

November 2022

Many crops, like corn and soybeans, are stored on the farm in grain bins before going to market. When farmers work in or around their grain bins, they are exposed to grain dust, a mixture of small grain particles, insects, silica, bacteria, fungi, and mycotoxins. Inhaling these particles could decrease lung function in the long-term and cause respiratory diseases. Researchers at The Ohio State University College of Food, Agricultural, and Environmental Sciences are studying how to overcome grain dust challenges.



## Exposure to Dust

CFAES researchers collected dust samples on-site and measured dust concentrations while farmers were working in grain bins to study their exposure to grain dust, which can cause lung problems and conditions like asthma, COPD, farmer's lung, and more. They also examined environmental conditions and noted farmers' work practices.

The study showed that environmental concentrations of grain dust exceeded the **American Conference of Governmental Industrial Hygienists' recommendations** in many of the cases, with some concentrations nearly 15 times higher. Dust concentrations fluctuated when farmers switched activities, and many did not wear respirators to reduce exposure while working.

Researchers plan to use this data to identify underlying risk factors and explore how to lower concentrations by implementing better ways to work in grain bins.



Department of Food, Agricultural and Biological Engineering (FABE)  
Yang Geng, [geng.83@osu.edu](mailto:geng.83@osu.edu)  
S. Dee Jepsen, [jepsen.4@osu.edu](mailto:jepsen.4@osu.edu)  
Alfred Soboyejo, [soboyejo.2@osu.edu](mailto:soboyejo.2@osu.edu)  
Lingying Zhao, [zhao.117@osu.edu](mailto:zhao.117@osu.edu)



## Grain Dust Simulator

Conducting on-farm grain dust research can be time-consuming and expensive. Researchers are also dependent on farmers' schedules, as they can only collect data when farmers are working in their storage facilities.

CFAES researchers addressed these barriers by building a 1/10th scale model grain bin with the same features as a full-size bin, surrounded by a chamber that could simulate weather conditions. These controlled conditions allowed researchers to adjust airflow, temperature, and humidity to see how these factors would affect dust concentrations when testing technologies like ventilation and auger systems.

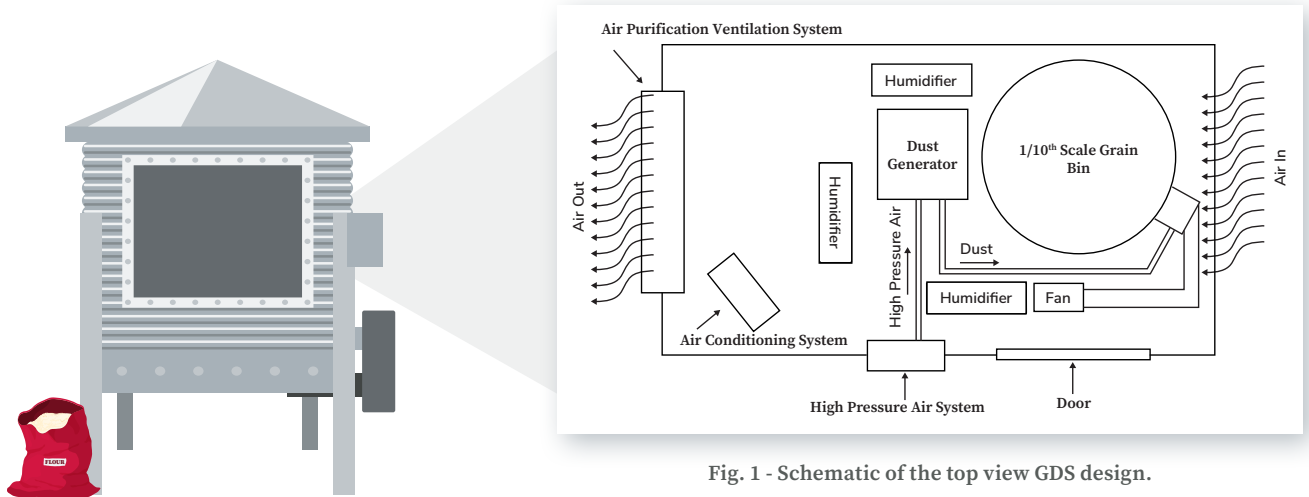


Fig. 1 - Schematic of the top view GDS design.

To ensure the tests were valid, they compared simulator results using flour to on-farm samples and showed the model could mimic on-farm conditions in initial tests. Researchers believe this grain dust simulator could be used in future tests to improve farmers' health and as a demonstration tool for Ohio State University Extension.

Yang Geng, FABE, [geng.83@osu.edu](mailto:geng.83@osu.edu)  
S. Dee Jepsen, FABE, [jepsen.4@osu.edu](mailto:jepsen.4@osu.edu)  
Lingying Zhao, FABE, [zhao.117@osu.edu](mailto:zhao.117@osu.edu)



## Recommendations

Agricultural safety programs can help farmers understand the health hazards from grain dust. A new simulator could make it easier for researchers to study grain dust exposure and for OSU Extension to demonstrate best management practices for minimizing dust concentrations.

For more information, visit [kx.osu.edu](http://kx.osu.edu) or contact Kim Winslow, [winslow.52@osu.edu](mailto:winslow.52@osu.edu).