
pattakon
engineexpo


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Stuttgart Messe, Stuttgart, Germany
3141
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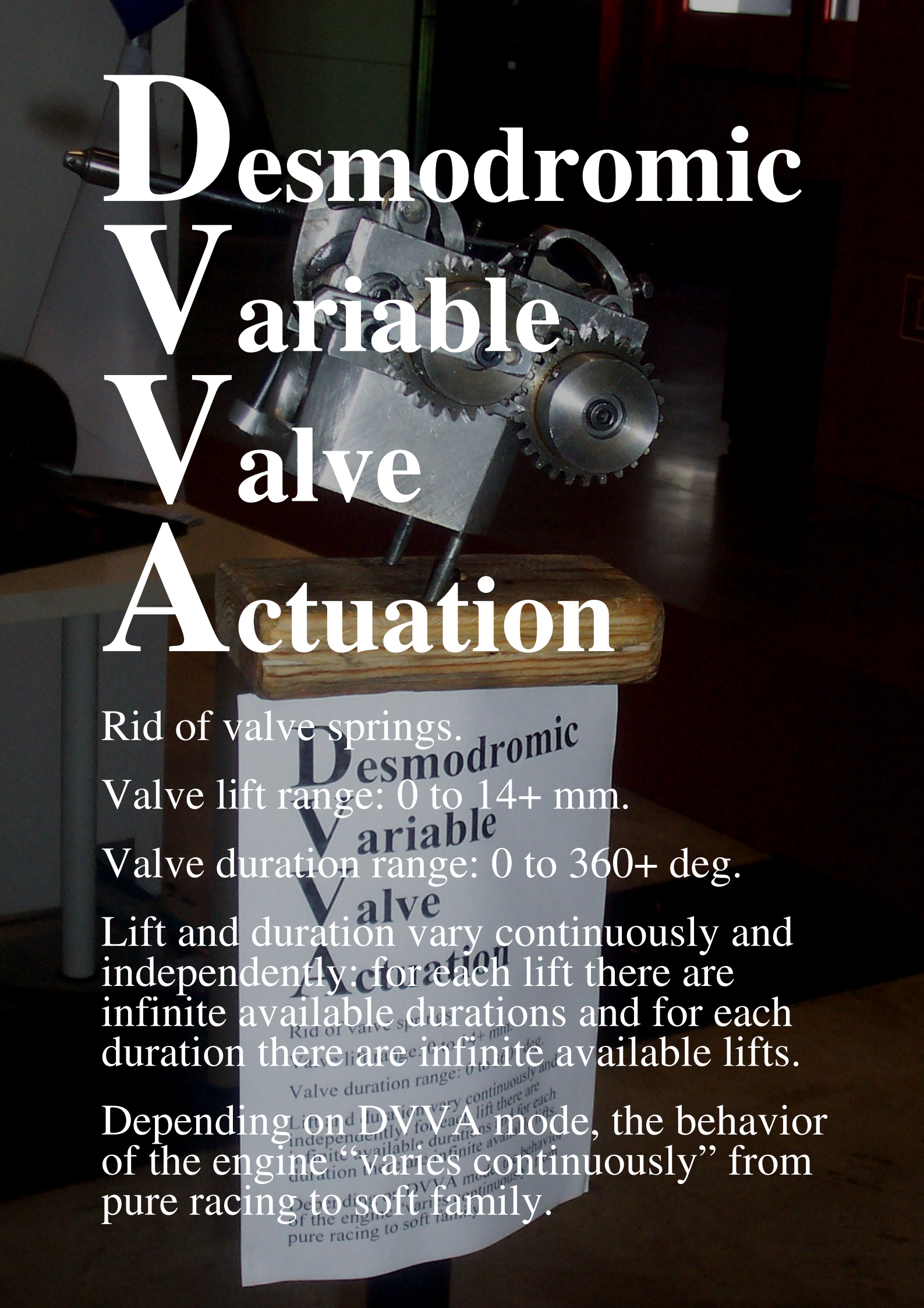
OPRE

Desmodromic Variable Valve Actuation



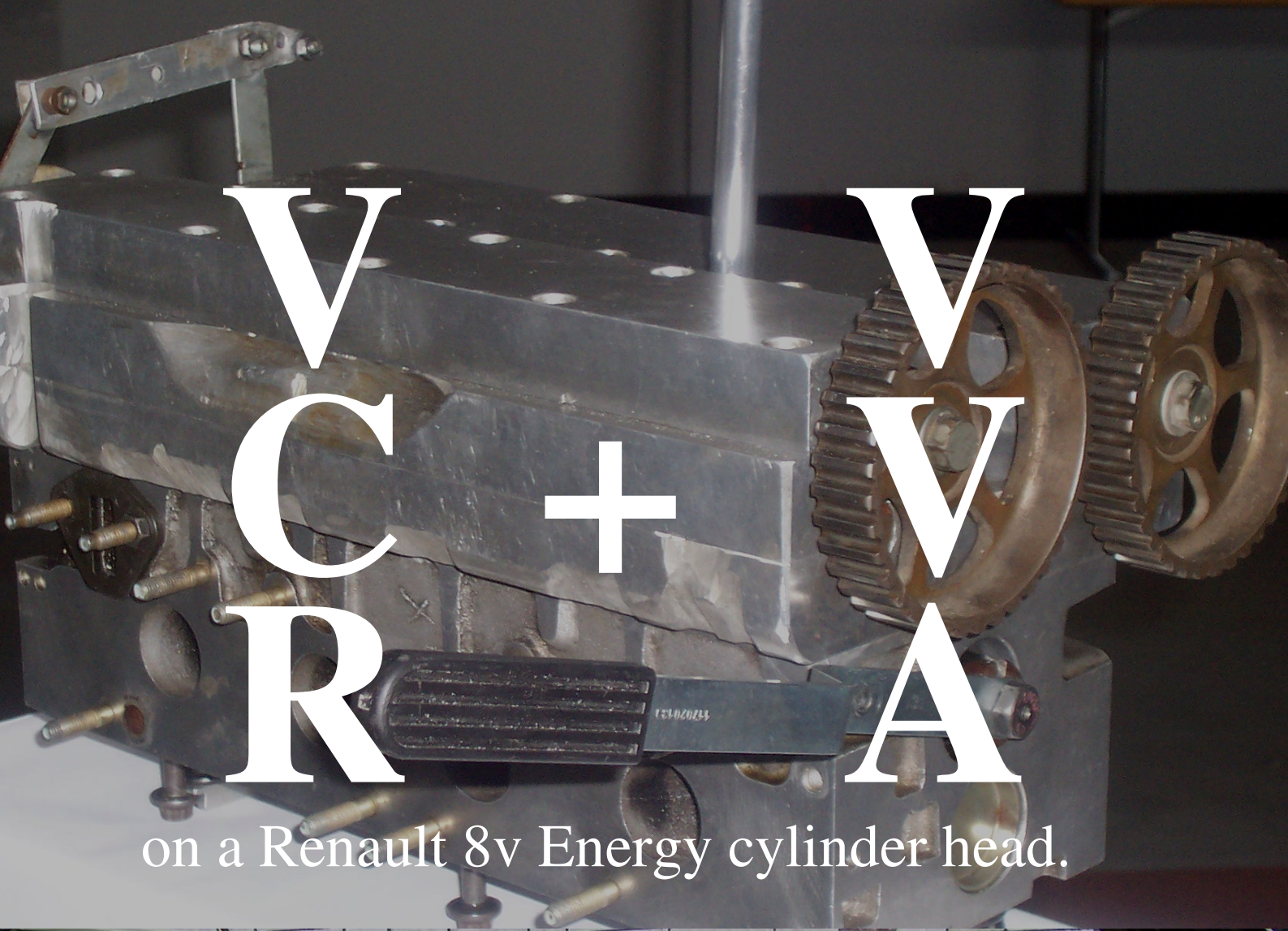
Rid of valve springs.

Valve lift range: 0 to 14+ mm.

Valve duration range: 0 to 360+ deg.

Lift and duration vary continuously and independently: for each lift there are infinite available durations and for each duration there are infinite available lifts.

Depending on DVVA mode, the behavior of the engine “varies continuously” from pure racing to soft family.



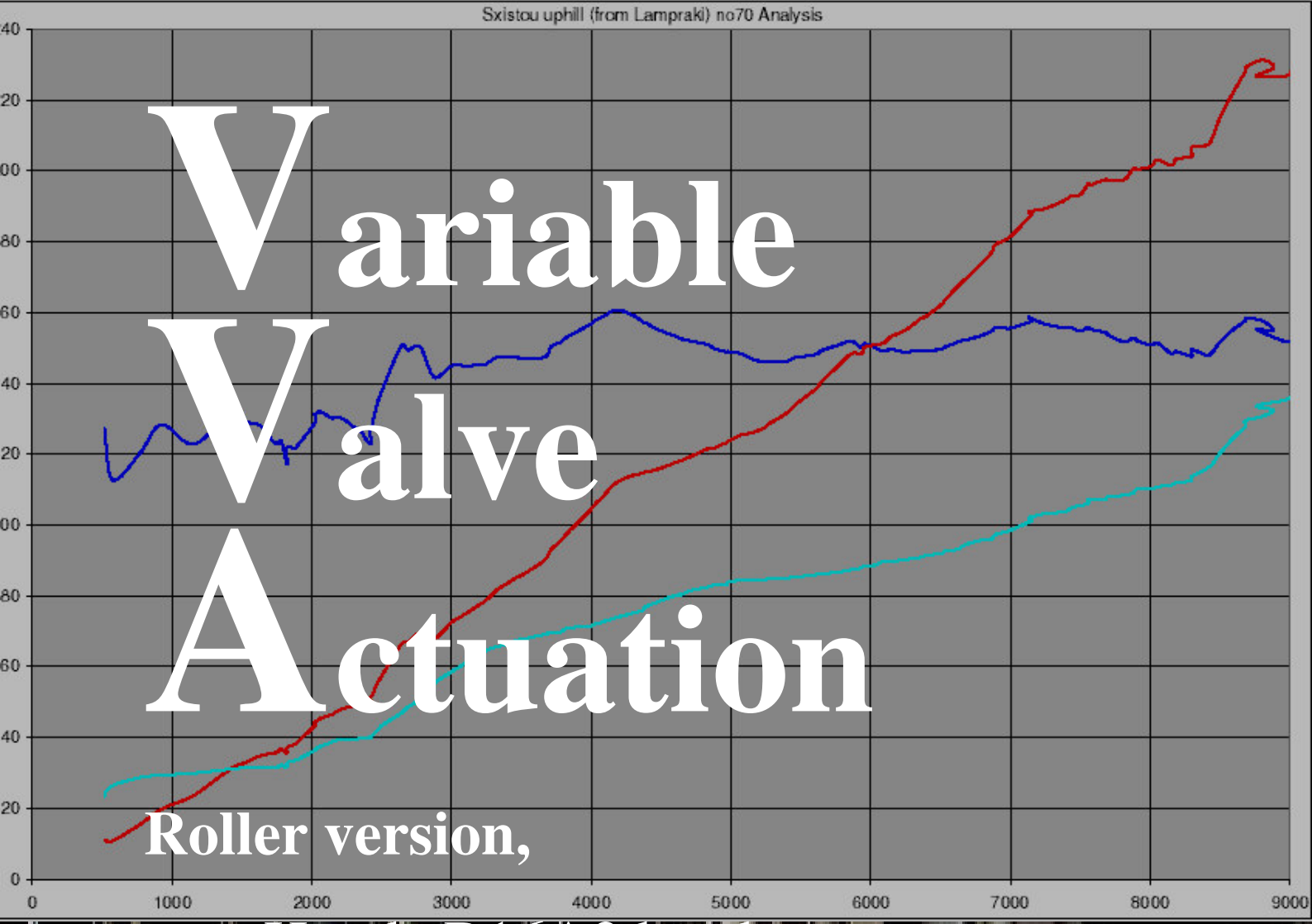
V C R + V V A

on a Renault 8v Energy cylinder head.

Variable Compression Ratio
Continuously from 7:1 to 20:1,
it leaves crankshaft, connecting rods and pistons untouched and avoids significant bending loads on engine casing.

Variable Valve Actuation, Rod version, controls all, intake and exhaust, valves.
This VVA has been used for many years, on public roads for normal driving and for many tests to the limit**.**

Pure mechanical.



Variable Valve Actuation

Roller version,

on a Honda B16A2 head,
controls all valves, intake and exhaust.

Continuously variable valve lift from 0.0 to 12.0+ mm. Pure mechanical: the gas cable just rotates the two control shafts.

“Rid of throttle valve”, with mechanical **IDLE VALVES**.

Tested for thousands of Km on public roads revving between 330 rpm (idling, 3 hours / litter of fuel) and 9,000 rpm (rev limiter). Flat torque curve.

Variable Valve Actuation

Rod-Roller version,
on a Peugeot-Citroen 1600cc, 16v head, controls the intake valves.

Continuously variable valve lift from 0.0 to 11.0+ mm.

Pure mechanical: the gas cable rotates the control shaft and changes the valve lift.

The revs and the signal from a TPS on the control shaft are the main parameters for the ECU in order to control the injection duration and the spark advance.

OPRE III

Opposed piston **P**ulling **R**od **E**ngine.

Direct Injection Diesel
Stroke 51+51=102mm
Bore 80mm (scavenge pump bore 90mm)
Capacity 512cc (pumping capacity 649cc)
Compression ratio 15:1
Built-in piston type scavenging pumps
Width 520mm

A **centrally located flywheel** receives the power from the two crankshafts by means of three spur gears and passes it, through the clutch, to the gearbox (4 gear ratios plus reverse and differential)

Combines 4-stroke lubrication with 2-stroke simplicity and power density.

40% longer piston dwell around CDC (combustion dead center) to shift peak power of di Diesels above 6000 rpm and to improve thermal efficiency of di engines.

OPRE II

Opposed piston **P**ulling **R**od **E**ngine.

Perfectly balanced Direct Injection Diesel
Stroke 50+50=100mm
Bore 80mm (scavenge pump bore 86mm)
Capacity 503cc (pumping capacity 581cc)
Compression ratio 17:1

Built-in piston type scavenging pumps
Width 505mm
Weight (flywheels excluded): 19Kg

Combines 4-stroke lubrication, oil consumption and emissions with 2-stroke simplicity, cost and power density

Half piston speed(for same combustion cylinder and same revs with conventional)

40% longer piston dwell around **CDC** (combustion dead center) to shift peak power of di Diesels above 6000 rpm and to improve thermal efficiency of di engines.

Independent Throttle Body

True free flow **ITB** (rid of throttle valves)

To achieve efficient and clean combustion at low revs, light load and during idling, it needs more accuracy than what any existing VVA can offer.

The other way is to use **idle valves** (or metering valves). It is the ideal application for electromagnets, as they have to activate small diameter (i.e. light) valves at a short stroke (say 3mm), exclusively at low revs (say less than 2000 rpm).

Despite the “throttle valve pumping loss”, the current VVA models of the largest automaker are based on a throttle valve for the idling and the low revs, light load operation.

pattakon at EngineExpo2009

The booth was in front of the Open Technology Forum where, besides the typical presentations, the “Engine of the year awards 2009” ceremony took place. Ten meters from the booth (back left at photo) was “resting” the original three-wheeler vehicle of Karl Benz.

In the booth there were prototypes tested to the limit and used for long at real conditions:

- A modified Honda B16A2 “VVA roller version” cylinder head.
- A modified Renault 1400cc VVA “rod version” cylinder head.
- A set of “idle valves” into the B16A2 VVAr cylinder head.
- True free-flow Independent Throttle Body (ITB) rid of throttle valves.

In the booth there were also working prototypes:

- OPRE III direct injection Diesel engine as part of a complete power unit comprising also a gearbox/differential.
- OPRE II with counter-rotating crankshafts.
- Citroen-Peugeot 1600cc 16v VVA “rod roller version” cylinder head, “ready to go”.

In the booth there were also “proof-of-concept” prototypes:

- A desmodromic VVA, rid of valve springs, with fully, continuously and independently variable valve lift and duration,
- A Variable Compression Ratio (VCR) mechanism integrated into a modified Renault VVA 1400cc 8v cylinder head.

After examining, touching and “playing” with the prototypes, the visitor had the animations and the “noisy” videos of the running engines to help him understand, before asking questions.

To see many visitors (including OEM experts) leaving the booth pleased, with a wide smile in their faces, was a reward.

Thank you