

Winter 2005

AIRFLOW SCIENCES CORPORATION

# The Airflow Update

Edited by Kevin Linfield, P.E.

## Temperature Mixing Solutions

Tampa Electric Company recently contracted Airflow Sciences Corporation (ASC) to help optimize flows at the Big Bend Power Station as part of an upgrade of their electrostatic precipitator (ESP). The goal was to minimize the potential for corrosion of the new ash collection elements. Plant test data showed that the gas temperature entering the ESP varied by almost 70°F. This thermal gradient resulted in "cold zones" within the ESP where metal corrosion could be more prominent.

To correct the situation, ASC constructed a computational fluid dynamics (CFD) model of the ESP inlet ductwork system. The modeling goals were to assess the current temperature patterns and design a flow mixing device that reduced the temperature stratification.

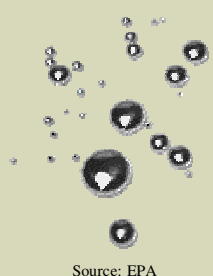
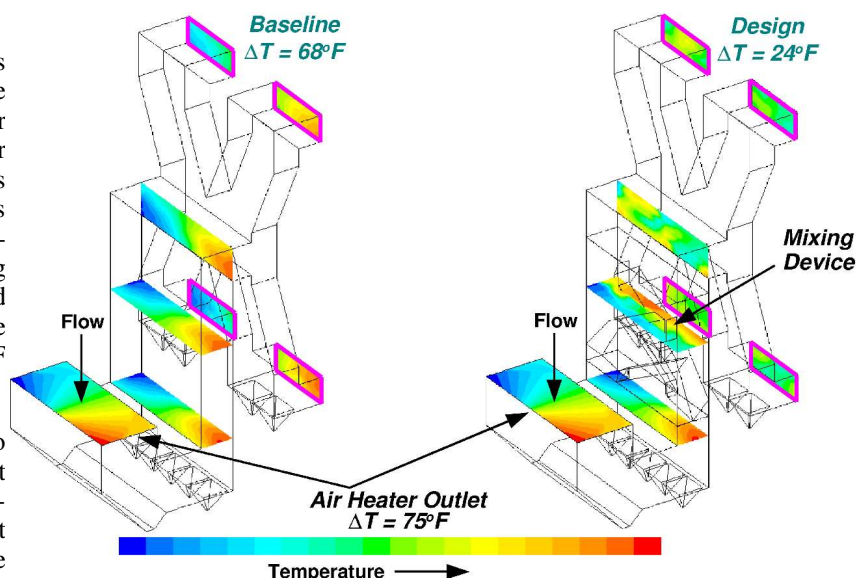
The duct geometry is shown in the figure. The flow exits the rotary air heater and splits to four separate ESP chambers (pink). Rotary air heaters typically cause a temperature gradient, and at Big Bend it was severe. Field testing indicated that the temperature varies by 75°F at the air heater outlet.

As the gas continues to the four ESPs, it does not mix much, due to the ductwork geometry and short residence time. The figure indicates the gas tempera-

ture profile at select planes within the duct. At the ESP inlet, the temperature variation is 68°F.

The CFD model was then used to develop a customized thermal mixer. A unique arrangement of baffles was developed to blend the hottest and coldest zones. After installation at Big Bend Unit 2, the temperature gradient was reduced to 24°F. The added pressure loss was 0.7 IWC, well within the plant-specified maximum of 2.5 IWC.

Tampa Electric personnel are very pleased with the results and now consider the corrosion problem resolved. A similar modeling effort is nearly complete for Unit 3. Further details can be found on ASC's website, or by calling John Smolenski of Tampa Electric Company at 813-228-1452.



Source: EPA

### Mercury Removal and ASC A Winning Combination!

Concerned about Hg removal? ASC can help ensure your ESP, SCR, WESP, scrubber and/or baghouse meet flow standards such as ICAC for optimizing your mercury removal strategies. Our CFD and physical modeling for sorbent injection and distribution combined with our field testing capabilities means that you can rely on ASC to be your engineering consultant for the upcoming EPA regulations.

**From the Editor**  
*Will the baby boom never stop? **Brian and Sandra Dumont** welcome **Mattias James**, while **Kevin and Doreen Linfield** welcome **Katrina Roslyn**. All are doing well, but what ever happened to babies who sleep all of the time?  
Have you checked out the revised version of the Institute of Clean Air Companies' ESP flow modeling guidelines? The updated ICAC-EP7 now discusses CFD modeling. Give us a call (734-525-0300) and we'll send you a copy.  
The EPRI Coal Flow Measurement and Control Laboratory has been exceeding all expectations. This state-of-the-art coal pipe simulator is providing excellent R&D data that will be presented at several 2005 conferences. Be sure to stay tuned!*

# Probe Calibration Services

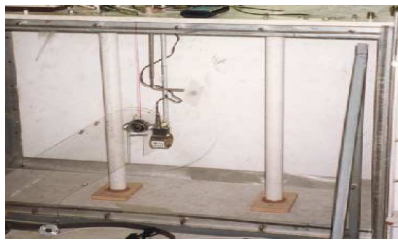
Airflow Sciences provides complete velocity probe calibration services for all types of differential pressure style probes:

- ✦ S Type Pitot
- ✦ Dirty Air
- ✦ Fechheimer
- ✦ 2D Wedge
- ✦ 3D Prism
- ✦ 3D Spherical Head



ASC's 17"x34" Subsonic Wind Tunnel

We also calibrate other types of velocity probes such as vane and hot wire anemometers plus temperature probes, pressure transducers, and thermocouple modules.



Wind tunnel testing with a vane anemometer

Our 17" x 34" wind tunnel exceeds all EPA specifications for calibrating 3D probes per EPA Method 2F. The tunnel has a velocity range up to 130 feet per second. The 36" diameter axial fan is powered with a 30 HP motor and variable frequency drive for precise velocity control. The tunnel test section



Test Section and Data Acquisition Equipment

diverges at 0.26 degrees to account for boundary layer growth due to wall friction. Thus, the velocity profile in the test section is extremely flat. Also, our inlet was carefully designed to ensure less than 1% turbulence.

Our calibration services include a complete probe inspection and full report. A computerized data acquisition system with NIST traceable pressure transducers is used to ensure accurate results. Typical turn-around time is one week; overnight turn-around is also available.

ASC also fabricates 3D, S-type, dirty air, and other velocity probes. Pressure, gas sampling, temperature, and particulate extraction probes are available.



3D Prism-type Velocity Probe

One of our specialties is the design and fabrication of custom probes for complicated or unique applications. If you have a standard test or one that's never been done before, now you know who to call.

## Contacting ASC:

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## Quote-of-the-Newsletter

*Common sense is instinct, and  
enough of it is genius.*

-- Josh Billings

## Airflow Events

As always, we're traveling the country attending and/or presenting at conferences, trade shows, and other gala expos. Be sure to keep an eye out for ASC at these upcoming events!

- Snaxpo (Mar 12-15, Hollywood, FL)
- Electric Power (Apr 5-7, Chicago, IL)
- WPCA NOx Seminar (June 2005, Charlotte, NC)
- Air Pollution Control Round Table (Jul 24-26, Tampa, FL)
- **Your Office:** Looking to host a seminar on modeling, fluid flows, or heat transfer? CALL US!

**We make house calls!**

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