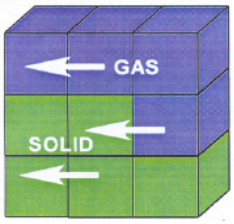
CONTINENTAL RESEARCH AND ENGINEERING, LLC

COMPUTATIONAL DESIGN AND ANALYSIS

The experienced team of engineers and scientists at Continental Research and Engineering (CR&E) utilize computational tools to design complex chemical processes, investigate unique reaction phenomena and perform detailed analysis to optimize plant operations.

The Research and Development Group is expert in process analysis, development and optimization. This includes detailed system modeling incorporating reaction thermodynamics and kinetics. Reactor designs and system configurations are produced for a wide range of processes operating under varying constraints.

For the destruction of chemical weapons, time dependent mass and energy balances have been developed for several plants utilizing CR&E's proprietary Peak Vaporization Rate Model. This model enables a precise determination of the time required to entirely vaporize chemical agents contained in a number of different projectiles. CR&E has refined this model for specific furnace and projectile configuration to account for variability in heat transfer due primarily to differences in radiation view factors. This model is used as the starting point to design increasingly complex thermochemical systems with optimized processing rates.



Computational Fluid Dynamics (CFD) modeling is also used to study a variety of problems incorporating complex geometries involving fluid, heat and mass transfer with great accuracy. CFD is utilized in a number of ways and can provide valuable information such as system temperature profiles, gas flow rates and flow patterns. Very specific process problems can be addressed using this technique. For example, CR&E has studied gas flow within a rotating kiln and simulated the effects of transient phenomena such as explosions within an otherwise static system. Coal or raw material erosion from stock yard piles has been examined for power plants. Our team is especially noted for the ability to tackle very difficult reactor design problems in a timely and efficient manner.

CFD is also utilized in the plant design process to examine various issues without the necessity of building a prototype or pilot plant. This is especially valuable in eliminating unwanted "surprises" in the operating plant, particularly in the start-up phase. This also can provide a substantial cost savings in studying potential engineering design modifications to existing equipment prior to the actual implementation. For example, CR&E utilized CDF to examine alternatives for altering airflow within baghouse ductwork in an existing plant. This work resulted in a simple, inexpensive design modification resulting in increased system processing rates.

Computational Design and Analysis Capabilities:

Process Development
Process Modeling
Computational Fluid Dynamics Modeling
Thermodynamic and Kinetic Analysis
Mass and Energy Balances
Peak Vaporization Rate Model

Selected Projects:

- Gas Velocity and Computational Fluid Dynamics Modeling for processing VX landmines, Raytheon, *Johnston Island*
- Surrogate mixture peak vaporization curves, Westinghouse-Anniston, Anniston, AL; Vaporization models for 4.2 inch mortars, 155mm HD rounds, 155mm and 8 inch VX rounds, Raytheon, *Johnston Island*
- Computational Fluid Dynamics modeling for processing secondary wastes, Raytheon, *Johnston Island*
- Mass and Energy Balances and Computational Fluid Dynamics Modeling for Charcoal Micronization System, Raytheon, *Johnston Island*
- Mass and Energy Balances for Waste to Energy Conversion Process
- Vaporization rate model, kinetic and thermodynamic analysis to support plant design, SAIC, *Pueblo, Colorado*
- Vaporization model MPF 4.2 inch mortars, 155mm HD rounds, 155mm and 8 inch VX rounds, Raytheon, *Johnston Island*
- Mass and Energy Balances for Charcoal Micronization System addition to the DFS, Raytheon, *Johnston Island*
- Computational Fluid Dynamics modeling for increasing metal, concrete and sandwich panel feed to the MPF, Raytheon, *Johnston Island*

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