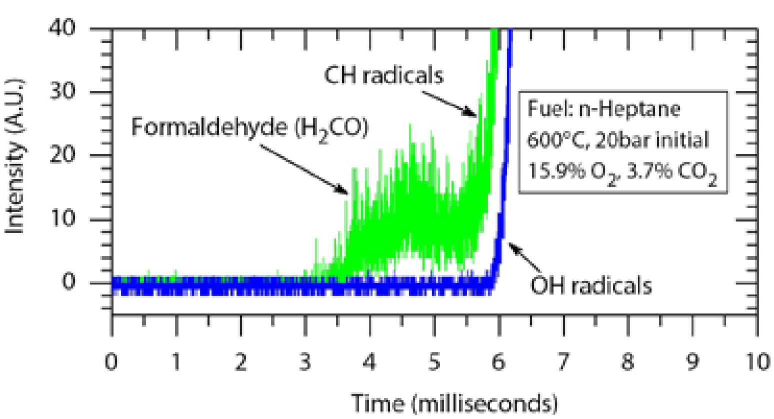
University of Michigan uses PAC's Herzog CID 510 for Engine Simulations

PAC' s Herzog Cetane Ignition Delay 510 (CID 510) was used in a research project at the University of Michigan Walter E. Lay Auto Lab, led by Professor Andre Boehman. Professor Boehman's federally funded study is intended to support development of high efficiency (55% brake thermal efficiency) diesel engines for Class 8 trucks ("supertrucks"). The work combined numerical simulation and in situ photography of combustion in the CID 510 to explore the response of different fuel blends to compression ignition.

The Michigan team has a strong interest in high speed photography and chemiluminescence in combustion engines. Boehman then explains, "We can also detect different wavelengths of light in the chamber to see natural chemical luminescence. We do this under conventional combustion conditions with air, and now also nitrogen, oxygen, and carbon dioxide for dilute combustion."

Professor Boehman explains that his team chose the Cetane Ignition Delay 510 for its powerful user interface. The CID 510 measures different testing conditions. It is easy for the user to change injection time, injection pressure, chamber pressure, and temperature all on the intuitive touch-screen. He goes on to explain, "The CID 510 is just a step away from a live engine because it is using a modern electronically controlled high-pressure injection system. We found the CID's



Natural chemiluminescence detection within the CID 510 during autoignition of n-heptane.

THE W. E. LAY AUTO LAB AT THE UNIVERSITY OF MICHIGAN

The Walter E. Lay Auto Lab has been a key component of UM's rich history of educational and research activities in automotive engineering. The University's proximity to the heart of the nation's auto industry in Detroit has made Automotive Engineering a natural focus for the Department of Mechanical Engineering. Research interests have included most areas of automotive engineering, from early studies on streamlining and engine heat balance to pivotal investigations on fuel efficiency and emissions. The Auto Lab houses a wide variety of engine and powertrain research facilities, including optically accessible engines and combustion experiments (like the CID 510), and test cells for battery performance, transient engine controls, fuels and emissions control research.

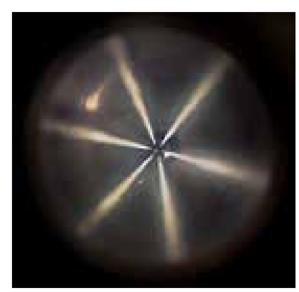
The focus of the MTC will allow researchers to test emerging concepts in connected and automated vehicles in both off-road and on-road settings.

results trended better with the Cetane Number measured by the traditional Cetane Rating Engine and has a higher data throughput than a flow reactor or shocktube. The CID is the perfect instrument for detailed comparisons between simulation and experiments, especially since we can look inside the Constant Volume Combustion Chamber (CVCC)."

Another advantage of using the CID 510 in their research is that the fluid mechanics and air exchange process is much simpler. One of Professor Boehman's students is studying the structure of spray model and ignition delays by running spray and ignition process experiments on the analyser, while another student working with Professor Daniel Haworth (Penn State University) is performing detailed numerical simulations of the spray and the ignition process. Boehman explains, "The structure of the CID 510 provides well controlled experiments that simulate the processes within a real engine."

THE HERZOG CID 510

Cetane Ignition Delay 510 provides for higher accuracy of Derived Cetane Number (DCN) for diesel fuels. It's fully automated design offers one button operation for simpler, easier use when calibrating the instrument, or when running a test sample. The CID 510 is equipped with a high-pressure injector for better combustion. This analyzer produces a much finer sample droplet size than other CVCC instruments. Due to the nearly perfect combustion of the CID 510, there is no soot formation in the chamber; thus leading to minimal or no cleaning of the instrument necessary.



CAD drawing of probe installation and photograph of n-heptane spray within the chamber of the CID 510