StaRS Backwash, Fall 2014

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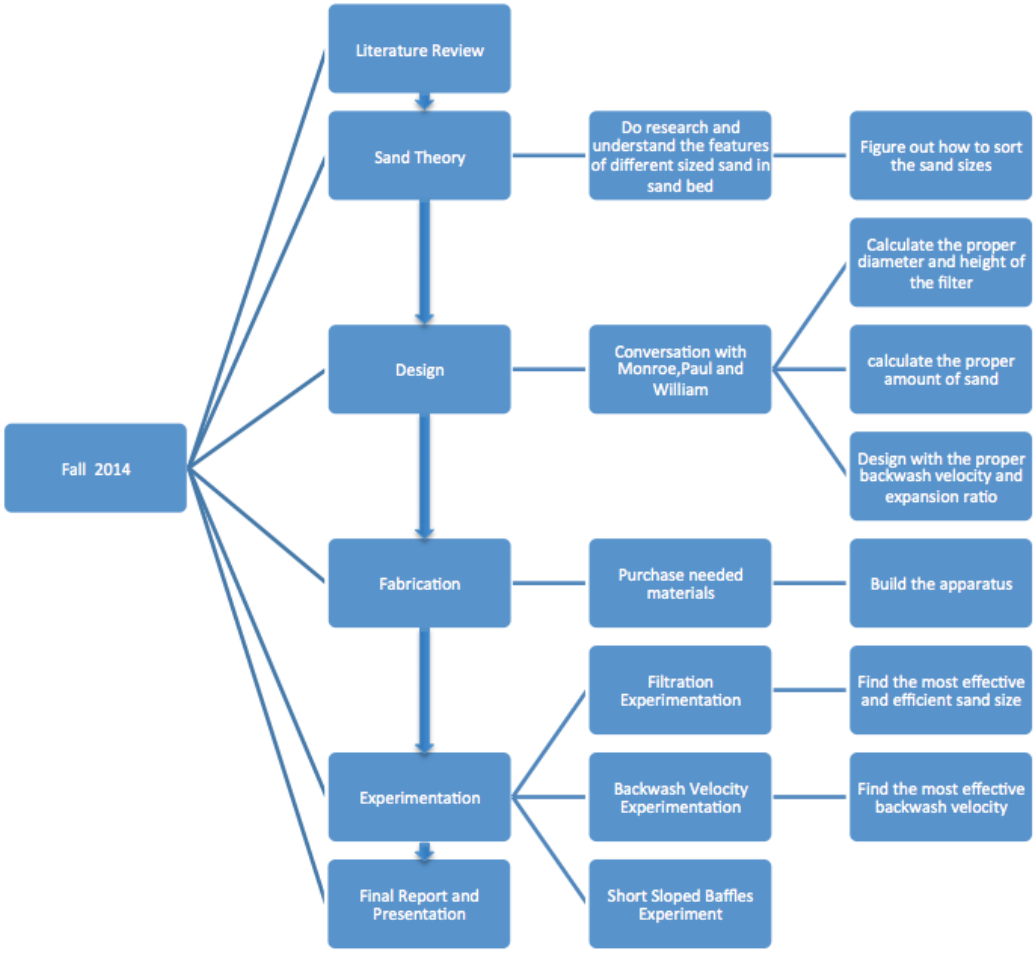
Abstract

The goal of StaRS Backwash is to determine the sand grain sizes and distribution for the most efficient and effective backwash in the stacked rapid sand filters.

Task List

Task Map



Task Details

1. Literature Review (by Monday 9/15) - entire team

    a. Read and understand the three articles linked under the challenges
    b. Get a good grasp on the basics of filtration and backwash with stacked rapid sand filters
    c. Find and read another article relating to filtration/backwash
2. Sand Theory (by Wednesday 9/24) - Nick Farino
    a. Finding particle sizes and uniformity coefficients that will in theory not be segregated after backwash and have an expansion ratio of approximately 1.4-1.8
    b. Do extensive research on sand sizes and gradations to understand the feasibility and effectiveness of different sizes in the sand bed
    c. Get samples of sand and figure out how to sort the sand sizes
3. Design (by Wednesday 10/8) - Vicki Chou
    a. Design an experimental apparatus that emulates a filter bed of the stacked rapid sand filter
    b. Calculate the proper diameter and height of the filter
    c. Calculate the proper amount of each sizing of sand and the total amount of sand
    d. Design with the parameters of a backwash velocity of 11 mm/s and an expansion ratio of 1.4-1.8
4. Fabrication (by Wednesday 10/15) - Chenhao Qi
    a. Use the design for the experimental apparatus to locate what materials need to be purchased
    b. Purchase needed materials
    c. Build the apparatus
5. Filtration Troubleshooting (by Wednesday 10/22) - Vicki Chou
    a. Begin testing the experimental apparatus
    b. Test to see if the expansion ratio is within the design range and if the sand is fluidizing properly
    c. Test to see if the sand is not segregating after backwash
    d. Fix any issues that come up and repeat process until the experimental apparatus is performing properly
6. Filtration Experimentation (by Wednesday 11/5) - Rui Zhang
    a. Begin running experiments with different grain sizes and ratios
    b. Test different sand types for effectiveness in filtration and backwash
    c. Draw conclusions on what size sand grains are the most effective and efficient during backwash
7. Short Sloped Baffles Experimentation (by Wednesday 11/22) - Chenhao Qi
    a. Add short sloped baffles to the experimental apparatus between the sand bed and the backwash effluent waste pipe
    b. Test backwashing for the effectiveness of the baffles
8. Backwash Velocity Experimentation (by end of semester) - Nick Farino
    a. Test different backwash velocities for effectiveness
    b. Current backwash velocity of 11 mm/s may not be the best velocity so other velocities should be explored and tested
9. Final Report and Presentation (by end of semester) - entire team

a. Prepare a presentation that concisely and effectively communicates the work accomplished this semester, highlighting important findings and design updates
b. Submit a final report that thoroughly explains all progress made throughout the semester and easily communicates data and conclusions drawn from the experiments

Team Roles

Team Coordinator - Nick Farino
- keeps schedule
- keeps track of what was accomplished at each meeting
- leads team meetings with advisors

Materials Coordinator - Chenhao Qi
- identifies materials that need to be purchased
- finds and purchases materials (through Casey)
- keeps track of all purchases and future purchases

Design/Fabrication Coordinator - Vicki Chou
- leads design of experimental apparatus
- leads construction and fabrication of the apparatus

Data Coordinator - Rui Zhang
- organizes data
- does preliminary analysis of data
- leads data discussion