Flushed

New Mexico

Supercomputing Challenge

Final Report

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Team Number: 84

School Name: Melrose High

Team Members: Ethan Wright, Thomas Martin

Teacher: Alan Daugherty

Project Mentor: Marsha M. Wright

Executive Summary

In this project, our goal was to test milking barn designs and modify them to achieve the highest water conservation. Originally, we wanted to test ways to treat waste water, in dairies, safely and effectively so that it can be reused in some settings, and test the feasibility of using waste from dairies to create electricity through methane gas production. As we began to research, we realized that these topics were too broad, so we decided to go with water conservation through modification of barn design.

Water conservation is a big problem in our area. In the past, we have seen communities completely dry up because of big industry, usually agricultural industries, completely exhausting the resources in one area, and then moving on, with no regard for the community. However, our area would be more so heavily impacted if we ran out of water and the dairies move on. The cheese plant would close, the trucking industry would suffer, repair shops would close, and mass amounts of fertilizer would be lost.

We looked at all the respective industries in our area with a high water consumption. We chose the dairy industry because of all the industries and companies such as Ruan Transport, Southwest Cheese Plant, numerous dairy supply and implement companies that would suffer or collapse without the presence of dairies.

If we could find ways to save water in dairies, we can extend the time the dairy industry is present, if not make it of lasting presence. Already we have had dairies collapse due to extreme feed prices caused by the drought. Pumping less water will translate to savings in dollars, which could make or break one individual dairy. As they say, a penny saved is a penny earned.

A milk barn is the site at a dairy where milk is extracted from cows, then transported to a storage site. A milking barn must be cleaned frequently cleaned because of USDA regulations. This is the site where the most water is used in a dairy with the most room for water conservation. Currently, these barns are hosed out with no regard to the amount of water used. The waste is then transported to a lagoon, and used for irrigation water.

Problem Statement

We live in an agricultural, yet increasingly urban area. The struggle for water between residents, industry, ranchers, farmers, feedlots, and dairies is constant, and increasingly more expensive now that more wells, even newly dug wells, are drying up, if water is even found at all. We need to find better ways to conserve water so that it will be there for future inhabitants and industry. We decided to test dairy milking barns and the dairy industry, and industries related to it, are one of the largest water consumers in our area. Also, the results of this project, if acknowledged by dairies, could potently save jobs from termination, industries from cloapse, or possibly create new jobs and industry.

Programming

We chose Net-Logo because we felt it would be the best language for our project. Also, it has the most online resources, the most models to learn from, and many of our teams have used Net-Logo so we have a direct source of knowledge, and people to help us.

We have programmed net logo to create a model of a milking barn, complete with waste, water, and nozzles, not hoses. Our program shows a standard milking barn, with nozzles to show water flow. It shows waste being removed when it is hit by water, and measures the amount of water required to achieve sufficient waste removal. More water from more nozzles causes faster removal, and should then translate to water conservation. Better placing of the nozzle will save more water by getting the spray directly to the waste.

Verification and Validation

For verification and validation, we have looked at experiments where design change impacted the outcome of the experiment. However, we see examples of this every day. For instance, in the early days of irrigation, sprinklers has nozzles on top of the pipe. However, on a hot day, large amounts of water evaporated. As water tables began depleting, the nozzles were put on drops, to cut down on water loss. To show the impact of this design change, sprinklers were then converted from high pressure, needing high volumes of water, to low pressure, requiring less water to run. This simple design change snowballed, saving irrigators water and dollars.

Also, we have cleaned our Ag farm and shop under water spray, testing the velocity of different kinds of sprayers, measuring the volume of water used with each one.

Most Significant Achievement

I would have to say that our most significant achievement is gaining a better understanding of Net-Logo, and better learning of this topic, and using our resources. If you asked us how much we like supercomputing, probably would tell you that it is fun, but is not my favorite thing to do. However, t is a good program to educate students in this ever-increasing technological world. In this, we achieve many useful computer skills that we will sooner or later use. Even programming skills, something you probably won't use on a daily basis can prove valuable. I would have to say that achieving skills for the future is my most significant achievement.

Acknowledgements

http://www.southwestclimatechange.org/impacts/people/agriculture

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