

# Zero Liquid Discharge (ZLD) Site for Flue Gas Desulfurization Wastewater Treatment

Allyson Baker Clinedinst, Jillian McNaught, Alex Biega, Amelia Shea, and Robert Hart  
Mentor: Derek Henderson

## Goal + Motivation

### Effluent Limitation Guidelines: 2024 Final Rule

- Established ZLD for flue gas desulfurization from coal generating facilities
- Intended to improve surface water conditions



## Project Scope

### Main Deliverables:

- Select a ZLD Technology
- Site Design using ASPEN
- Construction and Procurement
- Itemized Budget

## Introduction

### Choice of Technology: Brine Concentration + Fixation Major Components:

- Thermal treatment using MVR, falling film evaporator
- Addition of fly ash/gypsum/lime

### Design Assumptions:

- Pre-existing pretreatment system with 65-75% solids waste stream
- Designed for purge stream of 100-300 gpm
- Fly ash and gypsum readily available

### Total Area Needed:

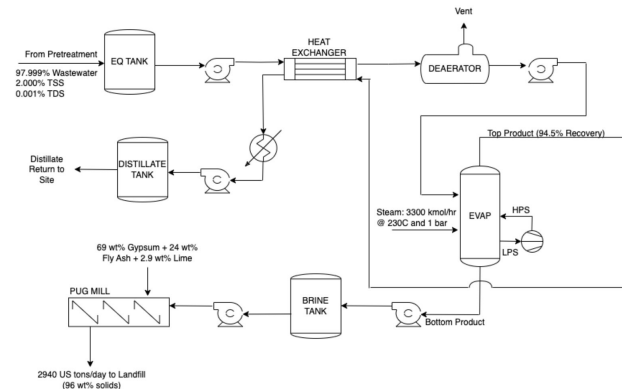
- Pre-Landfill: 7500 m<sup>2</sup>
- Landfill: 4.5 acres/year

## Process Considerations

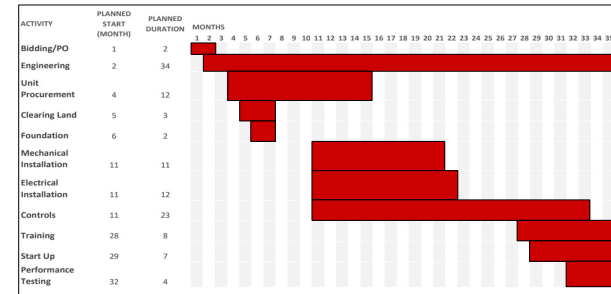
- Larger brine tank size** utilized to account for potential storage capabilities
  - 3x increase in volume from original size
- Areas for **maintenance/operational access corridors** added to calculations
- Vapor compressor** used to process distillate stream assumed to be **included in evaporator**

## Results

### Overview of Site Design



### Construction & Procurement Timeline



### Cost of Manufacturing

$$COM_d = \$22,854,022 = (0.18FCI) + (2.73C_{OL}) + 1.23(C_{UT} + C_{WT} + C_{RM})$$

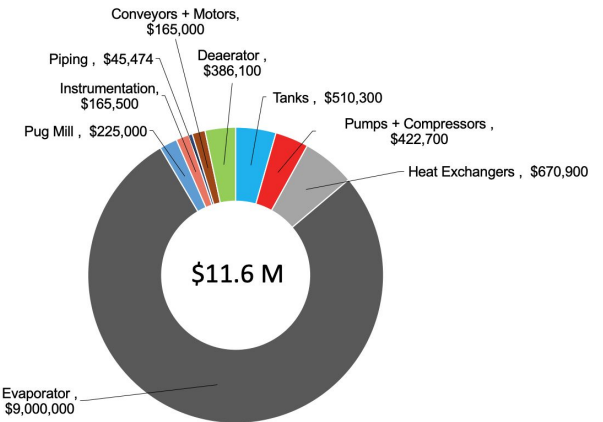
Component	Cost Estimate
Fixed Capital Investment (FCI)	\$48,589,640
Operating Labor (C <sub>OL</sub> )	\$960,000
Utilities (C <sub>UL</sub> )	\$2,089,471
Waste Treatment (C <sub>WT</sub> )	\$814,834
Raw Materials (C <sub>RM</sub> )	\$6,434,790

## Results

### Itemized Budget

- Engineering Services - \$162,968
- Landfill Operation - \$3,391,745
- Equipment Installation - \$33,606,921
- Equipment Cost - \$11,590,974

### Breakdown of Equipment Costs



## Conclusions

- Feasible opportunity** for regulatory compliance with the EPA
- Further discussions should be held to include:
  - Operator, mechanical, and electrical technician input
  - Potential design accommodations for larger process size

## Acknowledgements

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