

CURRENT TECHNOLOGICAL ADVANCEMENTS IN AUTOMOTIVE ENGINES

OBJECTIVES

To inform participants about the current technological advancements being made in the field of SI and Diesel automotive engines.

On completion of the course, participants will have a good understanding of the following areas:

- the operation of standard SI and Diesel engines
- the advantages of downsizing for SI engines
- the issues associated with and future developments of the Diesel engine
- the advanced combustion processes HCCI and CAI
- the variable valve actuation and its application to new combustion processes
- the principles and developments in forced induction systems.

COURSE CONTENT

SI ENGINE TECHNOLOGIES

0.75 day

Gasoline Direct Injection (GDI)

Advantages and disadvantages of GDI.

Operational strategies for various regimes (stoichiometric, stratified, ...).

System components - injectors, HP pump, regulator, fuel supply, power supply.

Examples of GDI systems.

Downsizing

Context, issues, motivation (efficiency improvements), problems to be overcome.

Specifications for forced induction systems, different intake boosting systems.

Turbochargers, positive displacement compressors.

Reasons for combining GDI and forced induction.

Management of engine knock.

Contribution of variable valve actuation to downsizing.

DIESEL ENGINE COMBUSTION AND TECHNOLOGIES

0.75 day

Context: emission standards present and future; specific power output evolution.

Swirl generation by cylinderhead inlet pipe design; variable swirl systems.

Fuel injection common-rail systems Bosch, Delphi, Siemens. Piezo injectors. Multi-injections.

Exhaust Gas Recirculation (EGR): high and low pressure.

Exhaust gas after-treatment: particulate filter, NOx trap, Selective Catalytic Reduction (SCR).

ADVANCED COMBUSTION PROCESSES

0.5 day

CAI (Controlled Auto Ignition)

Characteristics of CAI combustion.

Improvements in efficiency.

HCCI (Homogeneous Charge Compression Ignition)

Characteristics of HCCI combustion.

Improvements in NOx and particulate emissions.

VARIABLE VALVE ACTUATION (VVA)

0.25 day

Classical valve actuation: principles, limitations.

Variable valve actuation: advantages as compared to classical valve actuation, classification.

Current technologies: variable valve timing systems, 2 step systems (Honda VTEC, Porsche-INA variocam), continuous systems (BMW valvetronic), camless systems (FEV-Valeo).

FORCED INDUCTION

0.75 day

Role, limitations and dimensioning of intake boosting systems.

Development of forced induction technologies in relation to engine development.

Limitations of combustion pressure and temperature (downsizing), motivation for twin-scroll turbochargers.

Approaches for reducing turbo lag - ball bearings, electric assistance upon compressor start-up, positive displacement compressors.

Future developments. Variable turbine geometry (VTG), Twin-turbochargers (parallel and sequential), "e-Boosting".

▲ Who should attend?

Graduates engineers

involved in the design, development and testing of SI or Diesel engines and equipments, or automotive fuels.

▲ Duration

3 days

▲ Dates & Location

Non scheduled

May be organized for a single company

▲ Lecturers from

- ENSPM FI - IFP Training
- ENSPM/IFP
- INDUSTRY

Ref. **MOT / ETMA-E**