

COMBUSTION MEASUREMENT TECHNOLOGIES

GASOLINE ENGINES MPFI AND DI

BASIC ENGINE DEVELOPMENT

OPTIMIZE ENGINE KNOCK LIMITS

Exploit WOT Operation for Power Density and Fuel Efficiency

Task / Challenge

WOT operation in both NA and TC engines is limited by knocking combustion. Competitive targets for power density, fuel efficiency and NVH require optimization of engine knock behavior.

Possible Root Causes

Knock limit improvements can be achieved via optimization of in-cylinder flow, engine cooling and mixture formation. In order to exploit the influence of each parameter, knowledge about the local distribution of knock centers provides essential guidelines in basic engine development and in calibration of combustion system actuators.

Test Procedure

Measurement and evaluation of knock centers at WOT engine operation by means of 8 and 40 channel VisioKnock sensors and optical signal recorder.
Supplementary measurement of flame kernel propagation for evaluation of flame propagation influence on knock location. See fact sheet on Flame kernel measurement.

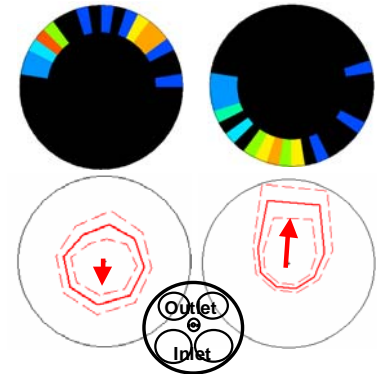


An example of flame kernel influence on knock center location: In-cylinder flow forces the flame either towards the inlet or the outlet side, knock centers respond to this flame kernel motion. Influence on flame kernel propagation is here achieved by cam phasing.

Action: Measurement of knock center distribution with VisioKnock and of flame kernel motion with VisioFlame

Data: Knock center statistics, flame kernel propagation

Result: Identification of key influence factors on knock location, recommendation for potential improvements



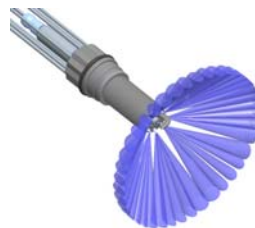
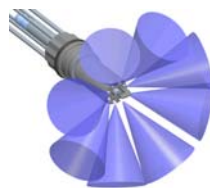
Benefit

- knock optimization under precise knowledge of local self ignition effects
- evaluation of flow influence: tumble, squish, cam phasing
- evaluation of local hot spots / cooling
- evaluation of spark plug depth position

Technical Data

- Visiolution spark plug sensor (8 to 40 optical channels) together with data recording system

8 channel sensor



40 channel sensor for high angular resolution

- „VisioKnock“ analysis software
- spark plug sensors applicable in any type of engine configuration on test bed and on chassis dyno
- NA and TC engines
- Synch and Master / Slave operation with indicating system
- flame Kernel measurement with VisioFlame sensor

Project Packages

- spark plug sensor procurement: 2 weeks on stock, 8 weeks standard types, 10 weeks non standard types
- measurement packages: per week
- documentation and recommendations per measurement variant
- on site AVL measurement service supporting customer engine development projects
- application package and expert support for Visiolution system users