

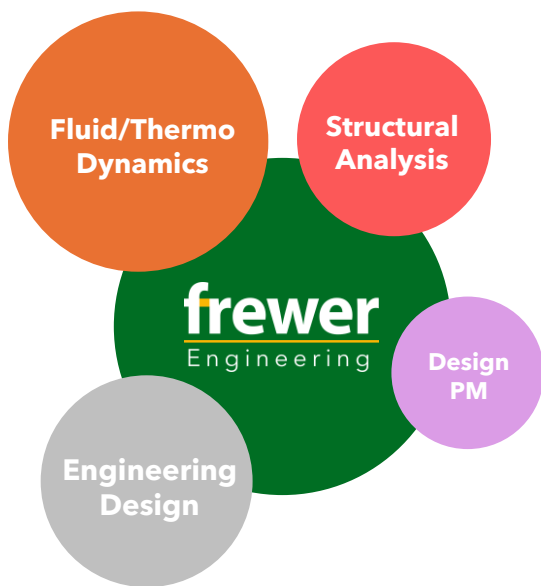
Case Studies: Hydrogen Fuel Cell Test Cell Design

Frewer Engineering supported the design and development of a new suite of SOFC/SOEC test facilities including digital twin modelling, pipework system design, component specification, thermal structural analysis and assessment to relevant codes.



Physical System Modelling

Frewer built a custom fluid and thermal modelling tool to enable the system performance and characteristics to be predicted early in the design phase. Our model was used to characterise and specify key system components such as heat exchangers, static gas mixers and air supply blowers. Predictions from this model were validated against supplier data and found good agreement with temperature and pressure loss estimations. The model was constantly updated as the design progressed, meaning that our customer could understand the impact of different designs on final system performance.



Integrated System Design

Our engineering team worked closely with the customer to deliver three separate systems with a range of power ratings. Our integrated design and analysis approach allowed for fast iteration and a system level view, meaning potential issues could be identified early and mitigated quickly. Close cooperation with the customer subject matter experts ensured that complex system integration risks were appropriately mitigated, and customer best practice was incorporated.

High Temperature Structural Analysis

Once mature, our engineers also assessed the designs under operational conditions including gas temperatures of up to 800°C. Thermal FEA modelling was used to understand the in-service thermal expansion and resultant pipework stresses. We identified key risk areas and proposed suitable design modifications such as expansion bellows and flexible connections.