, with Z 41-00, audio and numerical indicators. The A-OTT C31 current flow meter is mechanical current meter that is the type of horizontal axis current meter.

**2. Arduino**

Arduino is an open-source electronics platform based on easy-to-use hardware and software [3-4].

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**Materials and methods**

**1. Signal form A-OTT C31**

|  |  |
| --- | --- |
|  |  |
| **Figure 1** A-OTT C31 | **Figure 2** A-OTT C31 Signal |

**2. Block diagram**



**Figure 3** Block Diagram

**3. Flowchart**



**Figure 4** Flowchart

**Results and discussions**

**1. Testing at 20 Hz, 200 Hz, 1 kHz and 2 kHz**

|  |  |
| --- | --- |
|  | Experimented by frequency input with a function generator at frequencies of 20 Hz, 200 Hz, 1 kHz and 2 kHz. Then measure the output signal with oscilloscope and Arduino to compare results.  Determine the number of random variant n = 15. To keep all raw data from a serial monitor. The results of all experiments are shown in Tables 1 to 4. |
| **Figure 5** Test bench. |

**Table 1** Test results at 20 Hz

|  |  |  |
| --- | --- | --- |
| **Oscilloscope** | **Serial Monitor** | **Summary** |
|  |  | Oscilloscope = 20.0564 Hz  n = 15  Average = 20.0000 Hz  SD = 0.0000  Ua = 0.0000 |

**Table 2** Test results at 200 Hz

|  |  |  |
| --- | --- | --- |
| **Oscilloscope** | **Serial Monitor** | **Summary** |
|  |  | Oscilloscope = 200.044 Hz  n = 15  Average = 200.0667 Hz  SD = 0.2582  Ua = 0.0667 |

**Table 3** Test results at 1 kHz

|  |  |  |
| --- | --- | --- |
| **Oscilloscope** | **Serial Monitor** | **Summary** |
|  |  | Oscilloscope = 1004.19 Hz  n = 15  Average = 1004.2000 Hz  SD = 0.4140  Ua = 0.1069 |

**Table 4** Test results at 2 kHz

|  |  |  |
| --- | --- | --- |
| **Oscilloscope** | **Serial Monitor** | **Summary** |
|  |  | Oscilloscope = 2006.27 Hz  n = 15  Average = 2006.3333 Hz  SD = 0.4880  Ua = 0.1260 |

**Conclusions**

The experimental results show that this designed prototype can read four tested areas of the frequency range properly well. The application of this prototype will be applied to the A-OTT c31, the current flow meter, for replacing the damaged Z 41-00, the counter which is used to display as an audio and numerical output. It can be done simply by connecting only two wires. The prototype of this research will be developed as a tool to be used in fieldwork in the future.

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**References**

[1] Polpananavee, Pramoht. 2011. Principle of Water Flow calculation through Irrigation

Structures. Bangkok: Regional Irrigation Office 8. (in Thai)

[2] Leevajanakul, Kirati. 2000. Hydrology. Bangkok: Rangsit University Press. (in Thai)

[3] Arduino Language Reference [Online]. https://www.arduino.cc/reference/en.

[4] Makarn, Eakachai. 2009. Learn Understand and Use the AVR Micro controller family with Arduino. Bangkok: ETT Co., Ltd. (in Thai)

[5] OTT Hydromet. 2017. A-OTT C31 [Online]. Available: http://www.ott.com/products.