Improved Reformer Performance Using CFD Modeling

Praxair, Inc., headquartered in Danbury, CT, and with offices in Tonawanda, NY, is one of the largest industrial gases companies in the world.

Gases produced by Praxair are used in a variety of industries including health care, electronics, energy and various manufacturing sectors.

PRAXAIR
Making our planet more productive

Company: Praxair, Inc.
Industry: Industrial Gases
Location: Danbury, CT
Website: www.praxair.com

THE CHALLENGE

CFD modeling can be used to probe complex reforming furnace-related issues by developing a 3D 'virtual prototype' of the system and applying real world physics. Solving these equations, which can include physics for species transport, turbulence-chemistry interaction for combustion and heat transfer, is very computationally intensive and requires efficient high-performance computing (HPC) clusters.

NEXT-GENERATION SOLUTIONS

Access to UB-CCR's HPC resources has allowed inclusion of complex and realistic geometries, physics, chemistry and boundary conditions in our models, thereby improving the accuracy of the model results. The ready-to-run HPC environment and intuitive user interface has also enhanced the pre- and post-processing experience. This has enabled Praxair to efficiently troubleshoot reformer issues and validate engineering solutions, thereby improving the productivity and reliability of our fleet of hydrogen plants.

Access to UB's HPC resources is supported by funding from the Division of Science Technology and Innovation (NYSTAR) of the Empire State Development Corporation (ESD) through its High Performance Computing Consortium (hpc-ny.org) and the New York State Regional Economic Development Council.

ECONOMIC IMPACTS

Praxair's largest engineering and R&D center has been located in Tonawanda, NY since 1937. Over 1,100 people work at this site, making Praxair one of the top private employers in the Buffalo-Niagara region. Using the HPC resources at UB-CCR for our reformer-related CFD

simulations has reduced run costs by 50-60% and improved productivity. In addition, Praxair is a member of the Founders Council for Buffalo Manufacturing Works, part of the Buffalo Billion initiative aimed at making the region a leader in high-tech advanced manufacturing and innovation. The Founders Council is a group of anchor companies that advises on industry needs and informs the center's technology road-mapping activities.

RESULTS

The HPC cluster at UB-CCR has greatly reduced the time it takes to complete simulations, up to 65% in some cases. Additionally, the option to increase the number of processor cores being employed for the simulation can further improve productivity and help investigate complex and pressing issues in short order.

> *"It is a pleasure working with UB-CCR. They are more like a collaborator, ensuring my applications run efficiently. The cluster is highly efficient, and scaling up is straightforward. This has improved productivity and resulted in significant savings compared to other HPC providers."*
>
> ***Kwame Bedu-Amissah, Ph.D., P.E.***
>
> ***R&D Engineer, Praxair Inc.***

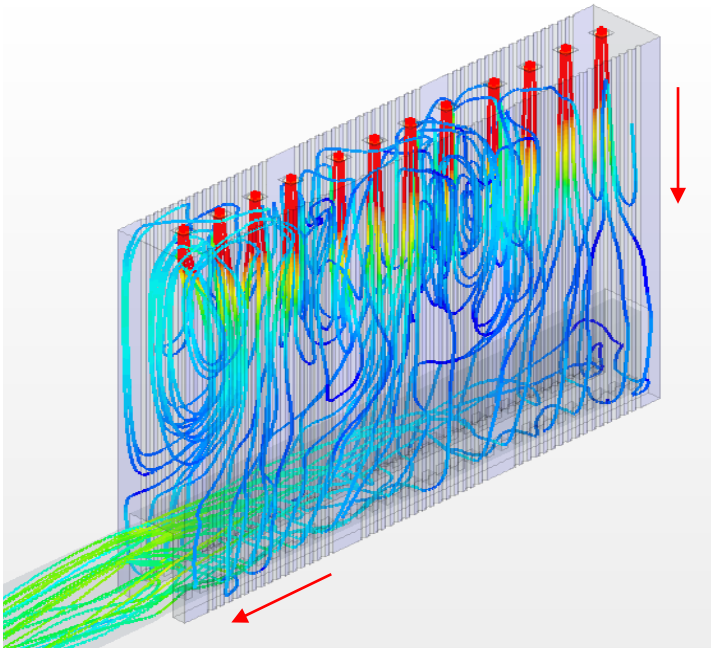

Figure 1: Velocity streamlines for flue gas flow from burners in a simplified furnace. Model run time was 2 days at UB-CCR on 64 cores vs an estimated 100 days on a typical 4-core in-house desktop machine.

ABOUT HPC[NY]

Funded by ESD Division of Science, Technology & Innovation, HPC[NY] is a partnership between NYSERNet, a private not-for-profit corporation created to foster science and education in New York, and three supercomputing centers: the Rensselaer Polytechnic Institute Center for Computational Innovations, Stony Brook University/Brookhaven National Laboratory's New York Center for Computational Sciences, and the University at Buffalo's Center for Computational Research.

HPC[NY] provides businesses and research organizations with access to world-class advanced computing expertise through accelerating the engineering and development path of complex, ground-breaking designs to reliable, accurate, innovative product and process performance that can provide a distinct competitive advantage.

ABOUT CCR

The Center for Computational Research (CCR), part of the University at Buffalo (UB), is a leading academic supercomputing facility. CCR maintains a high-performance computing environment, high-end visualization laboratories, and support staff with expertise in computing, visualization, and networking.

The mission of CCR is to (1) enable research and scholarship at UB by providing faculty with access to high-performance computing and visualization resources, (2) provide education, outreach, and training in Western New York, and (3) foster economic development and job creation in Western New York by providing local industry with access to advanced computing resources, including hardware, software and consulting services.

CONTACTS

NYS High Performance
Computing Consortium (HPC[NY])
Center for Computational Research
University at Buffalo - SUNY

701 Ellicott St., Buffalo, NY 14203
Office: (716) 881-8966
Fax: (716) 849-6656
http://hpc-ny.org

Praxair, Inc.

Kwame Bedu-Amissah
Phone: 716-879-7233
kwamina_bedu-amissah@praxair.com