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Design of Control System for Weighbridge Gate at PT. Sido Agung Agro Prima

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Abstract

PT. Sido Agung Agro Prima has a consideration problem that is transported by trucks on the weighbridge, errors often occur in weighing because the weighing process has not been completed, the next car enters during the weighing process, so the weight that is weighed is inaccurate, this causes losses to the company because the tonnage weight is too high. excess. A prototype tool has been designed to weigh the mass of objects using the HX711 Sensor (Load Cell). The circuit used consists of Power Supply, Loadcell, HX711, ATMega 328, LCD, Buzzer. The way this tool works is when the vehicle is detected on the ultrasonic sensor, then the load cell is prepared to weigh and the weight of the vehicle is detected by the load cell with the output signal in analog form which will be sent to the hx711 sensor module to convert the output signal to digital with parallel communication which is then sent to the arduino microcontroller as the control center then the LCD displays the weight of the vehicle and the level of violation if there is an overload of the load cell, if during the weighing process there is a violation of the weight of the load that has been determined by the officer then an alarm will sound. The results of several prototype tests work according to instructions and according to the Arduino program that has been made and this tool works automatically by responding to how much mass the object is detected by the sensor. Arduino-Uno then processes the mass of the object and gives an output that has been programmed previously with an error percentage of 0.107% which is then displayed on the LCD.

Keywords— *Scales, Load Cell Sensors, Arduino uno.*

1. INTRODUCTION

In the industrial and research world, data acquisition systems are the leading edge of the raw data collection process directly from the source where this system converts physical signals into electronic signals and then digitizes the signals so that they can be stored, transmitted or presented on a display or computer. [2]. The development of microelectronic technology that drives the development of microcontrollers today increasingly opens up opportunities to realize hardware acquisition systems that can acquire more than one type of quantity and can store and transmit it via a computer using serial communication facilities contained in a microcontroller chip. [3] This data acquisition system consists of sensors (which convert physical quantities into electrical quantities) and a microcontroller system that processes electrical quantities into measurable quantities in the form of digital data that is ready to be processed or analyzed. [4]

PT. Sido Agung Agro Prima occupies 4 hectares of land, located on Jl. Raya Cirebon-Losari KM. 16 Rawa Urip Village, Pangenan District, Cirebon Regency. PT. Sido Agung Agro Prima is a company engaged in the animal feed industry, with animal feed products under the brand name Sido Agung Feed, with a marketing area covering the provinces of West Java, Central Java, DKI Jakarta, Banten, East Java, and parts of Kalimantan.[1].

The problem that occurs at the location is that during the truck weighing process on the

weighbridge, there is often a buildup of vehicles in the weighing area, and when the car is in the weighing process and has finished weighing, the car behind sometimes often enters first before the car in front has finished weighing and passes the weighbridge plate limit so that there is an increase in unstable loads that are detrimental to the company in the payment process through tonnage weighing. With these problems, it is certain that the need for accurate vehicle weighing data management is very helpful for management and employees in their work.

2. RESEARCH METHODS

This tool uses an Arduino uno microcontroller that can be used to control a system. The weight sensor uses a load cell, the weighing result display uses a computer and an LCD that can be seen by the driver. [11] The following is a block diagram of the tool planning:

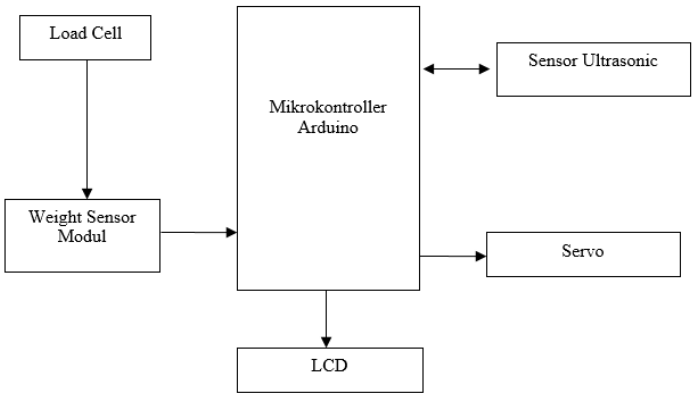

Figure 1. Block Diagram of System Planning Tools

From the block diagram above, the following working method can be taken:

a. The vehicle is detected by the ultrasonic sensor, then the load cell is ready to weigh.
b. The weight of the vehicle will be detected by the load cell with the signal it outputs in analog form which will be sent to the hx711 sensor module to change the output signal to digital with parallel communication which is then sent to the arduino microcontroller as the control center.
c. The LCD will display the weight of the vehicle and the level of violation if there is an overload from the load cell.
d. If in the weighing process there is a violation of the weight of the load that has been determined by the officer, the alarm will sound.

System Specifications

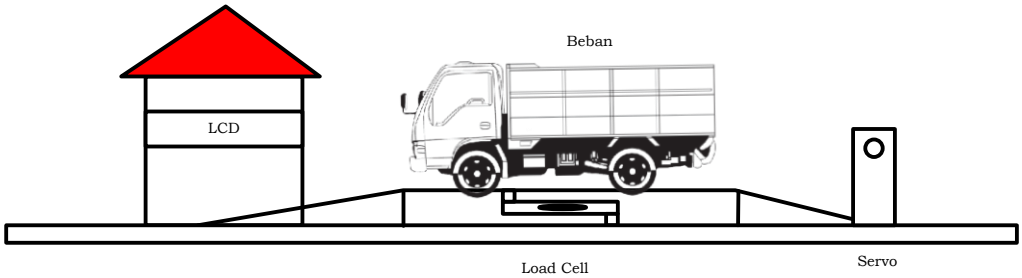

Figure 2. Design of weighbridge

Before a tool is made, a clear picture is needed which includes the equipment or tools that will be used later, therefore a picture is made in the form of a diagram so that this tool can be understood. In the specification of this overload protection system, the design and

manufacture of hardware and supporting software will be discussed. The circuit used consists of Power Supply, Loadcell, HX711, ATMega 328, LCD, Buzzer. When the circuit as a whole has been given power, if there is pressure or load, the load cell will read the change in value that has been converted. With the output display on the LCD, this tool also has a warning or alarm as a comparison if the weight exceeds the Buzzer automatically turns on.

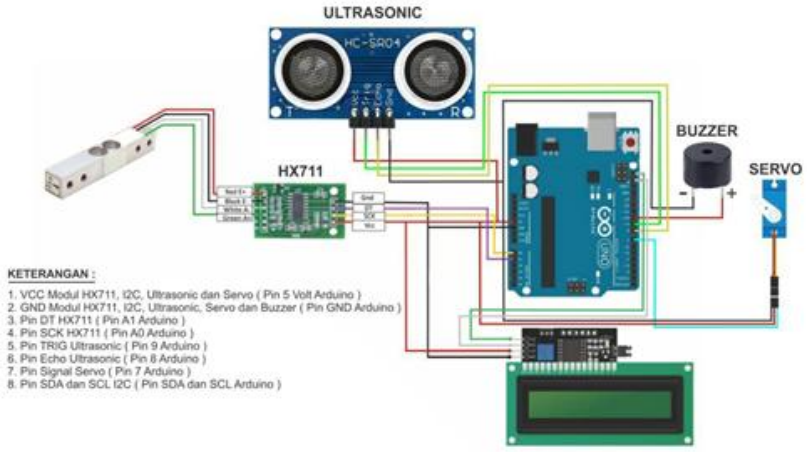

Figure 3. Schematic of system

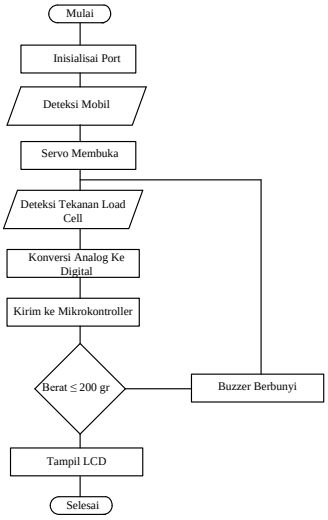

Figure 4. Flowchart of the tool's working system

4. RESULTS AND DISCUSSION

Figure 5. Overall circuit of the weighbridge

The implementation stage of the truck weighbridge using the load cell sensor and hx711 module is the stage where the system that has been designed in the previous stage is implemented, in the form of software and hardware used. Based on Figure 5, the installation of the entire hardware can be seen. Arduino implementation of the truck weighbridge using the load cell sensor and hx711 module.

Testing the Power Source Circuit

For the power supply on this tool, a cellphone charge adapter is used which has an input voltage of 100-240 volts with a current of 0.2 Ampere and an output voltage of 5 Volts and a current of 1 Ampere. The charger is connected to a power outlet connected to PLN and then connected at the top in the PCB board area. After the Active Circuit (current flows in the tool circuit) the charger successfully provides voltage input into this tool. And in this test, the charger used can flow current into the overload protection tool automation [12]. Weighbridge testing is the first stage that must be done. The test is by conducting a calibration test on the loadcell sensor by placing a load on which we know for sure the load is to match whether the calibration has been successful or notsuccess.

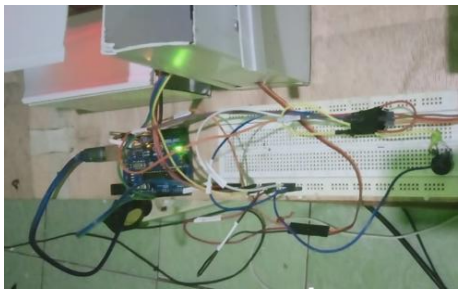

Figure 6. Ardunio Weighbridge Resource Circuit

Testing the Gate Bar (Servo Motor)

Table 3. Portal Testing

No	Sensor Ultrasonic	Load Cell	Status
1.	Reading object	Load Cell not detected	Open
2.	Reading object	Load Cell detected	Close
3.	Object not detected	Load Cell detected	Close
4.	Object not detected	Object not detected	Close

In the initial position, the LCD will show the initial weight before being given a load, which is 0.0 grams, then when given a load, the LCD will show the weight of the load according to what has been detected by the load cell sensor. Figure 13 is an example of a weighbridge that has been given a load.

Figure 7, Weighbridge that has been given the load

When the vehicle is read on the ultrasonic sensor, the gate bar opens and when the vehicle is in the weighbridge position, the gate bar closes. Furthermore, if the load on the

weighbridge shows 0.0 grams and the ultrasonic reads a vehicle, the gate bar opens and the incident continues to repeat itself. Testing is carried out by conducting experiments on several conditions as in table 3.

Load Cell Sensor Testing with Scales

The purpose of testing the Load Cell sensor with scales is to obtain the tolerance value between the sensor and the scales. The load cell sensor testing scenario with scales functions to compare the weight value between the load cell sensor and the scales by measuring several objects with different weights.

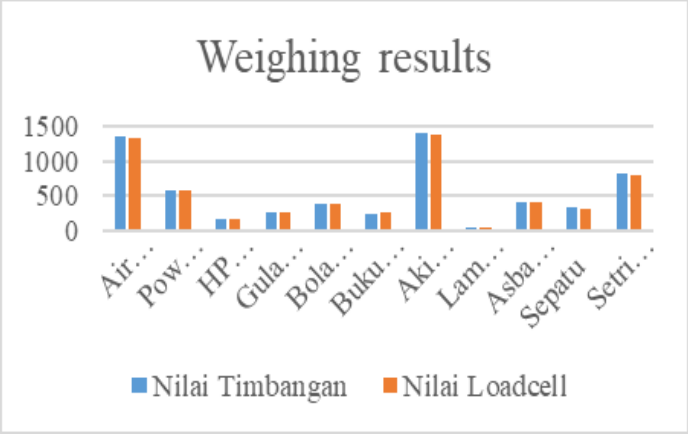

Figure 8. Results graph using scales and load cells

5. CONCLUSIONS

Based on the final assignment that has been done, the following conclusions were obtained:

1. The design of an Arduino Uno-based weighbridge utilizes a load cell sensor as a measuring tool for the load to be weighed and uses a servo motor to open and close the automatic gate.
2. The way to set the scale so that it can weigh the load according to the desired weight is by entering the reference weight value first.
3. Arduino Uno then processes the mass of the object and provides a previously programmed output with a percentage error of 0.107% which is then displayed on the LCD.
4. The results of several prototype tests work as instructed and according to the Arduino program that has been made.

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