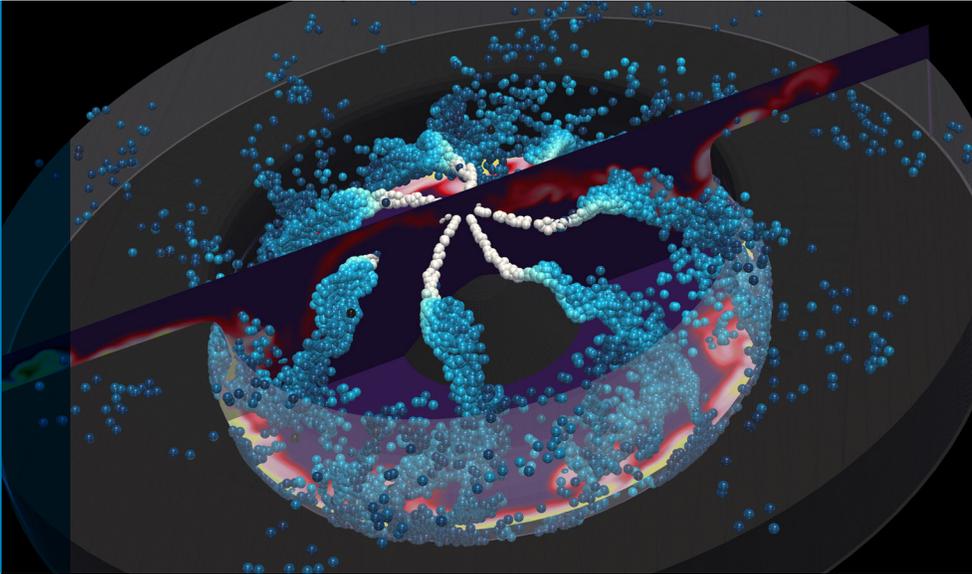**Argonne**
NATIONAL LABORATORY

VERIFI OPTIMIZES COMBUSTION

Argonne's Virtual Engine Research Institute and Fuels Initiative delivers high-fidelity results fast

VERIFI DELIVERS

☐ Unprecedented,

☐ High-fidelity/high-throughput,

☐ End-to-end,

☐ Combustion engine simulations and visualizations for design optimization,

☐ *With* uncertainty analysis.

This simulation captures fuel distribution inside the combustion chamber of a diesel engine being operated with gasoline fuel. High-fidelity 3D simulations provide unique insights into the fuel-air mixing process, which has enabled VERIFI to develop this combustion mode. The simulation was carried out on Mira using the computational fluid dynamics software CONVERGE.

UNIQUE EXPERTISE AND RESOURCES

Argonne's Virtual Engine Research Institute and Fuels Initiative (VERIFI) has the expertise and resources to deliver the results you need – including a multidisciplinary team of experts in high-performance computing (HPC), fuel chemistry, combustion science and engine performance; some of the world's fastest supercomputers; most diverse engine labs; and world's brightest X-ray beams.

Since VERIFI's inception, Argonne researchers have successfully engaged with more than a dozen companies and provided them with HPC solutions that include:

☐ Creation of detailed engine simulation models

☐ High-fidelity computation and visualization

☐ Validation of simulation models

Detailed Simulation Models

Argonne's theoretical and experimental combustion chemists build chemical kinetic models from first principles. High-fidelity two-phase flow and combustion models enable VERIFI researchers to address relevant physics questions. Researchers incorporate the resulting physical and chemical models into computer simulations to predict and optimize the performance of combustion engines.

High-Fidelity Computation and Visualization

Argonne's computational fluid dynamics experts – together with computational scientists – are dedicated to accelerating scientific and engineering breakthroughs. The Argonne Leadership Computing Facility (ALCF) is home to unparalleled computing resources.

ALCF scientists improve the speed and throughput of engine simulations on Mira.

Validation of Simulation Models

Using tools such as the Advanced Photon Source and shock tube, flow reactor, and rapid compression machines, VERIFI researchers are uniquely able to see what is happening in fuel sprays, combustion, and emissions, and apply that knowledge to engine simulations. From there, engine researchers can regulate highly configurable test engines at Argonne's Center for Transportation Research facilities to validate simulation results against precise measurements, under a range of well-controlled operating conditions.

CONTACT

Sibendu Som
Lead Computational Scientist
Phone: 630-252-5273
E-mail: ssom@anl.gov
http://verifi.anl.gov