

# Engine and Auxiliary Systems

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Edited by  
Prof. Dr. A.K.M. Mohiuddin



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# **Engine and Auxiliary Systems**

*Edited by Prof. Dr. A.K.M. Mohiuddin*



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Exhaust system optimization using GT- Power

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**Abstract**

The exhaust system consists of the exhaust manifold, the header, the catalytic converter, the muffler, and the tailpipe. Certain flow characteristics must be met for the optimal performance of the exhaust system. The main objective of this chapter is to design exhaust system (particularly the exhaust manifold) using GT-Power software and to optimize its performance.

*Keywords:* exhaust system, optimization, GT-Power, exhaust manifold, catalytic converter.

**Introduction**

A well designed exhaust system is one of the cheapest ways of increasing engine efficiency, and therefore increasing engine power. In a four stroke cycle engine, only one stroke out of the four does useful work which is the power stroke. The other three strokes which are intake, compression and exhaust will absorb some of the power that was produced during the power stroke. If the amount of power that is lost by these idle strokes can be minimized, more power will be available to drive the wheels, which is what the engine is supposed to be doing (Ganesan, 2004).

It is clear that there are real gains if the exhaust gasses are effectively removed from the combustion chamber. The pipe configurations and/or size will cause back pressure in many applications. Moreover, smoothly bent pipes, relatively free flowing mufflers, headers, and a balance pipe will result in a more efficient exhaust system and thus ensure greater performance. A well designed exhaust system can even 'draw' the gasses out of the chamber, using the momentum of the gas travelling down the pipe to suck the residual gasses out of the combustion chamber. The gas travelling down the pipe creates an area of low pressure behind it. This not only purges the combustion chamber, but also draws more mixture into the chamber during the valve overlap period. So, instead of having high pressure exhaust gas popping into the inlet tracts, a partial vacuum inside the combustion chamber is available which pulls the fresh charge into the chamber when the intake valve opens.