Dust Busters
Tailings Dust Emissions

Problem
- Evaluate cost-effective options for reducing tailings dust emissions
- Review of existing control measures in order to understand the limitations associated with certain physical and environmental aspects
- Investigate a method of mixing and shaping the mineral tailings as such that small nuggets, perhaps ½” to 1” in diameter, can be produced to from a top layer on the TSF

Solution
- Topical spray solution consisting of a vinyl copolymer

Design Basis
- 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 analyze 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.

The entire tailings facility will be treated with a single layer of a commercial vinyl polymer solution of 11% by volume in water at a rate of 1,250 gal/acre. Spray trucks already available at the site of the TSF will use the solution on the surface and Berm of the dam.

Full Scale Equipment

Economic Analysis
- 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 copolymer if visible dust is apparent in the air.
  - Mine, Health, and Safety Administration standards require operators to conduct surveys frequently to determine the adequacy of control measures

Conclusions and Recommendations
- The most effective, environmentally safe, and economical solution for tailings dust control is a topical spray consisting of a vinyl copolymer that forms a permeable but rigid crust atop the tailings.
- The efficacy of the vinyl copolymer, compared to current methods, is higher due to its longevity and economic value.
- The vinyl copolymer spray will save the Chino mine approximately $130,000 - $238,200 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 TSF 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 increased by 50%.

Environmental, Health, & Safety
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