

# ABSTRACT

Substantial improvements in engine fuel efficiency, torque and reduction of emissions are available with camless actuation capable of continuous control of engine valve lift, duration and timing. A phenomenological model has been developed for an unthrottled operation that is key to efficiency gain. An adaptive nonlinear controller has been designed to coordinate intake valve lift and duration by using high sampling rate intake manifold pressure and flow sensors. The driver torque demand is satisfied, while pumping losses are minimized. Simulation results for a 4 cylinder 2.0 L engine demonstrate event-to-event tracking and cylinder-to-cylinder balancing. The controller corrects for variations in effective flow areas (e.g. valve deposits), induction ram effects, and temperature.