The Airflow Update®

AIRFLOW SCIENCES CORPORATION

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Simple Cycle Systems and HRSGs

Lately, there has been a surge in simple cycle systems and HRSGs being built world-wide to supplement all of the new "renewable energy" sources such as wind and solar. What do you do when the wind stops blowing or it's cloudy and you need to maintain power level? A simple cycle system has the advantage of being able to go from off to full power in a matter of minutes. And although burning natural gas, these units still require pollution control equipment such as CO and NOx catalysts. Of course, maximizing pollution control efficiency is extremely important, so leaving it to chance is not an option. Ensuring a uniform temperature and velocity profile at a catalyst face is paramount in helping utilities and A&E firms reach these goals.

Recently, ASC provided flow modeling for catalyst supplier EmeraChem for a western-USA HRSG plant that features a duct burner, CO and SCR catalysts, and ammonia injection. ASC's analysis determined the uniformity of velocity, temperature, and ammonia throughout the system.

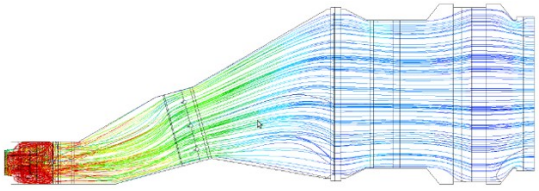


Fig 1: Pathlines colored by velocity

The model started at the turbine outlet flange and terminated at the stack entrance. The pressure drop through and flow uniformity at each internal component is extremely critical to ensure proper performance of the system.

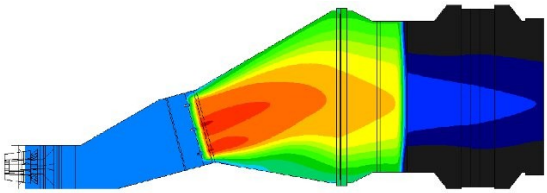


Fig 2: Temperature Profile

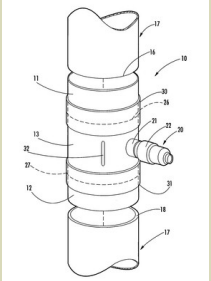
Results of the CFD flow model predicted that with the appropriate flow control devices, the flow field through the system was sufficiently uniform to ensure that all emission standards would be met. This was borne out when the unit became operational. Matthew Loy of EmeraChem stated that "*Performance is very good. Well below guarantees*".

ASC would be pleased to help optimize the temperature, velocity, and species inside your simple cycle or HRSG unit.

Fig 3: HRSG Facility on West Coast
(source: www.capitalpowerincome.ca)

ASC Designs Patented New Test Port Assembly

A patent has been issued to the Electric Power Research Institute (EPRI) for the ASC-designed rotating test port assembly. U.S. Patent 7,806,010 B2 details this invention, which was designed for use in the EPRI Coal Flow Loop, located at ASC's headquarters in Michigan. Congratulations to the ASC inventors Rob Mudry, Matt Fleming, and Bruce Devlin!



From the Editor

ASC's in-house CFD software has gone through some significant revisions to optimize it for speed and memory requirements. With features comparable to the most popular commercial codes, ASC offers the advantage of unlimited licenses to run many simultaneous cases on our high end computers. Many thanks to Dr. Franklin for his dedicated research and long hours coding.

ASC was recently awarded a Phase I SBIR contract for CFD Tools for the Management of Bulk Residual Stress. This award provides funding to demonstrate the feasibility of using CFD tools to accurately predict heat fluxes during quenching operations for use in existing residual stress analysis techniques.

Edited by Kevin Linfield, P.E.

CFD Aids CVD Uniformity

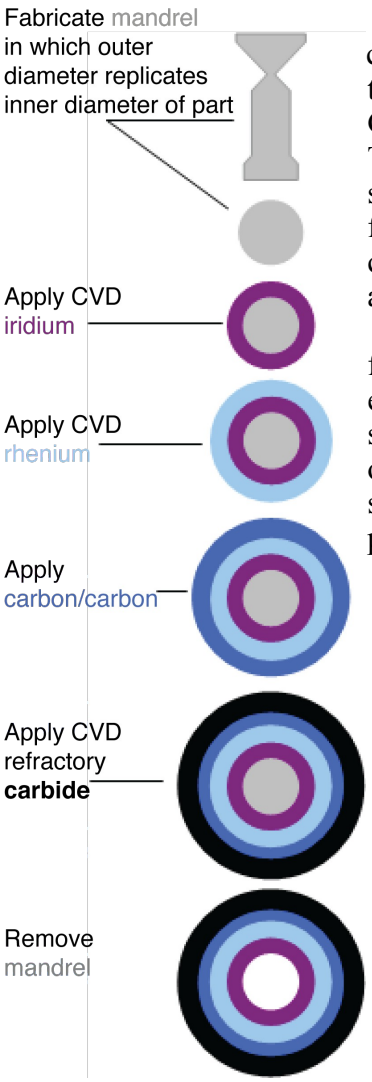


Fig 4: Ultramet's "inside-out" CVD manufacturing process for propulsion system components.

Chemical vapor deposition (CVD) is a process in which chemical precursors flow through a heated vessel, where they react on the surface of a substrate to form a film. Gaseous by-products are carried away with the exiting flow. This process is used for a variety of products, including semiconductors, optical coatings, wear resistance coatings for cutting tools and other parts, coatings for chemical resistance, and advanced materials.

In order to generate films of uniform thickness, it is necessary to ensure that all portions of the substrate are exposed to equal amounts of the precursor gas. Failure to do so can result in uneven films and poor part performance.

Fig 5: Liquid Rocket Engine Combustion Chamber

Recently, ASC applied its computational fluid dynamics (CFD) tools to help Ultramet (Pacoima, CA) improve their CVD process. Ultramet specializes in the chemical vapor deposition of refractory metals, platinum group metals, and ceramics in the form of coatings, freestanding shapes, composites, and porous materials where high performance in extreme environments is required.

ASC's CFD simulations were used to assess Ultramet's CVD process and the effect of several system design parameters on the uniformity of precursor gas flow over the mandrel.

The simulation results provided Ultramet with insight regarding the process operation and helped to guide subsequent activities.

Contacting ASC:

General Info:
www.airflowsciences.com
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 Dr. North
St. Petersburg, FL 33704
phone: (727) 526-9805

Airflow Events

We hope to see you at future trade shows including:

- NPRA Annual General Meeting (Mar 20-22, San Antonio, TX)
- Electric Power (May 10-17, Chicago, IL)
- Coal-Gen (Aug 17-19, Columbus, OH)
- Process Expo (Nov 1-4, Chicago, IL)
- ASM Heat Treat (Nov 1-2, Cincinnati, OH)
- ChemShow (Nov 1-3, New York, NY)
- **Your Office:** Looking to host a seminar on modeling, fluid flows, or heat transfer?

We make house calls!

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

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