Spring 2003

AIRFLOW SCIENCES CORPORATION

The Airflow Update

Optimizing the Flow to an SCR

In an effort to reduce emissions of nitrous oxides, many power plants are installing selective catalytic reduction (SCR) systems. SCRs work by injecting ammonia into the flue gas upstream of a fixed catalyst. The NOx and ammonia react in the presence of the catalyst to produce nitrogen gas and water.

In order for an SCR to work efficiently, it is important to achieve a uniform velocity profile, a uniform temperature profile, and a uniform ammonia concentration at the upstream face of the catalyst. Both physical modeling and computational fluid dynamics (CFD) can be utilized in order to achieve these goals.

Figure 1 shows a 1/12th scale physical model of an SCR and its associated ductwork. A fan draws air through the model, and a tracer gas is used to simulate the injection of ammonia. Velocity measurements are then taken at the catalyst face with a hot mandrel probe, while a gas sampling probe is used at the same location to determine the tracer gas concentration.

Figure 2 presents a CFD model of the ductwork upstream of the SCR. For coal-fired plants, it is critical that no large pieces of the ash residue enter the SCR or air preheater. A detailed design study can determine what modifications are required in the economizer outlet region to collect all large-sized particulate in the economizer hoppers.

ASC has the skills, experience, and capabilities to optimize the flow to an SCR and to help minimize any catalyst pluggage caused by large "popcorn" ash.

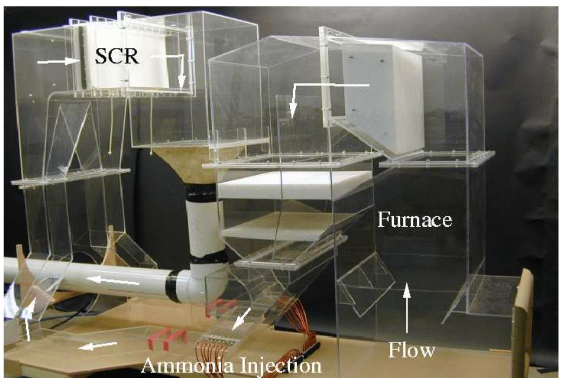


Figure 1: Physical Model of an SCR System

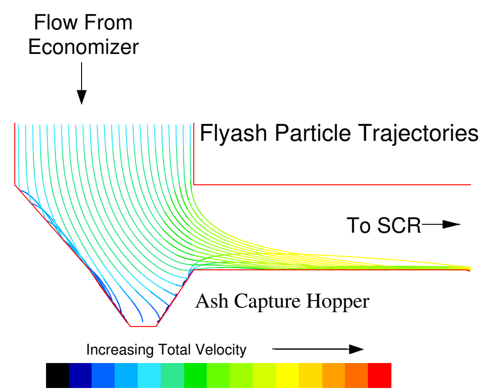
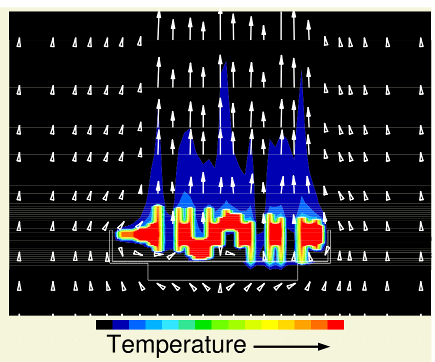


Figure 2: Particulate Tracking Before Modification

CFD Solves Forgings-Cooling Problem

The March issue of *Industrial Heating* magazine includes an article authored by our own **Jeff Franklin, P.E.** and **Andrew Banka, P.E.** This piece reviews how we used CFD to assist in the design of a cooling enclosure for forged crankshafts. The image on the right shows simulation results for a cooling forging.

The article is also available on the Airflow web page ***www.airflowsciences.com***



From the Editor

We have expanded again! Another 5000 ft^2 of (mostly) laboratory space has been appropriated to house the EPRI Coal Flow Loop as well as other experimental projects. From physical modeling to laboratory testing, we have the staff and facilities to fulfill your requirements.

More praise for our dedicated and hard working staff. Years of experience and months of studying for exams have paid off for two of our employees. ***Brian Dumont*** *and* ***Kevin Linfield*** *have recently obtained their Michigan professional engineering licenses. Way to go!*

If you have any flow, heat transfer, mixing, combustion, or mass transfer issues you're dealing with, feel free to give us a call at (734) 525-0300.

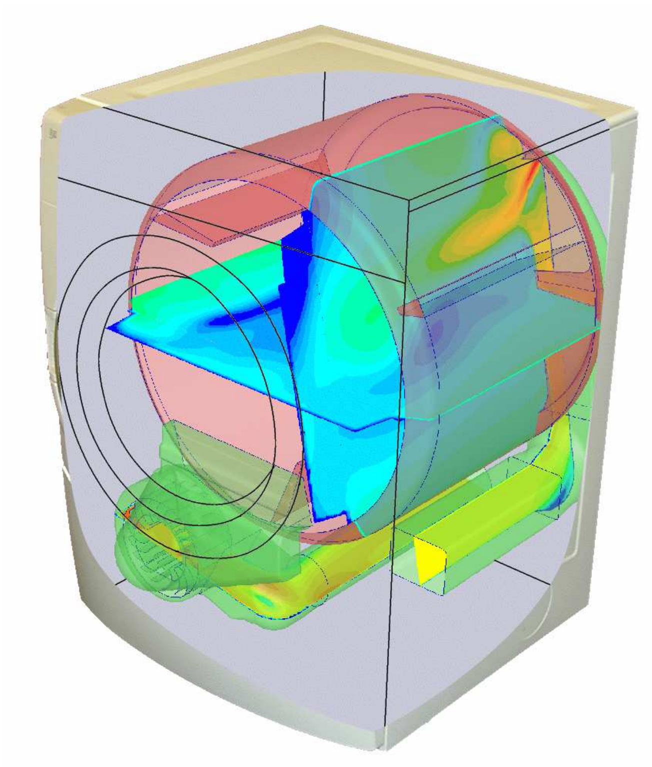
Modeling of Home Appliances

Air flow is critical to the proper functioning of household appliances. The transfer of heat and moisture comes into play in such items as toasters, ovens, and ranges. Recently, ASC worked with a major U.S. appliance manufacturer to study flow patterns in their clothes dryers.

A computational model was created of the rotating drum, along with the inlet ductwork, exhaust ductwork, and fan. One of the strengths of flow simulation is the ability to examine the aggregate effect of many components used in combination. Visualization of the computed flow velocities and directions is possible for any plane within the model. Some features of the flow geometry that were thought to be a concern were shown to actually work well, and so attention could be given instead to those areas where improvement would be possible.

Examination of the flow patterns revealed other specific areas where a design modification could increase the effectiveness of the dryer.

Several such modifications were examined through computational simulation to arrive at those that would produce the best results while meeting manufacturability constraints. The final design avoids unnecessary pressure losses, thereby ensuring sufficient air flow through the dryer over a broader range of operating conditions.



CFD Simulation in a Clothes Dryer

Contacting ASC:

General Info:
web: www.airflowsciences.com
email: asc@airflowsciences.com

Headquarters:
12190 Hubbard Street
Livonia, MI 48150-1737
phone: (734) 525-0300

Western Region Office:
P.O. Box 22637
Carmel, CA 93922-0637
phone: (831) 624-8700

Southeastern Region Office:
3709 Foster Hill Drive North
St. Petersburg, FL 33704-1140
phone: (727) 526-9805

European Region Office (UK)
Blackwood House, Faygate Lane
Faygate, West Sussex RH12 4SQ
phone: +44 (0) 1293 852903

Airflow Events

Have you visited us lately? We've recently participated at Power-Gen 2002, the NOx User's Group, and Electric Power 2003. We presented papers at each of these shows and copies are available on our web page.

We hope to see you at future trade shows including:

- IFT Food Expo (July 13-16, Chicago, IL) in booth 1879
- ESP/Fabric Filter Roundtable (Aug 10-12, Panama City, FL)
- Power-Gen 2003 (Dec 9-11, Las Vegas, NV)

If you are facing flow or heat transfer issues, please call us.

Airflow Sciences Corporation
12190 Hubbard Street
Livonia, MI 48150-1737

AIRFLOW SCIENCES CORPORATION
The Airflow Update

Visit our website at:
www.airflowsciences.com