Weekly CEAFM Seminar: Spring 2016

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, March 4, 2016**

Time: 11:00 AM

Location: Gilman Hall # 50

Speaker: **Dr. Claudio Filippone** (Thermadynamics Rail, LLC)

Title: ***"Waste Heat Recovery Systems to Reduce Internal Combustion Engine Fuel Consumption and Pollutant Emissions"***

Abstract

ThermaDynamics Rail (TDR) developed technologies to recover part of the otherwise wasted high- and low- temperature heat energy represented by Internal Combustion Engines (ICEs) exhaust gases and cooling fluids, and convert this energy into electrical energy. Technical and economic feasibility analyses of energy recovery and conversion technologies optimized for ICEs applications indicated that fuel consumption and pollutant emissions can be reduced by 10% - 20%. TDR performed tests on ICEs with power ratings from 250kW to 5MW and verified that fuel savings and pollutant emissions reduction can be cost-effectively achieved by non-invasively retrofitting the ICE exhaust gas piping system with high-pressure heat exchangers. These heat exchangers are matched and coupled to high-efficiency power conversion units for the final conversion of captured waste thermal energy into conditioned electrical power. Testing activities included retrofitting large diesel-engines and utilized TDR designed and operated advanced ICE simulator. The advanced ICE simulator comprises an extended combustion chamber to generate exhaust gases with thermodynamic properties comparable to those encountered in various types of ICEs with different power ratings. Additionally, the advanced ICE simulator enables prolonged testing of waste heat recovery components, while providing validation data to support the optimization of thermodynamic codes to more accurately project waste heat recovery and pollutant reduction performance under various ICE duty cycles. Adopting waste heat recovery and conversion technologies improves capital operating efficiency, protects the environment and the public by reducing toxic and thermal emissions, and promotes energy independence.