Airflow Sciences Corporation

Simple Cycle Systems and HRSGs

Case Study

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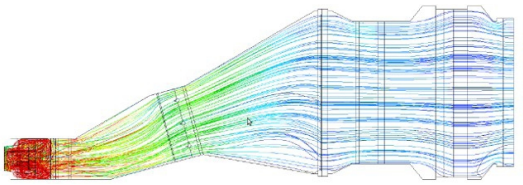

Figure 1 - Pathlines colored by velocity

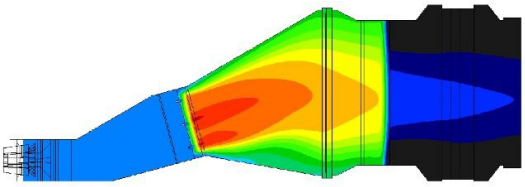

Figure 2 - Temperature Profile

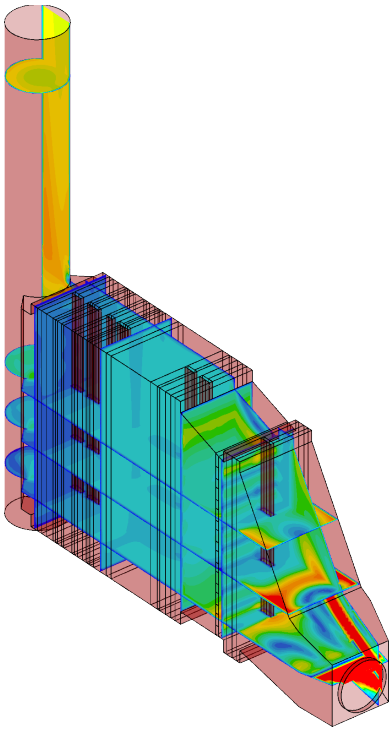

Figure 3 - HRSG velocity profile

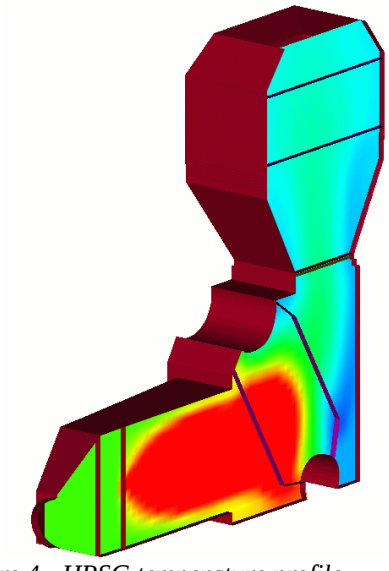

Figure 4 - HRSG temperature profile

Lately, there has been a surge in Simple Cycle systems and Heat Recovery Steam Generators (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 NO_x 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.

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.

Results of the CFD flow model (Figure 1 and Figure 2) 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".

HRSGs are often used downstream of gas turbines to efficiently utilize exhaust gas heat. The gas travels through steam tube banks to generate steam for a turbine or process equipment.

Flow and heat transfer characteristics within the HRSG are critical to its performance. ASC utilizes our flow modeling expertise to optimize the heat transfer to the tube banks, the velocity and temperature profiles through the NO_x catalyst, the duct burner position and design, as well as the overall pressure loss.

The results from different models (Figure 3 and Figure 4), show predicted velocity and/or temperature distribution with duct burners in operation. Clients such as Innovative Steam Technologies have been using ASC's engineering skills to optimize flow.

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

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