

FEV Signature Solutions

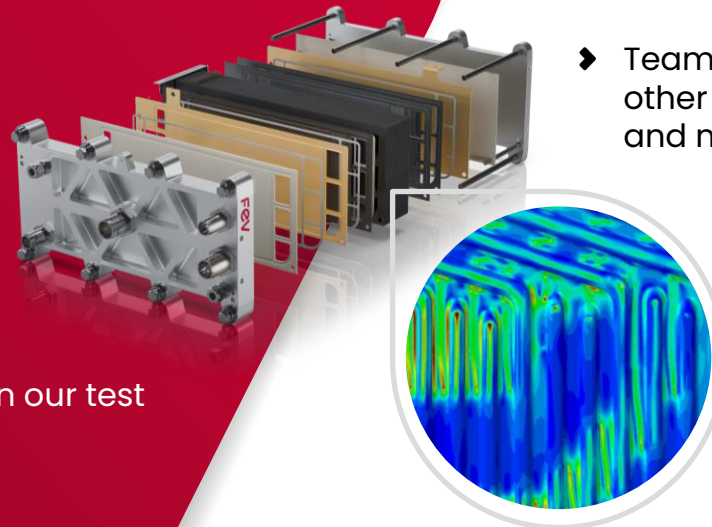
Advanced fuel cell mechanical CAE



Accelerate development and increase the performance of your fuel cell structures & components

FEV offers

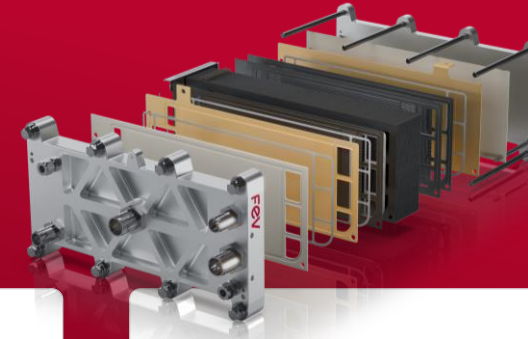
- ▶ CAE supported product development from concept to SOP with scalable simulations on premise and via cloud HPC for lower costs and high design maturity in early development stages
- ▶ Preoptimized layout of fuel cell components from microscopic to macroscopic scale based on holistic analysis of your system for shorter development cycles
- ▶ CAE supported root cause analyses / trouble shooting for rapid problem resolution
- ▶ Validation of simulated designs through testing on our test benches enabling you to quickly start production



Why FEV

- ▶ 45+ years of automotive engineering excellence, trusted by global OEMs and Tier-X suppliers to deliver innovative, production-ready solutions with deep domain expertise
- ▶ 25+ years of CAE experience for a vast range of simulation topics all around propulsion, including understanding and mastery of structural, fluid and electrochemical CAE disciplines
- ▶ Team with high engagement, well networked with other FEV subsidiaries to ensure know-how transfer and mutual support in simulation projects

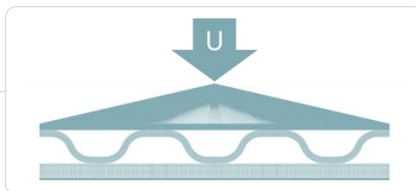
Overview of our CAE process – from microscopic to macroscopic scale



Component Level

BPP, GDL, MATERIAL ORIENTATION

- Small-scale models (e.g., bipolar plate, gas diffusion layer, sealings) are used to quickly explore component feasibility
- General material selection considering special effects (anisotropy, hybrid setup, forming)
- Main scope is to balance stiffness, contact pressure and GDL-intrusion



Cell Level FEA

SEALING, DESIGN FEATURES

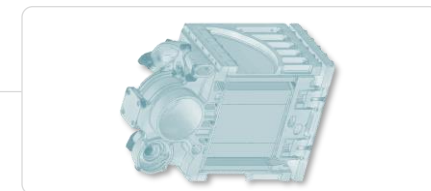
- Partial or complete cell models are used to review mainly port and distribution area performance
- Consideration of clamping force variation (estimation of assembly and thermal expansion effects)
- Main scope is review and optimization of structural stability and sealing performance on cell level



Stack Level

CLAMPING, END PLATES STRUCTURE

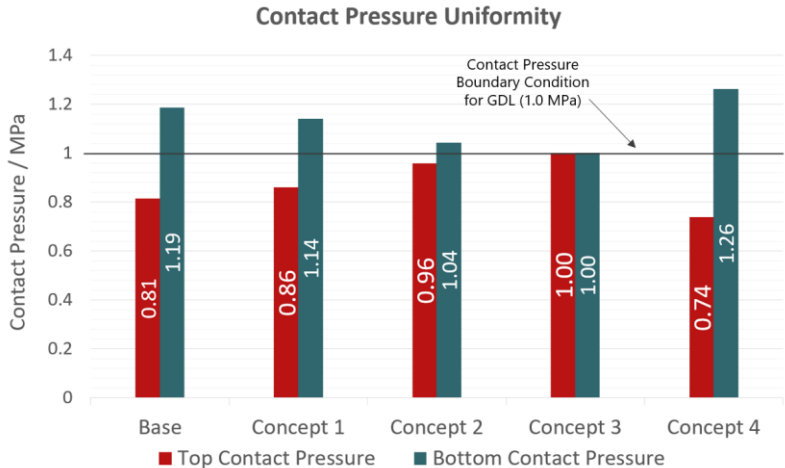
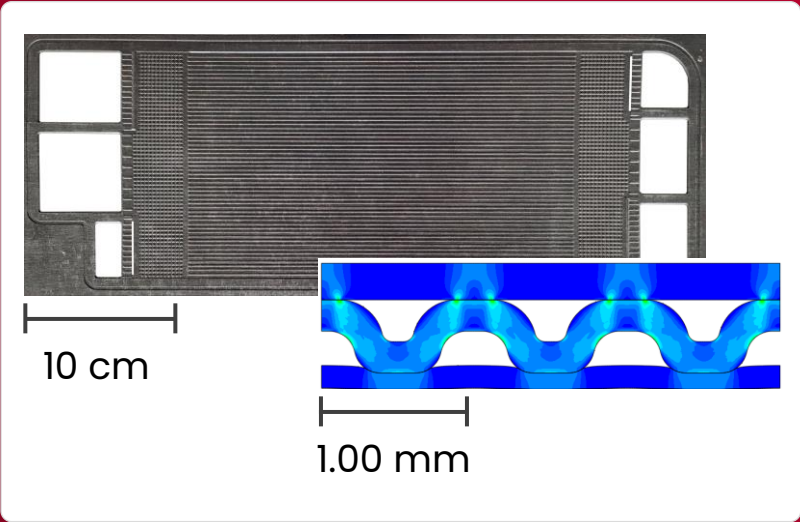
- Complete stack setup with focus on stack assembly layout (end plates, clamping system...). Simplified cell stacking
- Consideration of assembly and operational loads
- Focus is optimization of stack related parts such as end plates regarding assembly and operational loadings



Exemplary application of our CAE methodology

Concept design of GDL via adaption of BPP design & optimization of pressure uniformity

Model/Concept	Base Concept	Concept 1	Concept 2	Concept 3	Concept 4
Stiffness Gradient / mm/Mpa	-0.0006803	-0.0004629	-0.0004389	-0.0005106	-0.0004237
Dimensions					



Component pre-dimensioning:

- Iterative process - variation of component dimensions until all target scenarios are achieved or overfulfilled
- Consideration of even contact performance

Get in touch with us for further information



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