Roosevelt Fountain Wind-Driven VFD Pump Control
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Sponsor: Brookfield Zoo  |  Advisors: Dr. Jason Streeter, Dr. Gajan Sivandran

1 Introduction

The Roosevelt Fountain is a centerpiece of the Brookfield Zoo. The largest jet can send water vertically up to 18.3m. On windy days, water from the main jet blows mist outside the boundaries of the fountain and onto the civilian walkway. This affects the visitors of the zoo. The present countermeasure to this complication requires a manual valve adjustment or temporary pump shutdown. This causes the zoo staff to have to divert from their usual tasks, wasting time. This countermeasure also wastes energy, causing the zoo to overspend on electricity.

4 Results

In our design, the wind velocity and direction data from the anemometer are sent as to the Arduino as digital and analog signals, respectively. The velocity value determines the voltage to be sent to a variable frequency drive that controls the pump. Each voltage is assigned to a specific frequency. When there are high wind speeds, the frequency of the drive and the fountain height decrease.

5 Discussion

There are a few key differences between the model and the full-scale system. The anemometer (Figure 2), wiring and software are all the same; however, a solenoid valve (Figure 3) is used in place of the variable frequency drive (VFD), the piping is PVC, and the nozzle is a brass fountain nozzle (Figure 4).

6 References/Acknowledgements

Chicago Zoological Society and Brookfield Zoo
• Dr. Gajan Sivandran, Assistant Clinical Professor
• Dr. David Grimm, Assistant Clinical Professor
• Dr. Gail Baura, Director of Engineering Science and Professor
• Dr. Gregory Palmer, Lecturer

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Abstract

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2 Purpose/Scope

The purpose of the project was to design an automatic system to control the height of the Roosevelt Fountain. Its implementation will save the zoo staff time and money. To do so, the project team not only designed the system to be implemented by the zoo, but also constructed a proof-of-concept model to easily demonstrate its functionality before the full-scale implementation is possible.

3 Design Implementation

Figure 2: Anemometer
[The anemometer is used to measure the wind speed and direction. It sends this data to the Arduino.]

Figure 3: Solenoid Valve
[The solenoid valve receives the voltage from the Arduino and adjusts its state accordingly.]

Figure 7: Proof-of-concept in action. [This model shows that our system will function correctly once implemented as a full scale solution for the Brookfield Zoo.]

Figure 1: Roosevelt Fountain
[Picture taken from the south entrance of the Brookfield Zoo. The fountain is shown at about 3/4 of its full height.]

Figure 4: Fountain Nozzle
[This brass nozzle is used to mimic the full-scale system at the zoo.]