49. Evaluation of Shaker Dust Collector for Use In a Swine Farrowing Barn

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Objectives: A shaker dust collector was evaluated to 1.) determine filter capacity in terms of mass loading, pressure drop, airflow, and runtime; 2.) determine particle collection efficiency by size prior to and following repeated loadings.

Methods: A shaker dust collector was setup in the laboratory to take in contaminated air, collect dust, and exhaust treated air. Arizona Road Dust (<1 to 200 μm) was introduced into the air (1000 cfm at startup) entering the dust collector at a loading typical of dust concentrations in a Midwest swine barn in winter. The dust-laden air then passed through a standard polyester sateen filter bag. Filter pressure drop and exhaust velocity pressure were measured throughout loading. Filter collection efficiency was tested using polydisperse solid glass microspheres (<1 to 10 μm) and measured with an aerodynamic particle sizer at the startup and end of loadings. Cleaning cycles were run between loading tests.

Results: Overall efficiency was 44 percent for new filter and ranged from 91 – 99 percent after the initial loading period. Exhaust airflow decreased linearly with pressure drop (r^2=0.99) for all three loading tests. At shutdown, system airflows were approximately 700 cfm. Significant recovery of filter residual pressure was observed following primary and secondary cleanings ($p<0.001$).

Conclusions: High removal efficiency was achieved after an initial loading period. The shaker dust collector filter is anticipated to be sufficient to treat air continuously in a swine barn over a three-month winter period. The engineering control system is recommended for further testing to improve indoor air quality inside a Midwestern farrowing barn during winter.

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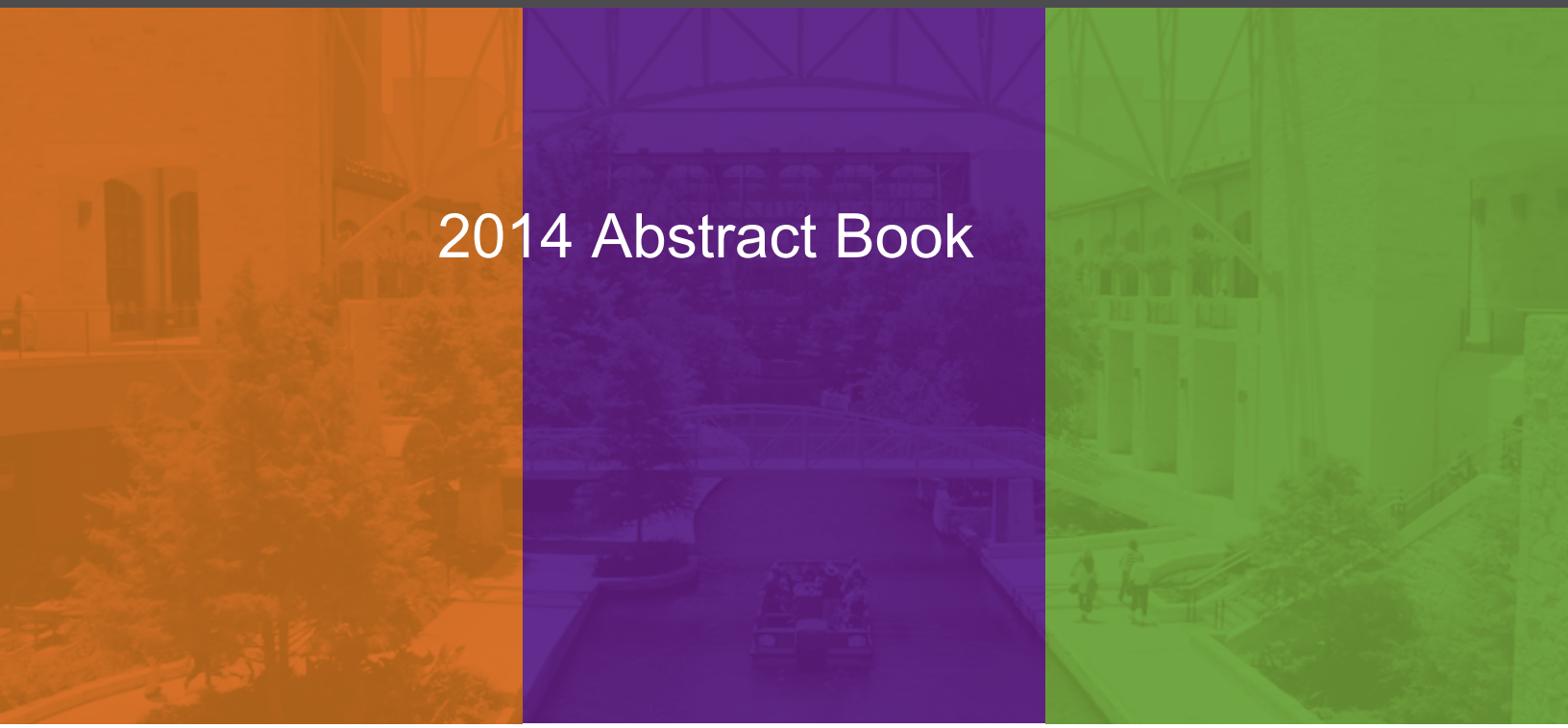

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