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# Reducing Flammability for Bakken Crude Oil for Train Transport

## Presentation Topic

Crude oil shipping by rail is critical to our energy security and has grown steadily with the Bakken oil boom. Existing rail infrastructure, however, is in a state of disrepair, as is evidenced by recent derailments. These incidents often lead to large oil spills which when in contact with hot surfaces results in devastating fires. This research proposal considers a solution to improve fire safety during transportation by adding long chain polymers to crude oil before shipping. In the first 3 years, mixtures of pure organic compounds, which serve to mimic the splashing and combustion characteristics of Bakken crude, were identified and tested. Then, an experimental study of the ignition, combustion and flame characteristics was carried out. It was found petro-diesel and biodiesel fuels could be used as surrogates for crude oil. Following that, experiments were conducted to examine the performance of nanoadditives in renewable jet fuel derived from soy oil-canola oil feedstock. In Year 4, experiments and computational modeling will be performed to study the splashing and mist formation for droplets on flat surfaces at various conditions. Year 5 will focus on completion of the simulations, with the key objective being the optimization of an additive and transferring this knowledge to industry for implementation.

## About the Speakers



**Dr. Albert Ratner** is a professor of Mechanical Engineering at the University of Iowa. Professor Ratner received a B.S. from the California Institute of Technology (Caltech) in 1995 and a Ph.D. in 2000 from the University of Michigan. From 2000 to 2003 he was back at Caltech as a Post-Doctoral Scholar.

Since 2003, Professor Ratner has headed the Combustion and High Speed Fluid Mechanics Laboratory. Prof. Ratner has taught invited courses in at Tsinghua University and Shanghai Jiao Tong University in China and at the Federal University of Brazil in Itajuba, Brazil. In the last 20 years, he has published or presented over 100 scientific papers on topics including combustion instability, laser diagnostics, droplet and spray behavior, and biomass gasification and combustion. Prof. Ratner is also co-inventor on 1 issued and 3 pending patents. Prof. Ratner is a Fellow of ASME, a Senior Member of AIAA, and a member of the executive committee of the Central US States Section of the Combustion Institute. He is also a Topic Editor for the journal Processes, a reviewer for a range of technical journals, and a referee for various national and international research funding organizations. Dr. Ratner is a member of ASME, AIAA, and the executive committee of the Combustion Institute, as well as an editor and reviewer for a range of technical journals and referee for various research funding organizations.



**Mr. Sazzad Parveg** is a graduate research assistant in the **Ratner Research Group**. Mr. Parveg is pursuing a Ph.D. in mechanical engineering, and his current research work is focused on droplet combustion and splashing behavior of fuel. He has earned a B.S. of Mechanical Engineering from the Bangladesh University of Engineering and Technology.

## Join us via livestream:

**December 8, 2020  
2:00 PM Central Time**

After registering, you will receive a confirmation email containing information about joining the meeting.

**Register in advance for this meeting:**  
<https://unl.zoom.us/j/602862020>

