

# THEORETICAL COMPARISON OF OTTO AND MILLER CYCLES WITH TURBOCHARGING

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## ABSTRACT

*The use of turbocharging systems in automotive engines has, as its main objective, the increase of the torque and power delivered by the engine. Recovering the energy released during the exhaust and increasing the intake pressure, some improvement of thermodynamic performance would be expected. However a price in terms of engine efficiency must be paid mainly due to the reduction of the compression ratio of the engine, imposed by the knock onset on SI engines.*

*The Miller cycle, is an over-expanded cycle, intakes a smaller quantity of mixture while maintaining the expansion stroke. The result is an improvement of the thermodynamic efficiency of the engine. The same engine working with a supercharging device may increase its power, keeping the efficiency at a high level.*

*The equations for a supercharged Otto cycle and over-expanded cycle (Miller cycle) are developed in this paper, so that both cycles can be compared. The cycles are also analyzed considering that the supercharging is only given by turbocharging, in order to understand the best working point for maximum efficiency. Supercharging limits are defined for the Miller cycle depending on the expansion ratio.*

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