Diesel Engine Cylinder Deactivation to Achieve Fuel-Efficient Emissions Reduction from Medium/Heavy-Duty Vehicles

Abstract:
Modern on-highway heavy-duty diesel engine systems are subject to stringent tailpipe-out emission regulations to reduce their footprint on air pollution and global warming. A complex exhaust aftertreatment system is required in heavy-duty trucks to meet these regulations. Diesel engine aftertreatment components need to be operated in a certain elevated temperature range to ensure efficient reduction of engine-out emissions. This is typically achieved by employing fuel consuming strategies on the engine, including late injections and turbine-based exhaust throttling, that increase engine-outlet temperatures and flow rates to warm up the aftertreatment and maintain elevated temperatures. Diesel engine cylinder deactivation (CDA) can be used to maintain elevated aftertreatment temperatures in a more fuel-efficient manner through reductions in airflow and pumping work. CDA has been studied to show a better tradeoff between fuel consumption and engine-outlet temperatures, achieving up to 70 deg C higher engine-outlet temperatures at fuel-neutral conditions and up to 25% reduction in fuel consumption at similar engine-outlet temperatures, during steady state idle and low load operating conditions. Incorporation of CDA to maintain desired aftertreatment temperatures during idle and low load engine operation over the heavy-duty drive cycle has shown up to 3.4% fuel savings at similar predicted tailpipe-out NOx levels. Additionally, fuel savings of 5.6% is predicted over the Orange County Bus Cycle and a 35% reduction is predicted over the port drayage creep cycle.

Bio:
Dheeraj Gosala is a 4th year Ph.D. student, working with Prof. Greg Shaver on reducing the fuel consumption and emissions from heavy-duty diesel engines. Dheeraj has been involved in various IC engine related projects in the past, including participation in the formula racecar competition, and graduated from IIT Madras, India, with B.Tech. (Hons.) in Mechanical Engineering in 2014.

Faculty Hosts: Professors Luciano Castillo, Thomas Siegmund and Jay Gore. PIZZA will be provided!