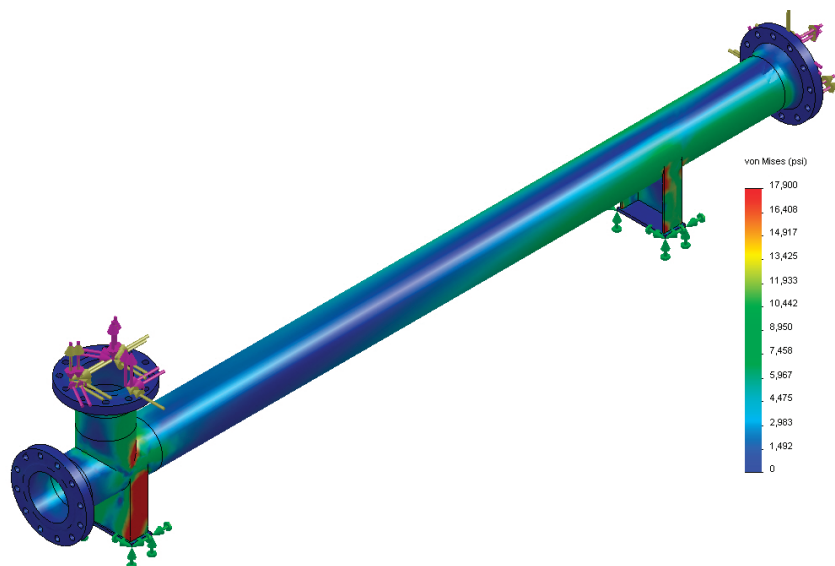# GAUMER PROCESS

Simulating the optimum electric process heater design with SolidWorks software

With SolidWorks Simulation Premium and SolidWorks Flow Simulation software, Gaumer Process has reduced design times and cut costs on the development of its electric process heaters, while maintaining quality.

When companies in the process industries, including oil, gas, food-processing, wastewater treatment, and petrochemical companies, have electric process heating needs, Gaumer Process often tops their list. That's because the Houston-based manufacturer helped to develop electric process heater technology over the last 30 years, acquiring several patents for its electric process heaters, systems, and controls.

The company's success rests on its record of consistently satisfying the most demanding electric process heating requirements. Given its deep commitment to quality, Gaumer Process often overdesigned and overengineered its heaters. Recently, however, market demands to accelerate system delivery, control costs, reduce energy consumption, and optimize material usage prompted the company to evaluate simulation technology.

According to Craig Tiras, P.E., vice president of engineering and design, Gaumer believed that computational fluid dynamics (CFD), thermal, and structural simulation tools could help the company respond to market demands without sacrificing quality. "Our initial interest in simulation involved flange thicknesses, which we had traditionally made thicker than necessary," Tiras recalls. "We make thousands of heater bundles, and reducing material usage can save a significant amount of time and money. With simulation, we hoped to improve efficiency and cut costs by accurately predicting the effects of pressure, temperature, and stress on our heater designs."

Gaumer Process evaluated several analysis packages before choosing SolidWorks® Simulation Premium and SolidWorks Flow Simulation software. The company chose SolidWorks Simulation solutions because they are integrated directly inside SolidWorks CAD software, are easier to learn and use, include automated report generation tools, and can simulate the multiphysics involved in electric process heater design.

Challenge:
Simulate the flow dynamics, heat transfer, and structural characteristics of electric process heaters to trim material, cut costs, and accelerate development.

Solution:
Implement SolidWorks Simulation Premium and SolidWorks Flow Simulation software to accurately predict the effects of pressures, temperatures, and stresses on electric process heater designs.

Results:
- Cut development cycle from three years to three months
- Saved $100,000 in prototyping costs
- Reduced material costs by 75 percent
- Enhanced visualization of system performance

SOLIDWORKS

Cutting flange size in half

By implementing SolidWorks Simulation solutions, Gaumer Process was immediately able to reduce flange thicknesses on all of its heaters by 50 percent, resulting in substantial savings. The new flange designs perform just as well and require less material and energy to produce. "Cutting our flange thicknesses in half really helped to change our company," Tiras notes.

"Our flanges used to require twice as much material, took four times as long to drill, and a lot more energy to produce. By simulating the thermal, structural, and fluid flow behavior in and around a flange, we saw that we had been wasting material. The cost of the SolidWorks Simulation package is insignificant compared to the savings we realized on that very first use. Since then, we have been able to optimize designs and reduce material costs overall by 75 percent."

Improving heat transfer

Gaumer Process also uses SolidWorks Simulation to improve heat transfer performance. For instance, the company's engineers believed that an internal baffle design could enhance heat transfer within its electric process heaters.

Without SolidWorks Simulation tools, Tiras says Gaumer engineers most likely would have pursued a cross-baffle design—four times better, theoretically—and then would have worked through trial and error to optimize it. That process would have taken three years. However, by using SolidWorks CFD and thermal analysis software to simulate heat transfer in a variety of concepts, Gaumer was able to show that an optimized scissor-baffle design performed best.

"With SolidWorks Simulation software, we were able to study and test six different concepts and reach an optimized design in less than three months," Tiras points out. "We eliminated more than two years of costs, saved $100,000 on prototyping, and produced a patented idea for enhancing heat transfer. That's the kind of advantage that helps us beat our competition."
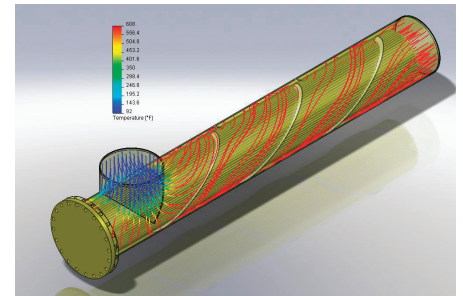
Thermal, structural, and CFD

Visualizing multiphysics helps Gaumer Process engineers understand how the entire system functions. For example, the company's heaters range in size from very small equipment to systems the size of a three-story building. On its large systems, Gaumer must account for physical phenomena not only within its heaters, but also surrounding them, such as seismic loads and the conditions created by 150 mph winds.

"We can simulate the external wind loading in CFD, as well as solar radiation in extremely hot and cold locales, and transport those results into the structural analysis package to get a more real-life result," Tiras stresses. "Instead of using brute force and bloody ignorance to overcompensate, we can design our supports and braces using thinner materials in a way that more accurately meets the needs of the actual operating environment. The cost savings we realize help us to save our customers money while offering the optimum design at the same time."

"WITH SOLIDWORKS SIMULATION SOFTWARE, WE WERE ABLE TO STUDY AND TEST SIX DIFFERENT CONCEPTS AND REACH AN OPTIMIZED DESIGN IN LESS THAN THREE MONTHS. WE ELIMINATED MORE THAN TWO YEARS OF COSTS, SAVED $100,000 ON PROTOTYPING, AND PRODUCED A PATENTED IDEA FOR ENHANCING HEAT TRANSFER. THAT'S THE KIND OF ADVANTAGE THAT HELPS US BEAT OUR COMPETITION."

Craig Tiras, P.E.
Vice President of Engineering and Design

By simulating thermal, structural, and fluid flow behavior, Gaumer Process can optimize its designs faster and more cost-effectively.