

# The Tuning Of A Small Four-Stroke Spark Ignition Engine For Flexible Valve Timings Through Numerical Approach

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## **Abstract**

Variable valve timing has been implemented by various manufacturers to improve internal combustion engine performance while operating at wide speed and load ranges. A novel flexible valve timing system for a small four-stroke engine is currently under development by Automotive Engineering Research Group (AERG) in Universiti Malaysia Pahang (UMP). In this paper, a comprehensive intake and exhaust tuning for the flexible variable valve timing is presented. A numerical assessment has been conducted to the engine in a one dimensional engine simulation using validated simulation model. There are eight valve timing configurations investigated for the tuning for three speed regions. The simulation shows a positive and significant impact to the engine performance in three approaches; namely late intake valve closing, early intake valve closing and late exhaust valve closing. These approaches sufficiently covered the whole range of engine speeds..

**Keyword** – Four-Stroke; Flexible Valve; Performance