COMBUSTION MEASUREMENT TECHNOLOGIES

GASOLINE MPFI ENGINES

INTAKE PORT SPRAY ENDOSCOPY

Mixture Formation for Optimum Combustion Stability and Emissions

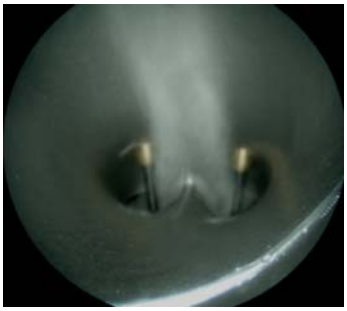
Task / Challenge

Higher than usual IMEP fluctuations in part load, insufficient transient response, soot emissions in transient operation. The root cause of insufficient mixture formation is identified with Visiolution spark plug sensors and flame pattern measurements – see also product description „Flame pattern“.
Chances to improve mixture formation include variations of spray targeting, injection timing and selection of injector variants to better match spray propagation to intake port dimensions.

Test Procedure

Injection is observed by means of port spray endoscopy. The manifold is prepared with one access hole to accept endoscope and illumination. Spray propagation, spray impingement on walls, wall film formation and interaction with airflow is recorded in degree crank angle sequences.

Spray blow back
by pulsating airflow



Perfect spray targeting
at open valve injection

Action: Adapt manifold to accept endoscope with spray illumination. Prepare for test variants: timing, injector selection, injection parameters, valve timing and boost pressure as applicable
Data: Digital film records with direct view onto spray propagation, interaction with walls and airflow. Software to enable side by side comparison of test variants on synchronized crank angle basis
Result: Identification of variants best suited to minimize fuel wall film formation, spray backflow, injector irregularities.

Benefit in Engine Development Process

- optimize injection to meet mixture formation criteria
- high dynamic response as a result of minimum fuel storage in wall films
- avoid sooting pool fire flames out of in cylinder fuel wall film combustion
- minimum transient soot and HC emissions

Technical Data

- applicable in NA and TC MPFI engines
- endoscope access via single hole in manifold to illuminate and inspect intake port area
- image timing derived from crank angle encoder
- image resolution up to 0.1 deg. CA
- Synch and Master / Slave operation with indicating system

Endoscope with side connector for illumination. Camera controlled via crank angle trigger.

Project Packages

- preparation of endoscope access in manifold
- measurement packages: per day
- documentation and recommendations per measurement variant
- aplications support for VisioScope users