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Application of Low-Cost Transducers for Indirect In-Cylinder Pressure Measurements

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ABSTRACT - The aim of this work is to present the results achieved in the evaluation of combustion metrics using low-cost sensors for the indirect measurement of cylinder pressure. The developed transducers are piezoelectric rings placed under the spark plugs. Tests were carried out on three different engines running in various speed and load conditions. The article shows the characteristics of the signals generated by the piezo-ring sensors, compared to those coming from laboratory-grade pressure transducers: Focus is to assess the achievable accuracy in the determination of frequently used combustion metrics, such as those related to knock intensity (Maximum Amplitude of Pressure Oscillations, MAPO), combustion phasing (MFB10, MFB50, ...), and peak pressure. Despite some issues related to the variation in sensitivity (temperature effect) to mechanical noise at high engine speeds and to signal deviation from the actual cylinder pressure trace in some portions of the engine cycle, the article shows that combustion metrics evaluated using low-cost sensors are meant to be used for combustion feedback control. © 2023 SAE International.

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