# FARMER'S CAGE WATER AID PROJECT

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## Abstract

This paper will discuss the design of an automated prototype pig farm water aid. The project has been completed and tested to work properly. The aim of this project is to utilize a microcontroller to control the living environment of pig farm by utilizing various hardware and software.

In the farm industry, what defines a successful business from failure is the profit made. Many farmers can argue that the time spent on an animal for profit must profitable in the long run. There have been issues where the farmer sometimes let his animals dehydrate due to the lack of attention, causing major loss in his business. To solve this problem, a prototype system has been designed and constructed that would allow the animal be given water without any assistance from the farmer. Our team has developed an automatic water system prototype, using simple logic gates and low cost components, that automatically refills the water as needed. The system contains no "hard to build" procedures and as a bonus, our team also included a temperature sensor that controls the temperature in the cage, cooling down the animal as necessary. To reduce the electricity cost of this system, our team also placed a power supply using solar panels and rechargeable batteries to power up the system. This project would benefit both small and large scale pig farms by reducing cost of operation, manual labor, and increasing productivity.

## Introduction

The production of pig meat around the world is one that affects many production companies around the world. The increase of demand of pigs cause farmers to domesticate pigs for the sense of making profits, however many complaints have been observed due to the meat contamination and drug usage or simply the diet given to the pig. Over the years, farmers have reduced the production of pigs to focus on the pig's health and make it profitable without making any contaminated meat. Farmers have pig farms where multiple pigs are put together in one cage, mistreated and eventually causing the animal's death. The *Farmer's Cage Water Aid* is design to reduce dehydration to the animals in the cage. In the business world, large productions at low costs determine the success of a meat production company. The lack of attention to the animal can make the difference between a healthy pig for production and a dehydrated animal that will be a profit loss to the owner.

# The Systems

## Water Aid Sensor

This system was designed to regulate the water level of a container. The circuit activates a water pump if water level is below the desired level and deactivate water pump if full level has been reached. In addition, an alarm buzzer was implemented on the circuit to warn of the possible overflow condition. The circuit was based on 10 transistor switches. Each transistor is switched on to drive the corresponding LED when its base is supplied with current through the water through the wires. One of the wires was connected to 9V DC and placed at the bottom of the tank. Next, wires are placed step by step above the bottom probe. When water level rises, the base of each transistor gets an electrical connection to the 9V DC power source through water and the corresponding wire, which in turn makes the transistors conduct to glow LED indicating the level of water as seen in Figure 1. A 7432 IC OR Gate was used to control the ON/OFF states of the water pump. Input A of an OR Gate was connected to the collector pin of low water level transistor and input B was connected to the collector pin of high water level transistor. That way, water pump is ON or HIGH as long as any of the two inputs is HIGH, otherwise water pump is OFF. An overflow security alarm was placed above the full level of container. This alarm was also connected to one transistor and it will turn ON only if water level goes beyond the full state of the container. Water will make contact with the wire connected to the transistor that is connected to the alarm buzzer.

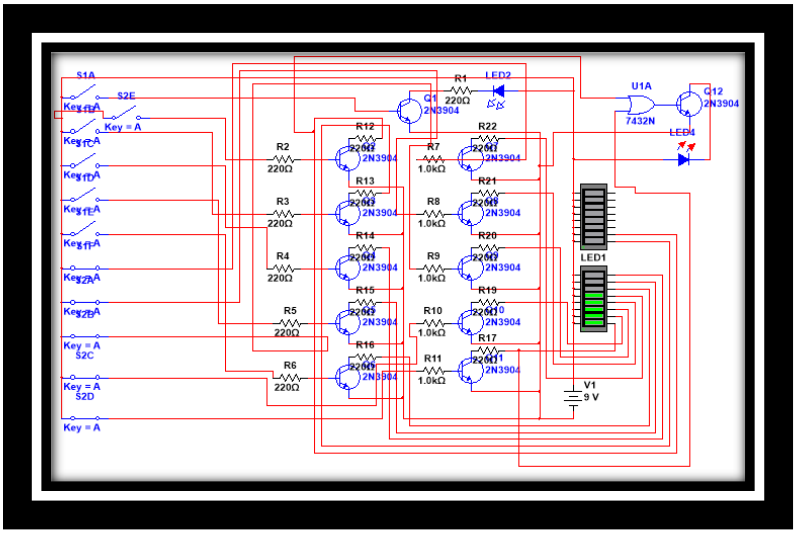


**Figure 1 Water Control Circuit**

As water increases, it closes the connection between each transistor base and the 9V power source (Multisim 12.0)

**Fan Sensor**

This system was designed to regulate the pig cage temperature. The circuit should automatically turn ON the fan and DC Motor if the temperature of the cage increases or equals to 31 degrees Celsius (used to test the circuit). Otherwise, if cage temperature remains below 31 degrees Celsius, the fan and DC Motor should be OFF. The IC used was the LM35 Temperature Sensor. We integrated this with the Arduino UNO Open Source to measure the temperature. The Arduino UNO read this measured value from the LM35 and translated it into degrees Celsius, Fahrenheit, Kelvin and Ranking which we were able to read from the Arduino UNO serial monitor. A 16X2 LCD Screen was used in this project in the following format; digital pins 12, 11, 5, 4, 3, and 2 of the ATMEGA 328 Microcontroller were connected to the LCD so we could display the different temperature scales. A DC motor was connected to digital pin 13 and a fan was connected to digital pin 10. ATMEGA 328 Microcontroller was programmed to deliver a High output at digital pins 13 and 10 only if analog pin A0 would read a temperature greater or equal to 31 degrees Celsius, the program is shown below. Circuit was fully completed and has 100% functionality.

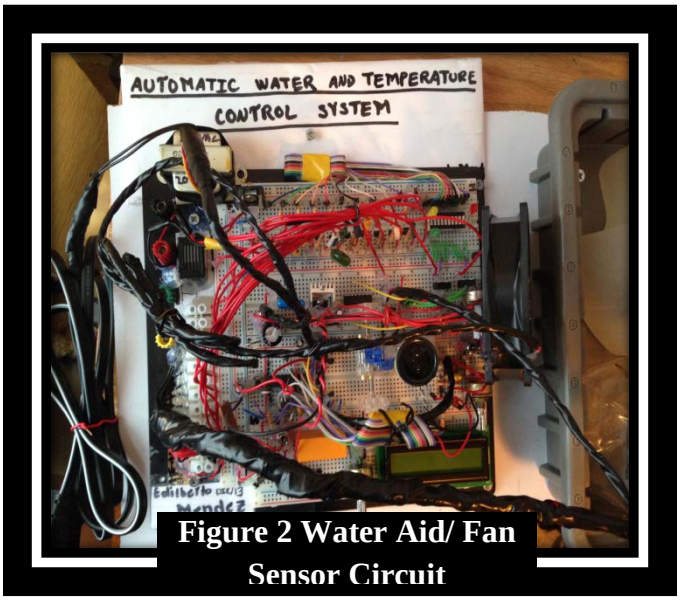


**Figure 2 Water Aid/ Fan Sensor Circuit**

**Solar Power System**

This system was designed to provide power to the whole project by making use the one solar panel and two 12V de batteries. They were place in strategic places to save the most of space of the project. Solar panel was installed. A simple connection of wiring was made to charge the batteries (Figure 3). Batteries were placed allowing the circuits to be charge separately.

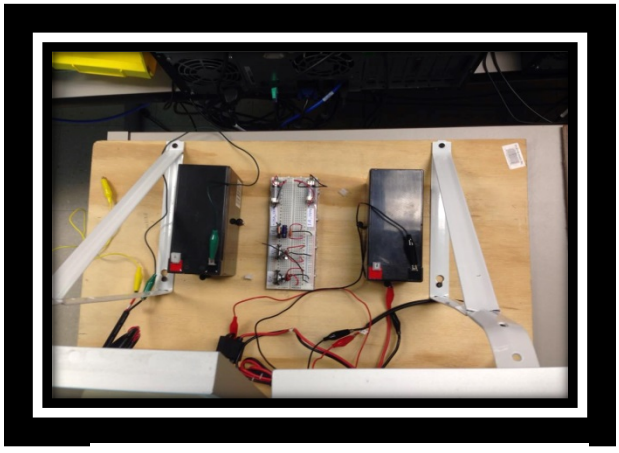

**Figure 3 Rechargeable Battery**
Keep charge for the circuits

## Conclusion

Farmer's Cage Water Aid Project was successfully completed and operated as designed. The designed prototype system would allow the animal be given water without any assistance from the farmer. In this project a system has been developed for an automatic water system prototype, using simple logic gates and low cost components, which included a water pump that was controlled with the circuit. We have made the systems work using the solar panel to charge a battery that was on use the whole time. The prototype system is made at a low cost and includes an alarm system in the prototype to acknowledge issues such as water container has been overfilled or the system simply failing to perform properly. The analysis above shows that every system faced different challenges as they were built. And, troubleshooting was a typical task to do on a regular basis due to the fact that real-world circuits do not behave exactly as virtual circuits. Problems faced during the completion of the systems include low knowledge of programming; it was fixed by reading and better understanding the concepts of programing using the language C. Furthermore, only some systems were able to make it through the final stage with 100% functionality. The completion of the project was not too expensive as originally suggested.

## Works Cited

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## Acknowledgements

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