

Benjamin Baumgard, Grant Honken, Michael E. Anderson, Jacek A. Koziel

Dust Sampling in Simulated Cage-Free Egg Production Environment

Client: Department of Agricultural and Biosystems Engineering, Ames, Iowa

Problem Statement

- New developments in cage-free egg production has brought dust management practices into question. The problem at hand is how to make repeatable dust samples to determine best management practices.

Objectives

- Develop physical system to create repeatable dust samples.
- Create Standard Operating Procedure (SOP) for dust sampling.
- Test different dust management strategies.

Constraints

- Budget: Tim Shepherd provided materials
- Timeline: Project completed before 4/4/2020
- Materials: Cement mixer, air hoses, dust collection filters, flowmeters, vacuum pump.

Scope

- Testing of dust collection in multiple aggregates with different management practices.
- Developing an SOP for operation.
- Scope has been adjusted due to the COVID-19 pandemic restricting access to our project materials.

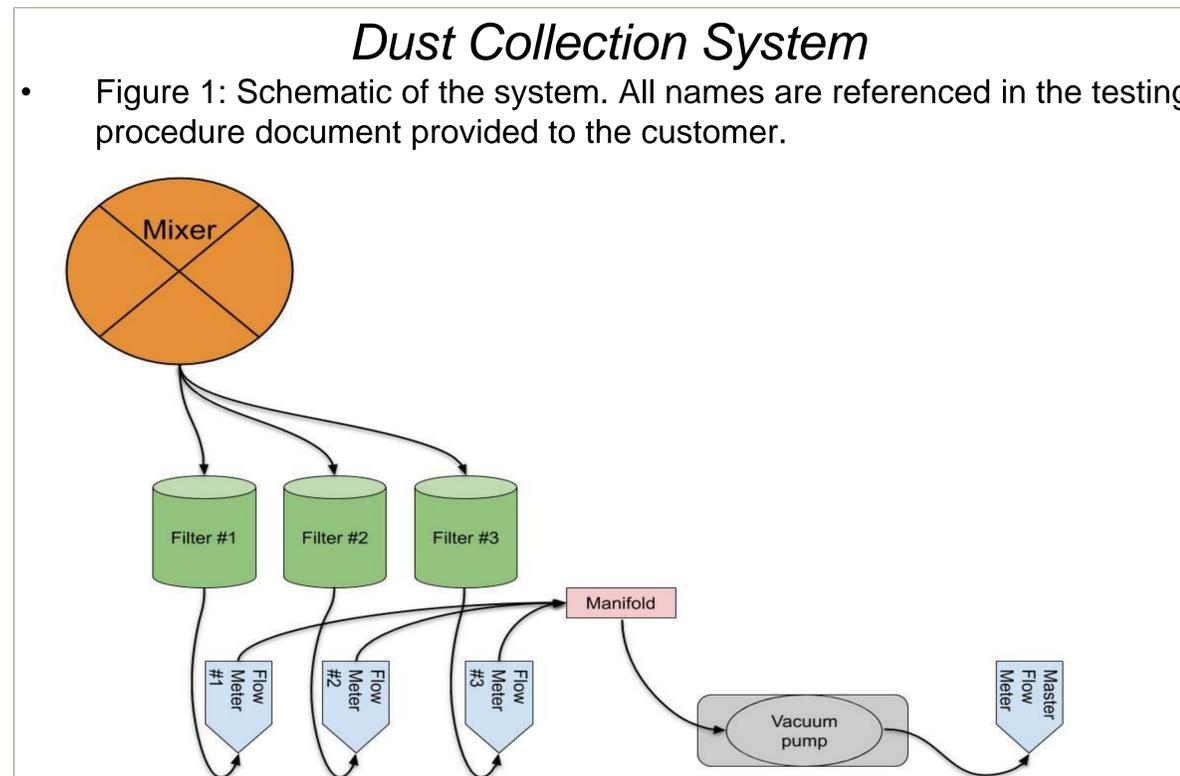


Figure 1: Schematic of the system. All names are referenced in the testing procedure document provided to the customer.

Figure 2: Data collection template

Test Number	Aggregate	Treatment	Hours Processed	Pre-Test Master Flow Meter Reading	Post-Test Master Flow Meter Reading	Pre-Test Flow Meter #1 Reading	Post-Test Flow Meter #1 Reading	Pre-Test Flow Meter #2 Reading	Post-Test Flow Meter #2 Reading	Pre-Test Flow Meter #3 Reading	Post-Test Flow Meter #3 Reading
1	Concrete	NA	2	3	2.3	3	2	2	3	4	1
2											

Test Number	Pre-Weight #1	Post-Weight #1	Pre-Weight #2	Post-Weight #2	Pre-Weight #3	Post-Weight #3	Weight #1	Weight #2	Weight #3	Test Average Weight	Notes
1	0.002	0.0067	0.0021	0.007	0.0022	0.0073	0.0047	0.0049	0.0051	0.00490	EXAMPLE
2											

Methods/Approach

- Design and construction of dust testing system.
- The different treatment methods will be applied to cage free egg production to reduce dust.

Major Deliverables

- Design of system to repeatedly test dust creation
- Develop SOP of testing using the above system
- Testing of ratios of Chicken Litter comparing them directly to the data of the concrete

Recommendations

- Recommendations will be made based on best practices to reduce dust creation and also with the research of dust solutions.

References

- “Reducing the Dust Load, Protecting the Health in Layer Houses.” *The Poultry Site*, 12 Mar. 2020, thepoultrysite.com/articles/reducing-the-dust-load-protecting-the-health-in-layer-houses.
- Walker, Meredith Swett. “Dust Baths and Longer Beaks Can Make Cage-Free Chickens into Mite-Free Chickens.” *Entomology Today*, 23 Dec. 2017, entomologytoday.org/2016/09/14/can-a-cage-free-chicken-also-be-a-mite-free-chicken/.