RECOMMENDATIONS

- Further clarification of the sludge tipping fees and transportation costs for receiving sludge should be pursued with both the WREP of Indianapolis and the MWRD of Greater Chicago. The delivered on-site cost of the sludge is going to be the principal driver for determining the economics for installing such a feed system.

- Before this project would move to a commercial demonstration, sludge-associated issues concerning odors, noise, and traffic around the plant site should be addressed with the local community to minimize the negative feedback that might occur from such a project.

- Further testing of improved dual-fluid dispersion nozzles should occur. Pilot-scale tests should be performed at the Wabash River facility to refine system concepts for a Phase II commercial demonstration. The design of the EERC nozzles was continually improving and had not reached near-optimum conditions. As near-optimum conditions are achieved, better diagnostics for measuring the sludge droplet size will be needed to discern minor improvements in performance.

- Further work could be completed to determine the effects of preheating the sludge and preheating the recycle syngas on the nozzle performance. Preheating the sludge and recycle syngas should help improve the nozzle performance. Sources of low-cost waste heat from the gasifier should be identified and investigated for their suitability to preheat the sludge. Preheating the recycle syngas will occur naturally in the boost compressor.

- These tests should also be conducted in a pressure vessel operating at full system operating pressures in order to determine the appropriate flow rates and pressure ratios that will optimize the performance of the dispersion nozzle. These tests should also incorporate the second control block and modified PLC logic to verify that the pulsing flow experienced with leased equipment can be eliminated.

- Longer-term nozzle wear tests should also be performed to determine the expected wear rates and life expectancy for these nozzles given the use of hardened parts.

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APPENDIX A

PARAMETERS FOR TERMINAL VELOCITY EQUATIONS

PARAMETERS FOR TERMINAL VELOCITY EQUATIONS

d_p^* Dimensionless particle size

d_p Particle size, ft

ρ_g Gas density, lb/ft^3

ρ_s Particle density, lb/ft^3

g Gravitational constant, 32.2 ft/sec^2

μ Gas viscosity, lb/ft-sec

u_t^* Dimensionless terminal velocity, ft/sec

Φ Sphericity, dimensionless

u_t Terminal velocity, ft/sec

APPENDIX B

NOZZLE TESTING PHOTOGRAPHS

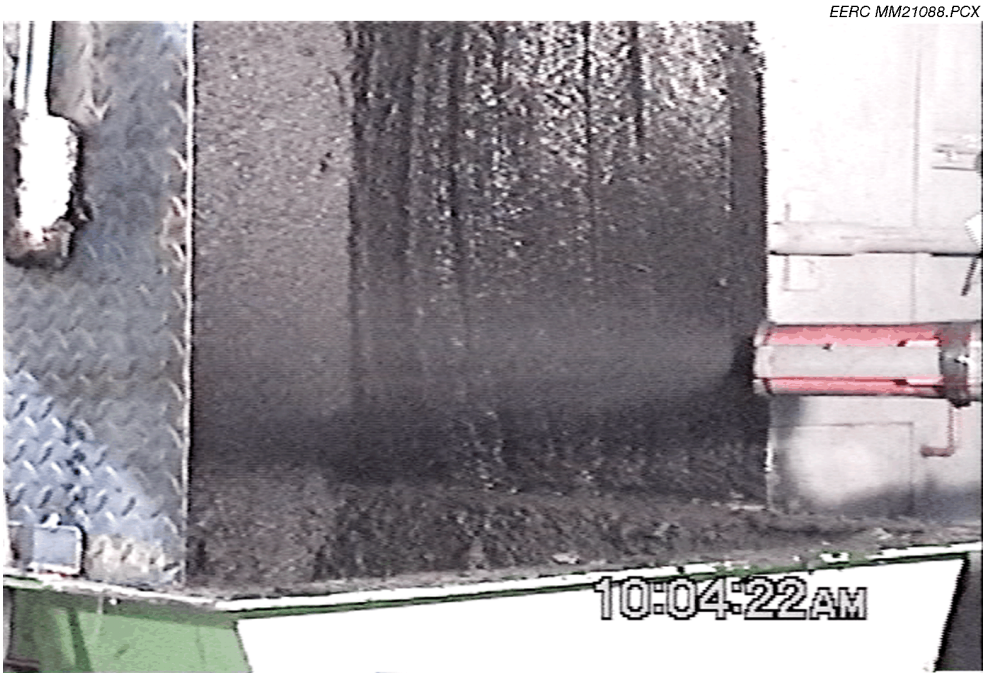

Figure B1. Sludge dispersion testing with shotcrete nozzle.

Figure B2. Sludge dispersion testing with EERC-1 nozzle.

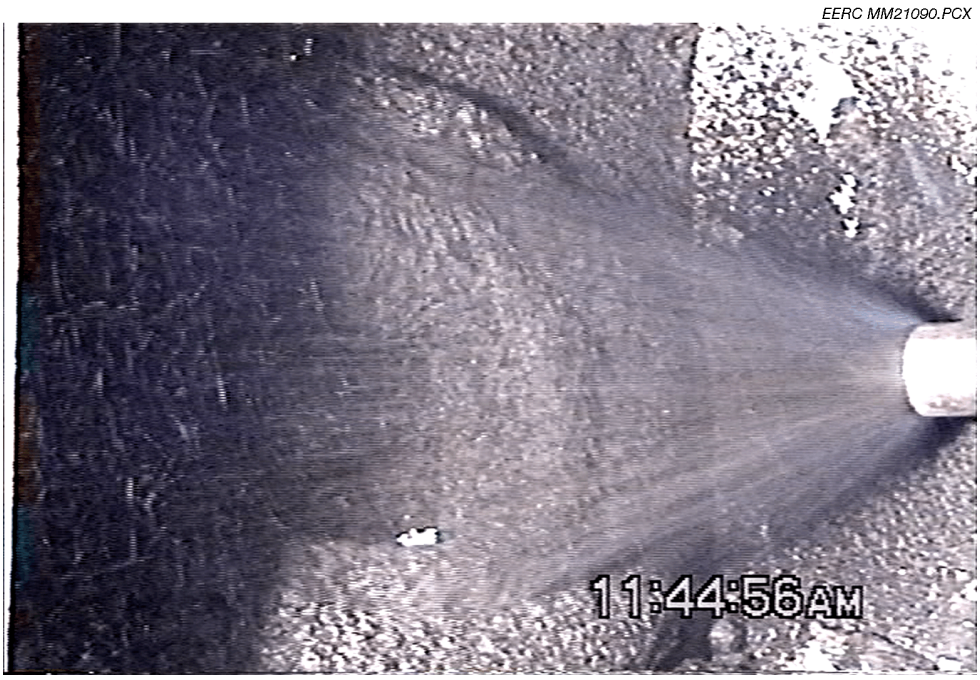

Figure B3. Sludge dispersion testing with EERC-2 nozzle.