High-temperature solution for identification of in-cylinder pressure sensors in internal combustion engines

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In the automotive industry an accurate measurement of the in-cylinder pressure of internal combustion engines is crucial to combustion development. Piezoelectric sensors are used for this purpose, but their characteristics and aging must be consequently monitored in order to guaranty the required accuracy.

Indeed the sensors and especially their piezoelectric elements are submitted to hostile temperature and pressure conditions, which quickly modify the sensor characteristics, especially in terms of sensitivity. This means – in practice – that the amount of charge delivered by the piezoelectric element for a given in-cylinder pressure decreases with time.

The thermodynamic computations based on the in-cylinder pressure signal are highly complex, and a sensor inaccuracy of only a few percent leads to unacceptably low accuracy in the thermodynamic evaluations.

Sensor mounting on ICE is furthermore a science of its own, and sensors are not easily accessible or visible when mounted on an engine unless dismounted again. In order to keep track of sensor aging and reduce resulting inaccuracy, it is thus necessary to easily know which sensor is mounted on which engine and cylinder at any time without having to see or get close to the sensor.

The SAW technology offers here a very suitable and robust sensor identification solution, allowing easy identification from a remote piezoelectric amplifier integrating an SAW transponder. A reflecting surface installed in the sensor housing encodes an identification number that can be read via SAW from the signal amplifier, meaning easy remote tracking of the sensor and of its run-time or also of its temperature and load history. This sensor history allows definition of maintenance milestones, sensor aging checks and re-calibrations, and improves drastically the accuracy of the measurement chain.