

DESIGN AND DEVELOPMENT OF E-TURBO™ FOR SPORT UTILITY VEHICLE AND LIGHT-TRUCK APPLICATIONS

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ABSTRACT

The purpose of the project is to develop an electrically assisted turbocharger, e-Turbo™, for application to the sport utility vehicle (SUV) and light truck class of passenger vehicles. Earlier simulation work had shown the benefits of the e-Turbo™ system on increasing low-end torque and improving fuel economy. This paper will present further data to show that advanced turbocharging can enable diesel engine down-sizing of 10-30 percent with 6-17 percent improvement in fuel economy. This is in addition to the fuel economy benefit that a turbocharged diesel engine offers over conventional gasoline engines. In this downsizing scenario, e-Turbo™ is necessary to recover acceptable driving characteristics with downsized diesel engines.

As a first step towards the development of this technology for SUV/light truck sized diesel engines (4-6 L displacement), design concepts and hardware were evaluated for a smaller engine (2 L

displacement). This strategy was chosen to minimize design and development issues and then prove the concept in bench testing and small engine testing. Following small engine success, the concept could be applied to a large V-engine (one on each bank) to prove target performance characteristics. After successful demonstration of concept and performance, large turbomachinery could be designed and built specifically for larger SUV-sized diesel engines. This paper presents the results of development of e-Turbo for a 2 L diesel engine.

A detailed evaluation of motor-generator and turbocharger requirements and designs has been performed, including comparison of different motor-generator technologies and different motor-generator/turbocharger integration schemes. Detailed analysis and bench testing have been performed to confirm basic design concepts and will be used to finalize product design for engine testing.