

Remote Monitoring of Water Pump Health in Developing Countries

Roque Dietrich
Nicholas Sum
Paul Zwart



The Need

Millions of households in sub-Saharan Africa rely on hand pumps installed by various non-governmental organizations (NGOs). Studies have shown that 30 to 50 percent of these pumps are broken when people come looking for water, with significant delays before maintenance personnel arrive. The Intelligent Water Project (IWP) works under the sponsorship of World Vision to develop a system that not only tracks pump usage, but also monitors and reports pump health to the NGO.



OUR SYSTEM

Our system consists of an accelerometer, water presence sensor, GSM module and PIC microcontroller electronics powered by a battery and a solar panel. Sensor



Main system electronics

data is processed to calculate volume of water pumped, maximum time to prime the pump, and maximum leak rate. Each day this information is sent via text message to a remote database/web reporting system. The raw data in the text message is processed and used by the IWP website to inform client NGO's about the level of use of the pump and whether the specific pump needs to be fixed.



IWP system attached to hand pump

In the summer of 2017, thirteen units were installed in northern Ghana. Since then broken accelerometer wires and irregular text message communications has necessitated a phase of product evaluation to determine the cause of system malfunctions. We have created new means of remotely gathering system diagnostic data and improved system components to increase system reliability and serviceability.

CLIENT



ADVISOR

Dr. Randy Fish

STUDENT TEAM



- . Sandra Snozzi
- . Kelsey Nichols
- . Paul Zwart
- . Roque Dietrich
- . Nicholas Sum

THE GOAL

Preliminary Work: Monitor pumps to detect the flow rate of water to catch pump failure early. Use performance indicators of volume dispensed, time for the pump to prime, and the maximum leak rate to analyze the functionality of the pump. Send text messages, containing information on how the pump is functioning, including the performance indicators from the previous day and the battery level.

Current Work: Evaluating the complete system to work towards a final, reliable product design that can then be mass produced.

FURTHER INFORMATION

For more information about World Vision

worldvision.org

For more information about the Intelligent Water project

Paul Zwart—Student Project Manager pz1155@messiah.edu

FUTURE GOALS AND DEVELOPMENT

- . Send updated components
- . Gather diagnostic data
- . Increase system metric accuracy
- . Develop power saving strategy
- . Theory of operation document
- . Mass production
- . Optimization of IWP website

