

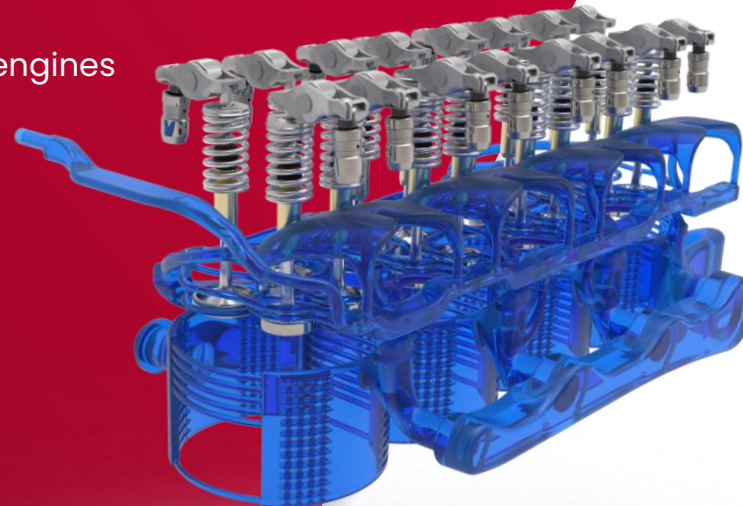
FEV Signature Solutions

Precision Arterial Cooling Concept

Enhance the efficiency and durability of your engines with our arterial cooling concept

FEV offers

- › Novel concept tailored for targeted cooling of local hot spots and providing a uniform temperature distribution around the combustion chamber in challenging package environments
- › Development for conventional cast as well as additively manufactured components, such as cylinder heads and crankcases
- › Designs specifically tailored for use in engines powered by alternative fuels, including hydrogen



Why FEV

- › **Proven expertise:** 45+ years of automotive engineering excellence, trusted by global OEMs and Tier-X suppliers to deliver innovative, production-ready solutions with deep domain expertise, e.g. in design as well as virtual and physical validation of powertrains from passenger car to large commercial applications
- › **Pioneer** in developing the largest ICE components specifically designed using the benefits of additive manufacturing
- › **Complete lifecycle support:** From concept to series maturity, including design, simulation, prototyping, testing, industrialization, and implementation
- › **Customer-centric solutions:** Transparent and customizable, enabling you to extend, integrate, and scale your own development

Reference project FEV propulsion LeiMot

FUNDED RESEARCH PROJECT

Development of a lightweight aluminum passenger car cylinder head and crankcase for additive manufacturing with our novel arterial cooling concept included

FEV involvement

- Head of the project consortium
- Definition of the overall concept
- Design of the cylinder head and crankcase including bedplate
- Validation of the manufactured prototypes on the engine test-bench

Mass reduction

Crankcase and cylinder head with 20 to 30% lower mass compared to reference components from series production

Cooling design

Cooling channel concept reduces the max. flame deck temperature at rated power by 40 °C with 40% lower coolant flow rate compared to the reference engine



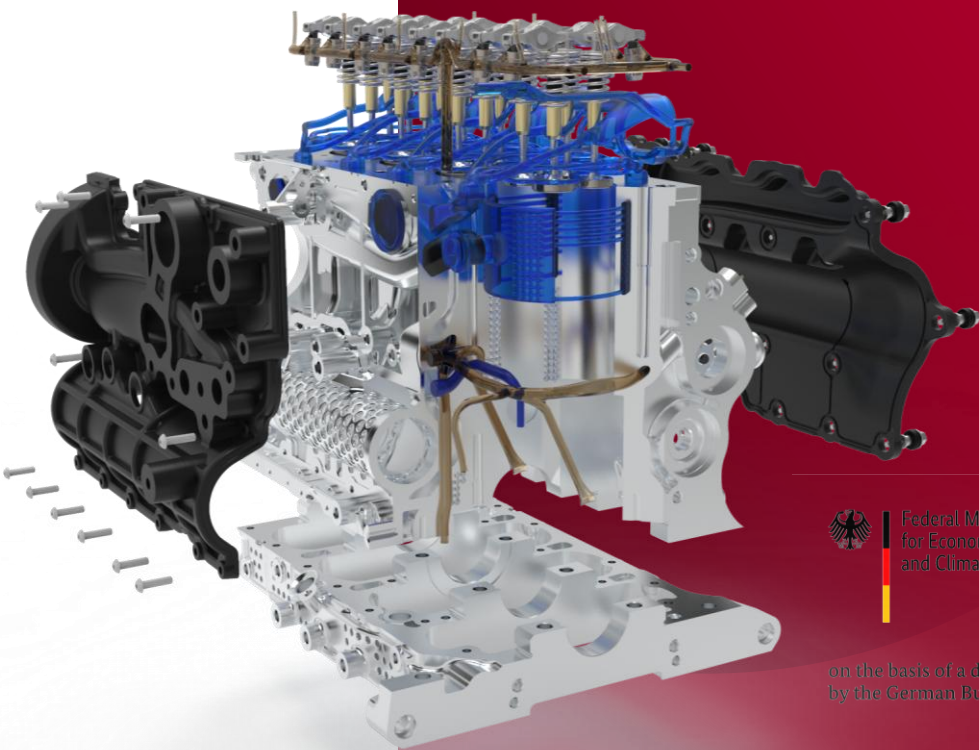
Exhaust Channel
Thermomanagement
DE102020003393A1

Related Patent Applications

Cylinder Head
Cooling Channel
DE102020003394A1

Cylinder Bore
Cooling
DE102020006256A1

Lightweight
Cylinder Head
DE102023001162A1



Reference project FEV propulsion

Arterial cooling for a CV hydrogen combustion engine

PUBLISHED IN MTZ WORLDWIDE (VOLUME 84, 2023)

Development of a commercial vehicle cylinder head designed for hydrogen combustion with an artery cooling concept to reduce the temperature at the flame deck

FEV involvement

- Definition of the overall cylinder head concept for an optimized hydrogen combustion including gas exchange channel geometries as well as spark plug and injector positions
- Design of the arterial cooling channels to avoid hydrogen pre-ignition by reducing the maximal material temperatures
- Validation of the manufactured prototypes on the engine test-bench

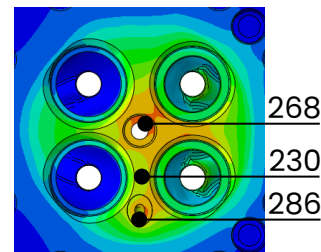
Cooling design

Despite up to 45% higher gas HTC at the center of the flame deck due to intensified charge motion for optimal hydrogen combustion compared to reference cylinder head, the new cooling concept significantly reduces the average temperature level as well as the peak temperature at rated power

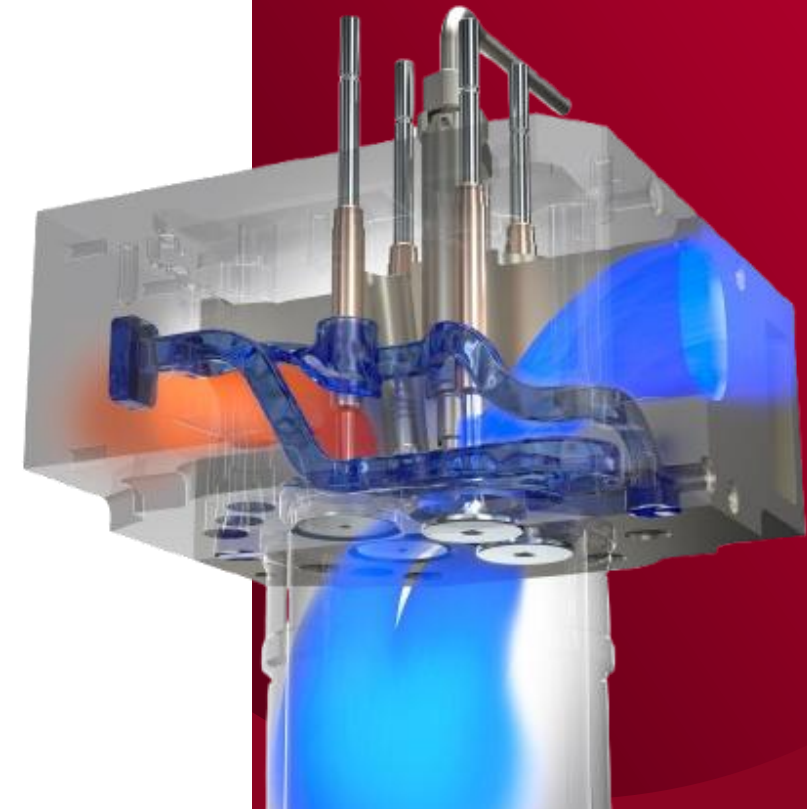
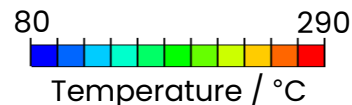
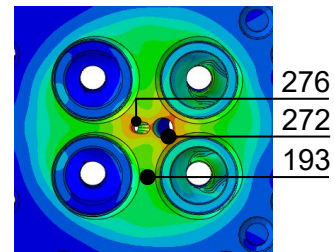


Cylinder Head With
Arterial Cooling
DE 102023125033 A1

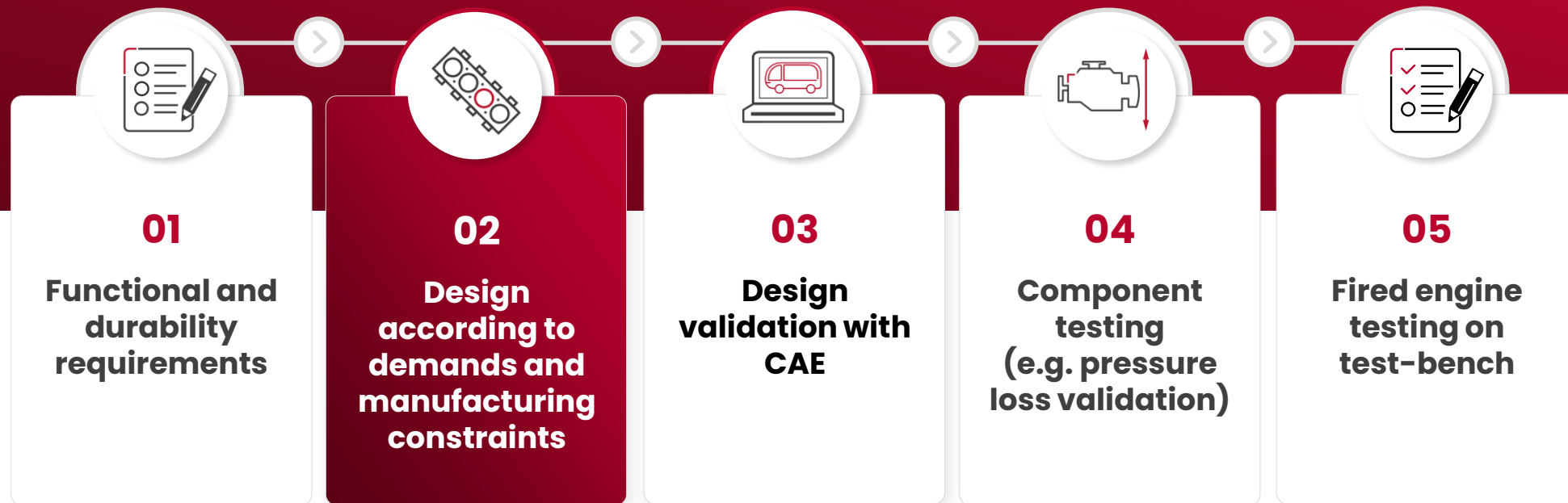
Reference Diesel
cylinder head layout



Cylinder head with
arterial cooling

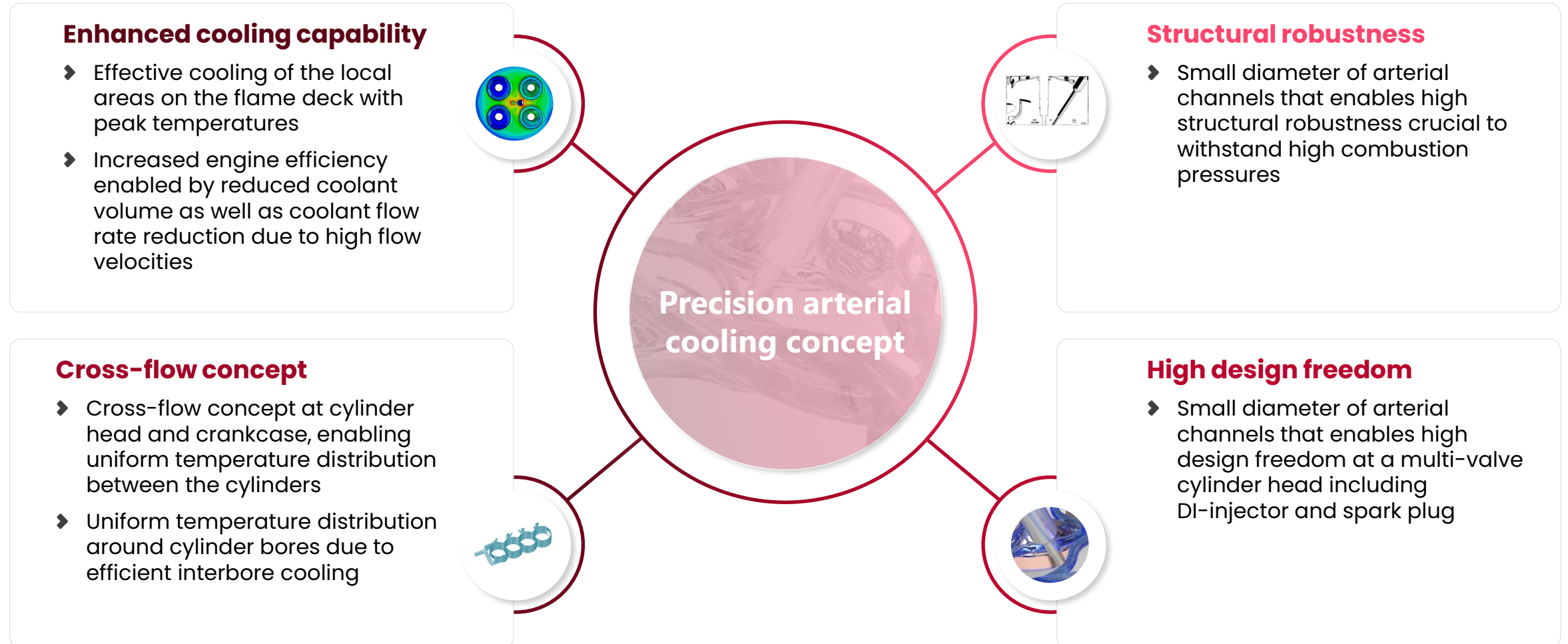


Continuously increasing power demands and alternative fuels necessitate novel and highly efficient cooling concepts



Our cooling concept enables precise cooling of the combustion chamber hot spots with arterial channels having diameters as small as 3 mm

KEY FEATURES OF OUR PRECISION ARTERIAL COOLING CONCEPT



Get in touch with us for further information



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signature-solutions](http://www.fev.com/en/signature-solutions)