Spring 2007

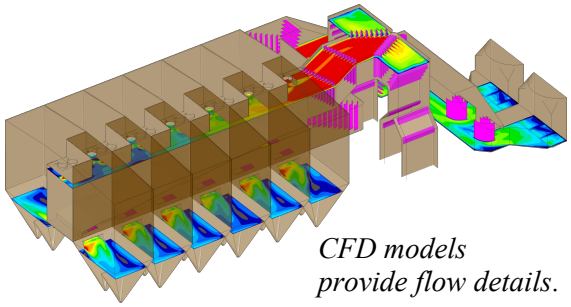
AIRFLOW SCIENCES CORPORATION

The Airflow Update ®

Optimizing Baghouse Performance

Baghouses remove particulate from a gas stream and are a commonly used pollution control device. If designed and installed correctly, a baghouse can be exceptionally effective- collecting over 99.9 percent of particulate before it reaches the stack. Incorrect design, on the other hand, can lead to problems such as uneven flow, premature wear of bags, the use of more or larger fans, or particulate buildup that can threaten the structural integrity of supporting duct work.

Flow modeling is one of the most effective ways to ensure optimum baghouse design and performance. It is often done during the initial design phase, but can also be performed for an existing baghouse. Specific objectives of a baghouse study usually include:



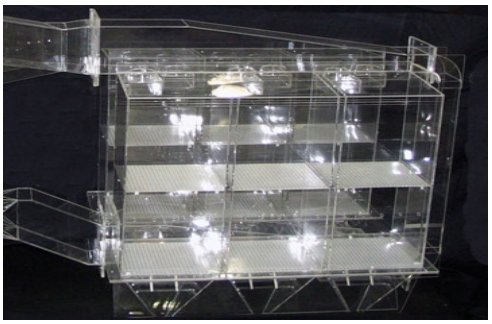
CFD models provide flow details.

- *Ensuring that flows entering each compartment are well-behaved and that all bags are utilized within a given compartment.*
- *Preventing gas velocities that are high enough to damage a bag via ash erosion.*
- *Minimizing pressure losses.*
- *Ensuring a uniform portion of the gas and particulate go to each compartment, with all compartments in service or with one out of service.*
- *Ensuring proper mixing and interaction between sorbent and gas for mercury absorption.*

The end result of the process is usually the design of flow control devices, such as vanes and baffles, that can optimize performance and avoid costly problems.

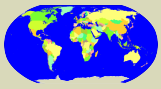
Both physical and computational fluid dynamics (CFD) modeling are useful tools in the analysis and optimization process. These methods can be used independently or, in some cases, together.

In summary, a baghouse can be a powerful pollution control device, but its performance hinges greatly on local flow direction, velocity, temperature and pressure. Ensuring that these factors are accounted for in your design can be a worthwhile investment that can save much in maintenance, energy, and labor costs.



Physical models assist in the visualization of baghouse flow.

Expanding our Horizons



Airflow Sciences is pleased to announce we have entered into an agreement with Korean consultants/distributors HANA Evertech Co., Ltd. to offer test equipment and services in Southeast Asia. HANA Evertech will be representing ASC in China, Indonesia, Japan, Malaysia, South Korea, Thailand, and Vietnam. If you have any needs in these countries, please contact our representative Jeff Jang at jjang@airflowsciences.com

From the Editor

*Another newsletter, more new staff members We've added three more people to our flow modeling and testing team. **Carl von Buelow** has joined our engineering department, while **Walt Jambeck** and **Jeff McConville** have added their skills to our laboratory team. I hope you have an opportunity to meet and work with our new staff members soon.*

If you have any flow or heat related issues, please give Airflow Sciences a call.

Edited by Kathleen Yanik

Railcar Aerodynamics Focus on Safety/Fuel Efficiency

ASC has been involved in the analysis of railcar aerodynamics since the early 1980s. Much of this work has been driven by the need to improve safety or fuel efficiency.

Safety: One of the main rail operational safety issues is wind-induced tip-over. This is a concern at high wind speeds for units having a tall profile and/or light weight. ASC has conducted numerous CFD tip-over studies for several of the Class I railroads. For two of these railroads, a database of railcar rollover-tendency was developed and used in the formulation of a real-time speed restricting system for locations prone to high winds.

A second aerodynamic safety issue involves the behavior of diesel exhaust plumes in the vicinity of locomotive cabs. ASC has performed CFD simulations of various locomotives operating under different ambient conditions. The studies were used to quantify the concentrations of diesel exhaust at the operator cab window. High concentrations are a concern because of the long-term and serious risks posed to operators.

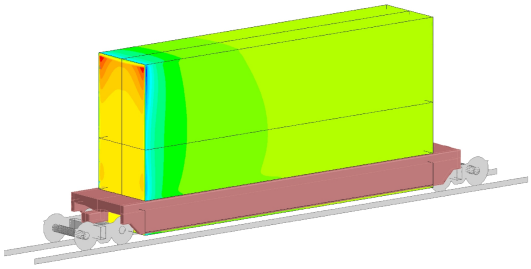


Figure 1: Pressure distribution over the well car.

Fuel Economy: Depending on car type and train speed, drag can account for 60% or more of a train's fuel consumption. Even small reductions are hence worthwhile since they can lead to millions of dollars in fuel savings per year.

ASC recently used numerical modeling to quantify the aerodynamic benefit of Greenbrier's smooth-sided, double-stack well cars. Greenbrier is a major builder and supplier of freight cars. Comparison simulations of competitive cars having exposed side ribs showed drag savings of up to 12%. The contour plot in Figure 1 shows the pressure distribution over the well car traveling at 60 mph and 0° yaw angle. The integration of these pressures provide the net drag on the railcar.

The illustration in Figure 2 shows the CFD results of another simulation. In this study, the effects of inter-platform spacing on railcar drag was investigated. The recirculating streamlines highlight the "dead flow" regions that manifest themselves in energy loss and drag.

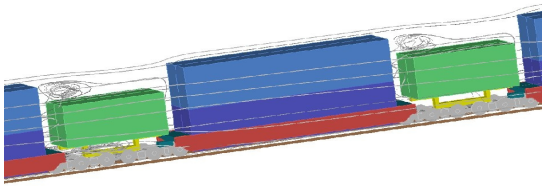


Figure 2: Effects of inter-platform spacing.

If an aerodynamic analysis would be of benefit to you, please call ASC.

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Airflow Events

We hope to see you at future trade shows:

- SNAXPO (March 24-27, Hollywood , FL)
- Electric Power (May 1-3, Chicago, IL)
- APC Roundtable & Expo (July 8-12, Chattanooga, TN)
- Coal-Gen 2007(August 1-3, Milwaukee, WI)
- ASM Heat Treating Society Conference and Exposition (Sept. 17-19, Detroit, MI)
- **Your Office:** Looking to host a seminar on modeling, fluid flows, or heat transfer?

We make house calls!

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