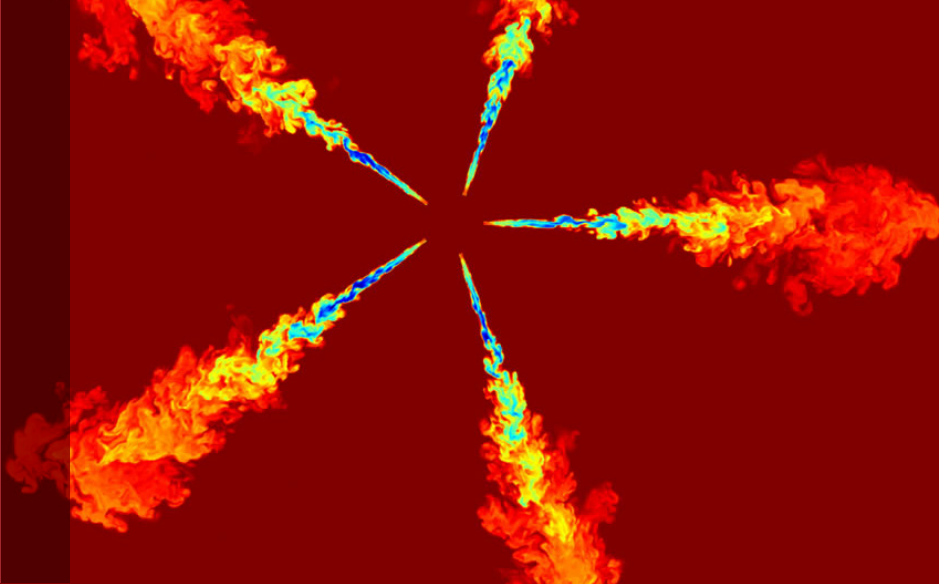


CATERPILLAR AND CUMMINS GAIN EDGE THROUGH COMPUTER MODELING AND ANALYSIS



The random nature of fuel spray leads to significant cycle-to-cycle variations in engines. High-resolution computer simulations conducted on Argonne's massively powerful supercomputers depict the flow structures that occur during fuel injection. Note the differences in individual fuel spray plumes.

By collaborating with Argonne and software developer Convergent Science, Inc., heavy equipment manufacturing giants Caterpillar and Cummins gained access to cutting-edge computer modeling and analysis tools and expertise that allowed them to achieve major advances in fuel economy and reduce development costs and time-to-market for engines.

Argonne, through its Virtual Engine Research Institute and Fuels Initiative (VERIFI), has developed engine models and software for large-scale computer simulations that provide – in virtual space, before costly physical production ever begins – a better understanding of how internal combustion engine parameters interact.

As part of a Cooperative Research and Development Agreement (CRADA), Caterpillar, Argonne and Convergent Science, Inc., conducted simulations of the Caterpillar C15 engine to identify the bottlenecks and gaps for engine simulations on high-performance computing platforms. Such simulations reduce the time and cost of the design cycle for new engines, allow the rapid adaptation of fuels from new sources, and lead to substantial increases in fuel economy while meeting future emissions standards.

As part of another CRADA, Cummins, Argonne and Convergent Science, Inc., conducted simulations on Cummins engine products, focusing specifically on the fluid dynamics of fuel injectors. Argonne's fuel spray modeling capabilities and

Results

- Significantly reduces the number of experimental test campaigns
- Shrinks development timescales
- Lowers the cost of development

advanced load-balancing algorithm technologies: allow for more reliable analytical calculations; lower dependence on experimental engines and prototypes; and accelerate new engine concepts and design to market.

VERIFI's products have won a prestigious Federal Lab Consortium (FLC) Award as well as an HPC (High-Performance Computing) Innovation Excellence Award.

To learn more about partnering with Argonne to solve your business R&D challenges: email partners@anl.gov phone **800-627-2596** or visit www.anl.gov/technology/technology-development-and-commercialization