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Experimental Evaluation of a Method for Turbocharging Four-Stroke, Single Cylinder, Internal Combustion Engines MICHAEL BUCHMAN, MIT graduate student, AMOS WINTER V., MIT Professor — Turbocharging an engine increases specific power, improves fuel economy, reduces emissions, and lowers cost compared to a naturally aspirated engine of the same power output. These advantages make turbocharging commonplace for multi-cylinder engines. Single cylinder engineers are not commonly turbocharged due to the phase lag between the exhaust stroke, which powers the turbocharger, and the intake stroke, when air is pumped into the engine. Our proposed method of turbocharging single cylinder engines is to add an "air capacitor" to the intake manifold, an additional volume that acts as a buffer to store compressed air between the exhaust and intake strokes, and smooth out the pressure pulses from the turbocharger. This talk presents experimental results from a single cylinder, turbocharged diesel engine fit with various sized air capacitors. Power output from the engine was measured using a dynamometer made from a generator, with the electrical power dissipated with resistive heating elements. We found that intake air density increases with capacitor size as theoretically predicted, ranging from 40 to 60 percent depending on heat transfer. Our experiment was able to produce 29 percent more power compared to using natural aspiration. These results validated that an air capacitor and turbocharger may be a simple, cost effective means of increasing the power density of single cylinder engines.

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