INSTITUT CARNOT
IFPEN Transports Energie

www.carnot-ifpen-te.fr

High-efficiency powertrains

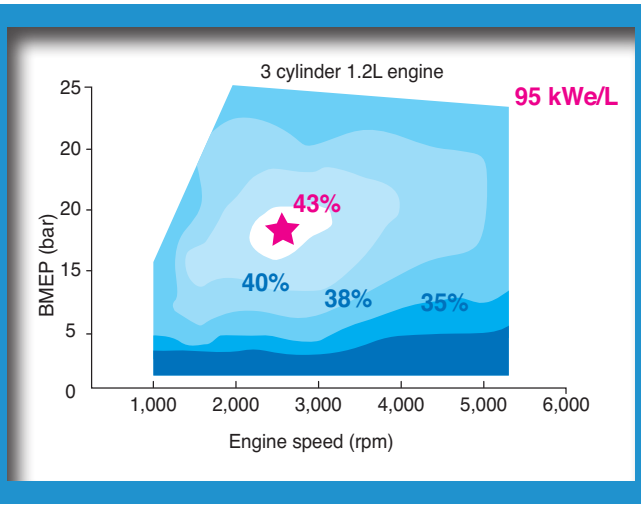
Next generation of fully lambda 1 Miller-Atkinson engines

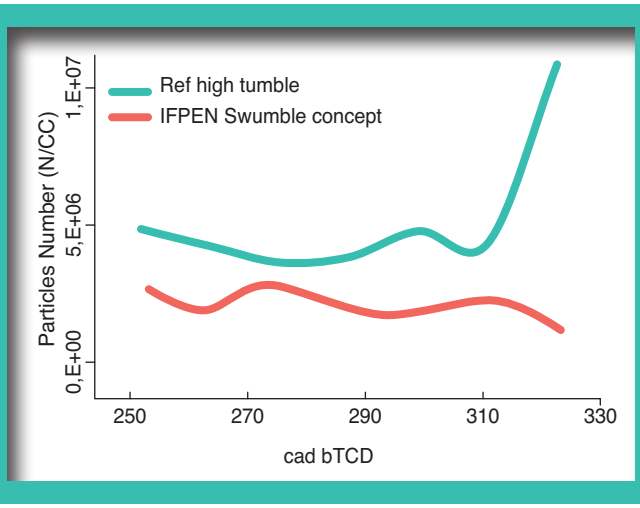
- New swumble design concept of gasoline engine
- Plug and play solution, ready to replace current tumble architectures
- Compatible with increasing compression ratios, higher than 13:1
- Achieving high efficiency, even for low-displacement engines

Reduction of the real-world fuel consumption

43% peak brake efficiency together with 95 kWe/L power output, and a large > 38% brake efficiency area with:

- CR 13:1 – Miller cycle 140°CA lift duration
- Use of IGR and EGR
- Use of VGT





Reduction of the emitted particulate mass and number

Very low particulate level due to the favorable interaction between air motion and injection

- Higher capability of increased injection phasing resulting in mixture homogenization improvement, and thus efficiency gain

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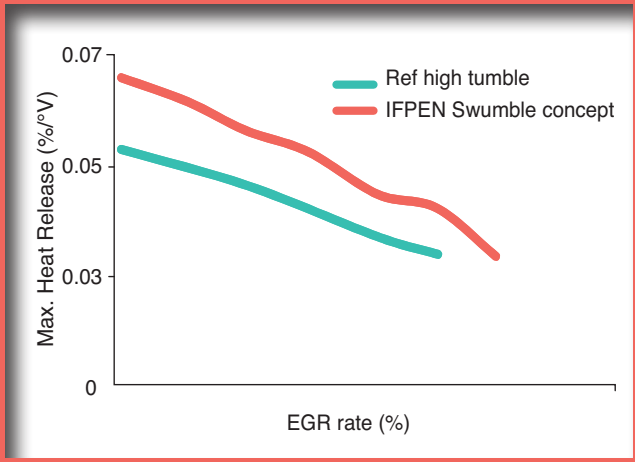
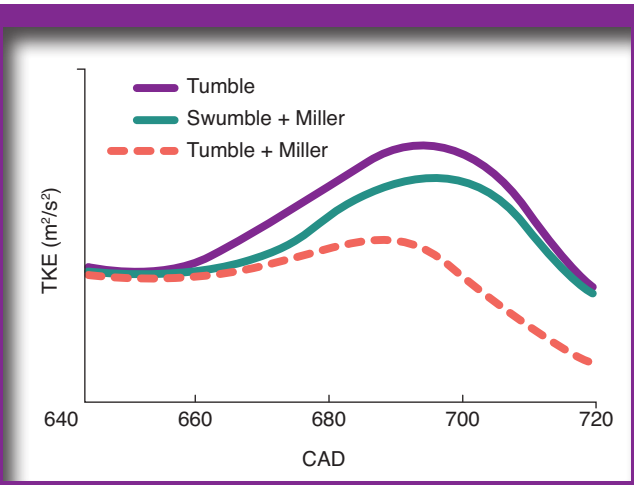
Greater capacity for dilution

Optimum turbulence production improves dilution capacity and Miller capability, thus enabling further fuel efficiency gains.





Native and highly turbulent aerodynamics

Real breakthrough in the area of gasoline engines, with significant gains compared to the tumble motion:

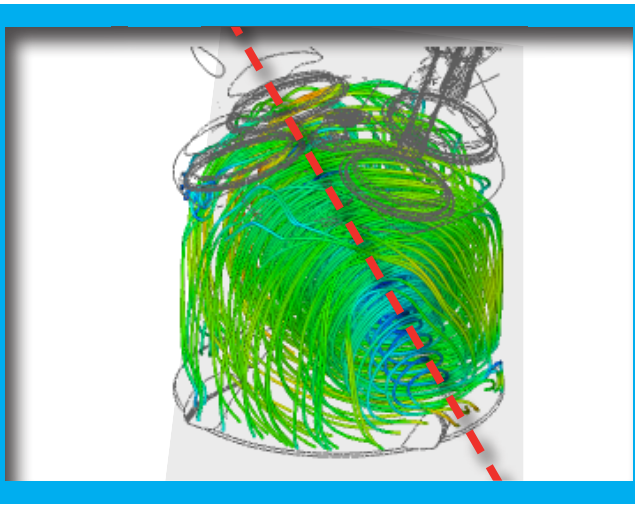
- Higher turbulent production with same in-cylinder flow velocity
- Better trade-off between turbulence and flow capacity

The larger the Miller ratio, the higher the benefits of the swumble concept.

One concept, compatible with multiple engine families

IFPEN is currently developing the swumble concept for both, two and four valves per cylinder architectures. Those different approaches permit to achieve high specific power output together with maximized efficiency:

- Increase specific power above 90 kW/l
- Improve efficiency beyond 43%



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