Applied Combustion Research at the University of Utah

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Abstract

One of the challenges of applied combustion research is bridging the gap between fundamental combustion science and industrial applications. The challenge is even greater for highly variable and complex fuels such as coal or biomass. The University of Utah has approached this problem for solid fuels by developing a wide array of experimental facilities over the last 25 years, ranging from fundamental bench-scale reactors up to a variety of pilot-scale test rigs. Although this approach provides a means of demonstrating the potential of a new technology at pilot scale, ultimate scaling of that technology to industrial practice is accomplished through the use of reacting computational-fluid-dynamics-based (CFD) combustion simulation tools. These simulation methods draw on expertise at the University of Utah and our strong interdisciplinary programs with the National Laboratories. Our strengths are in software engineering, computer visualization, solver frameworks and high performance computing, as well as a strong understanding of combustion principles and practice. The University of Utah faculty have been developing such simulation capability for over 20 years, and some of this combustion software has attained wide acceptance and applicability in the utility and other industries.

Our approach is to: use the experimental capabilities to study controlling mechanisms for various fuels with regard to pollutant emissions or key operational problems; develop theoretical models describing the controlling physics; incorporate these models into combustion simulations; validate the computational tool with experimental data over a range of experimental scales, and then apply the tool to practical combustion systems.

This poster will present a summary of selected capabilities at the University of Utah with regard to solid fuel combustion research (coal, biomass, & other opportunity fuels), and will present an overview of recent results in the particular areas of NOx control and trace metals vaporization.