



Dust Busters 2017 Team

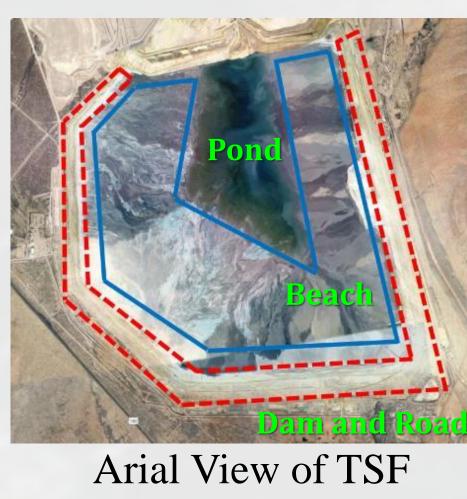
Ryan Bernard, Emily Degner (team coordinator), Zakary Galligan, Joe Griffin, Sam Horn, Julie Jameson, Joshua Mueller, Natalie Tucker

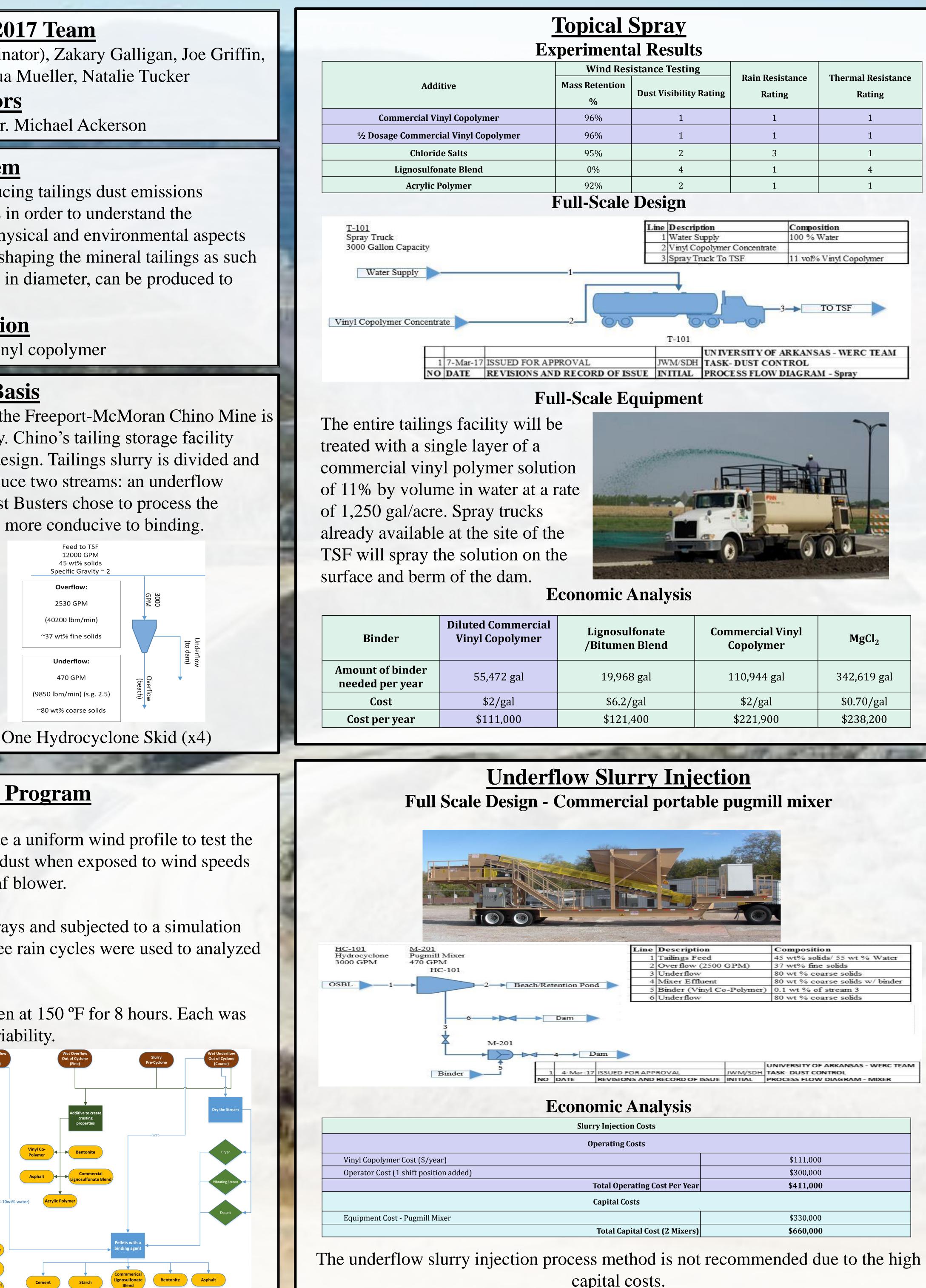
Dr. W. Roy Penney and Dr. Michael Ackerson

- Evaluate cost-effective options for reducing tailings dust emissions Review of existing control measures in order to understand the
 - Investigate a method of mixing and shaping the mineral tailings as such that small nuggets, perhaps $\frac{1}{2}$ to 1" in diameter, can be produced to from a top layer on the TSF

• Topical spray solution consisting of a vinyl copolymer

The Dust Busters' design was based on the Freeport-McMoran Chino Mine is a copper mine located east of Silver City. Chino's tailing storage facility (TSF) is constructed with an upstream design. Tailings slurry is divided and fed to four hydrocyclone skids that produce two streams: an underflow stream and an overflow stream. The Dust Busters chose to process the underflow stream, as its coarse nature is more conducive to binding.

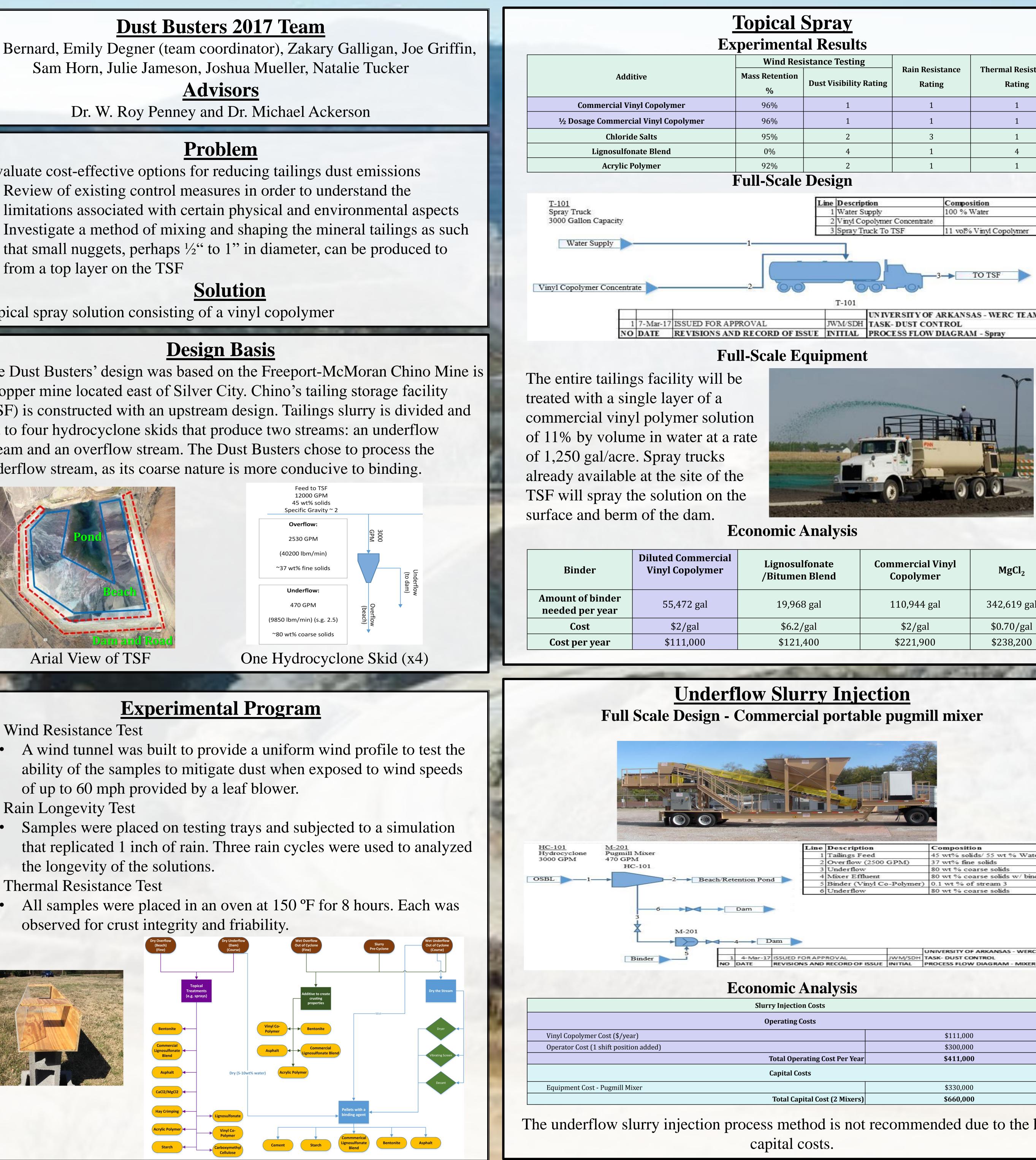




Experimental Program

- Wind Resistance Test
- A wind tunnel was built to provide a uniform wind profile to test the ability of the samples to mitigate dust when exposed to wind speeds of up to 60 mph provided by a leaf blower.
- Rain Longevity Test
- Samples were placed on testing trays and subjected to a simulation that replicated 1 inch of rain. Three rain cycles were used to analyzed the longevity of the solutions.
- Thermal Resistance Test
 - All samples were placed in an oven at 150 °F for 8 hours. Each was observed for crust integrity and friability.





Dust Busters Tailings Dust Emissions

esults		
e Testing	Dain Desistance	Thormal Decistor co
Visibility Rating	Rain Resistance Rating	Thermal Resistance Rating
1	1	1
1	1	1
2	3	1
4	1	4
2	1	1

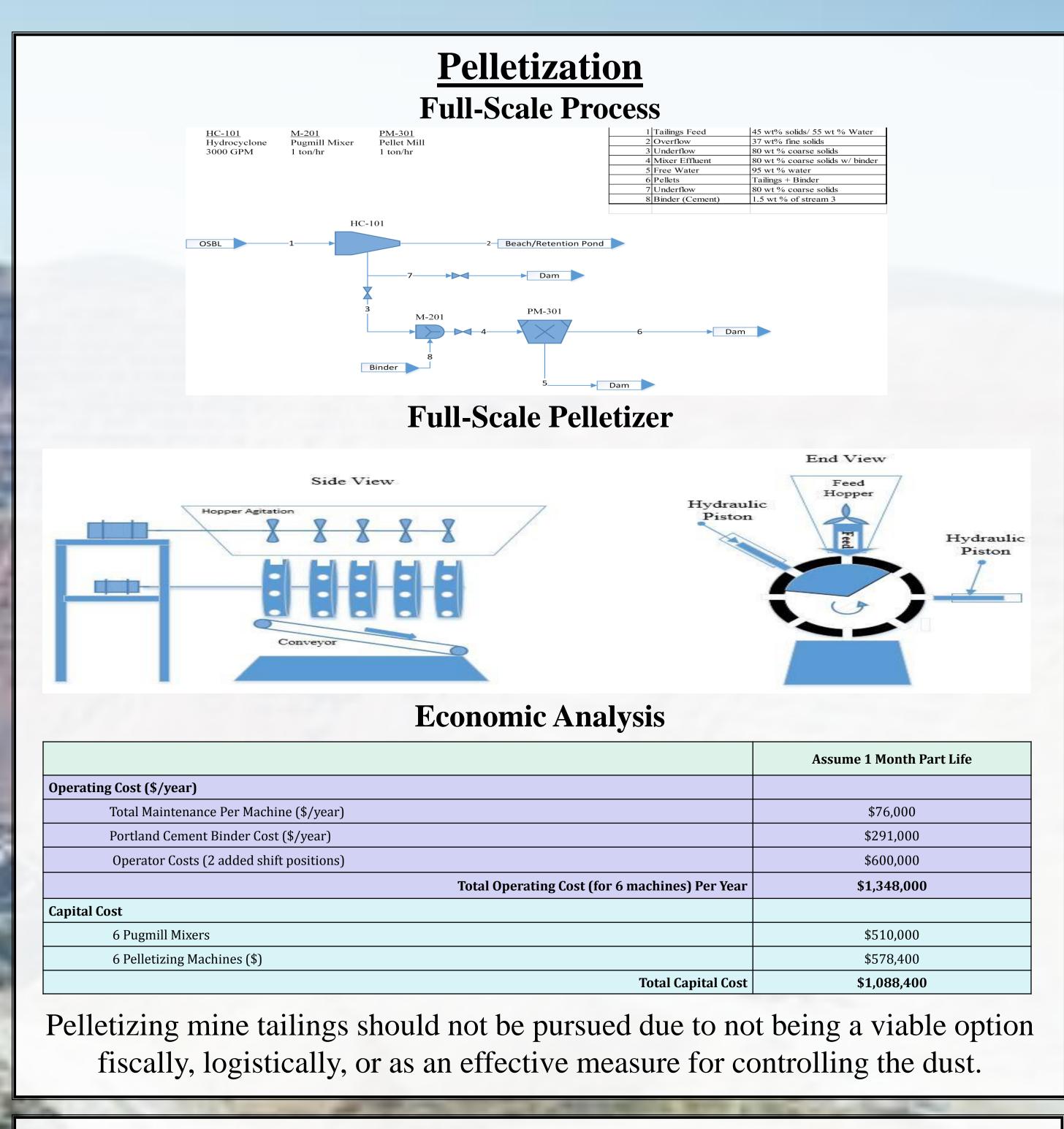
e 1	Description	Composition
1	Water Supply	100 % Water
2	Vinyl Copolymer Concentrate	
	Spray Truck To TSF	11 vol% Vinyl Copolymer

	→ TO TSF
T-101	
	UN IVERSITY OF ARKANSAS - WERC TEAM
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e Id	Commercial Vinyl Copolymer	yl MgCl ₂	
	110,944 gal	342,619 gal	
	\$2/gal	\$0.70/gal	
	\$221,900	\$238,200	

wt% solids/ 55 wt % Water) wt % coarse solids w/ binde

	¢111.000	
	\$111,000	
	\$300,000	
st Per Year	\$411,000	
	\$330,000	
(2 Mixers)	\$660,000	



Environmental, Health, & Safety

- copolymer if visible dust is apparent in the air.

Conclusions and Recommendations

- permeable but rigid crust atop the tailings.
- due to its longevity and economic value.

- increased by 50%.



• A vinyl copolymer topical spray solution benefits the environment because: It effectively mitigates dust emissions from entering the environment The polymer solution is biodegradable and therefore the tailings facility has the capability to be restored to its natural state after use

Biota and water bodies are not harmed when in contact with the solution The material is not corrosive to mining equipment

The proposed fugitive dust control plan will be accomplished in compliance with the applicable federal, state, and local regulations. The Freeport-McMoran Chino Mines Co. will need to apply the commercial vinyl

Mine, Health, and Safety Administration standards require operators to conduct surveys frequently to determine the adequacy of control measures.

The most effective, environmentally safe, and economical solution for tailings dust control is a topical spray consisting of a vinyl copolymer that forms a

The efficacy of the vinyl copolymer, compared to current methods, is higher

The vinyl copolymer spray will save the Chino mine approximately \$130,000-\$390,000 per year on dust treatment material and will not create additional capital costs due to the presence of available on-site spraying equipment.

The vinyl copolymer is a sustainable and environmentally friendly solution due to its compatibility with biota and ability to be reclaimed in the mining process. The Dust Busters recommend that TSFs apply the commercial vinyl copolymer product at 11% by volume in water at a rate of 1,250 gal/acre. If this treatment does not prove adequate for the particular mine, the application should be