Single-use Fixed Bed Adsorption Filter Media System

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MONTROSE ENVIRONMENTAL

Introduction

Project Description

- Single-use adsorption filtration media system designed to remove arsenic from groundwater.
- 1. Receives 50 gpm of feedwater at 60 ug/L of arsenic, adjusts pH to enhance adsorption and lifetime of media.
- 2. Suspended solids removed by pre-filters.
- 3. Contaminated water enters lead/lag adsorption vessels.
  - o Lead vessel filters water first.
  - o Lag vessels filter the effluent of the lead vessel.
  - o Lag vessel becomes the lead vessel when the first lead vessel's media needs to be exchanged.
- A model predicting adsorption breakthrough curves is constructed to optimize media replacement intervals.The Thomas model and the Adams-Bohart model are adapted to the system and compared to examine the most practical model.
  - o Replacing filters too often is costly
  - o Not replacing the filters often enough risks exceeding effluent concentration limit (10 ug/L)

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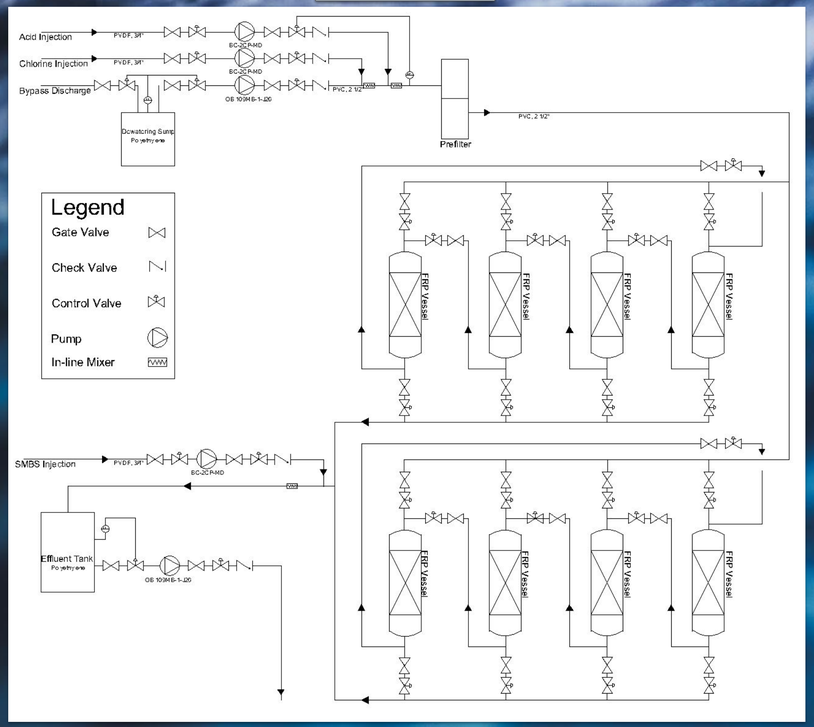
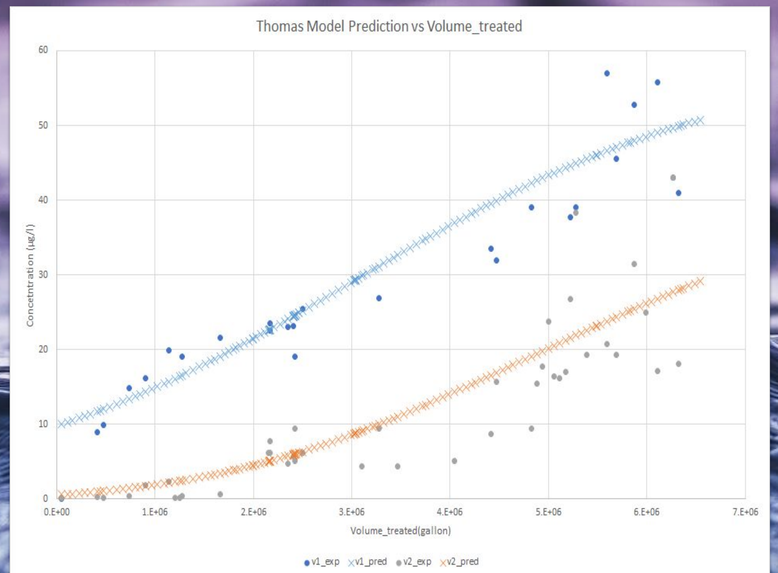
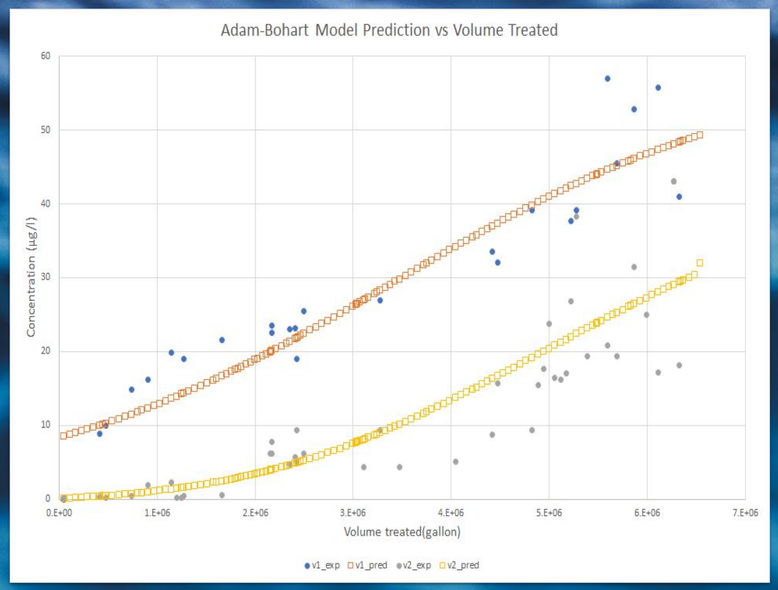


Thomas Model



Adams-Bohart Model



Arsenic Removal System Details

Material	Fiberglass Reinforced Plastics
Pressure Rating	Max. 150 psi
Diameter	36 in
Cylindrical SS height	46 in
Inlet and outlet connection	6" X 6" flange, reduced to 1 ½ in
Resin loading/unloading ports	6" X 6" flange, reduced to 1 ½ in
Top Distributor	3 in. slotted nozzles
Bottom Distributor	316 SS 3 in hub with slotted Filter nozzles distributed in a hub and lateral distributor
Accessories	Air relief valve on each vessel, arsenic removal vessel main inlet and outlet pressure gauge, one main feed pressure transmitter, one per each train rotary type flowmeter, one main feed line flowmeter totalizer transmitter

Constraints

1. Isotherm data needs to be experimentally obtained to refine adsorption capacity estimation.
2. Flow rate assumed to be constant.
3. Influent concentration assumed to be constant.
4. Adams-Bohart and Thomas models do not directly account for some system conditions, such as pH and temperature.

Future Plans

1. Estimate cost of system
2. Adapt model to different contaminants (PFAS, other heavy metal anions)
3. Determine chlorine and SMBS injection quantities
4. Refine model to take into account effect of different pH levels
5. Account for competitive adsorption with other oxyanions
6. Construct site plan for the system

Background Reference: Pixpoetry. "Unsplash." Unsplash, 7 Aug. 2019, https://unsplash.com/@blackpoetry.