Fuel Cell Library

Reducing emissions and the carbon footprint of our society have become imperatives, requiring the automotive industry to adapt and develop new technologies to strive for a cleaner sustainable transport system and for sustainable economic prosperity.

With increasing global emission restrictions and with target deadlines looming, manufacturers are facing ever increasing challenges to create vehicles that meet the new environmental and legal requirements. Whilst the development of electric and hybrid vehicles offers one option for low emission powertrains, over the last two years fuel cell technology has also begun to move at tremendous pace. Globally, governments are offering funding for all hydrogen economy related activities. For industries including heavy duty, marine and aerospace, fuel cell technology is showing particular promise.

Challenges

Most hydrogen and fuel cell technologies are still in the early stage of commercialisation, meaning a huge number of potential solutions to find the ultimate balance between efficiency and performance.

Fuel cells stacks are not currently efficient when ancillaries are plugged in. Fuel cell suppliers can provide stacks but not the mechanical components, leaving the OEM with the burden of the balance of plant.

- Fuel cell options are still heavier than the diesel equivalent

- The technology has seen a breakthrough in durability, but issues remain with purity of H_2 and air filtration, meaning fuel cells would need to be cleaned annually and likely replaced every 5 years.

- No single optimal solution has been established

- Physical models and prototypes are expensive

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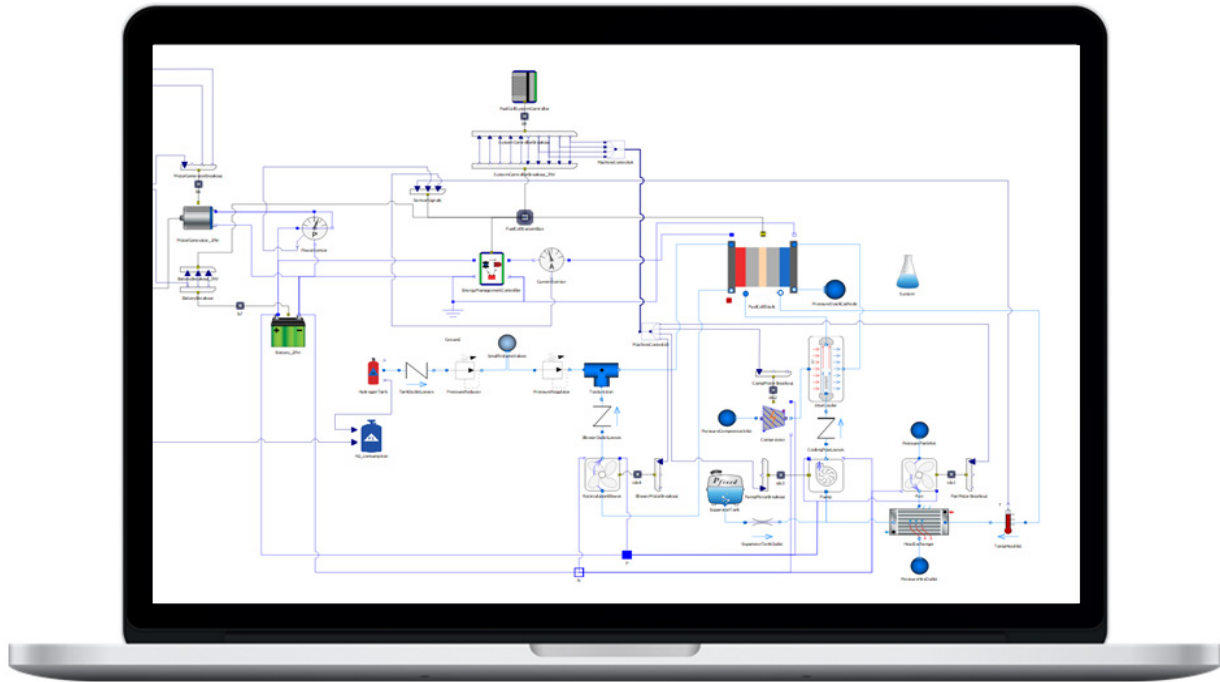
Solution

To support timely and cost efficient development, Ricardo Software's toolset is now capable of modelling fuel cell systems with a newly introduced Fuel Cell Systems library; allowing the user to quickly investigate different different control strategies for balance of plant, including humidity control, cooling and specification of ancillaries especially the sizing the components to give the required performance.

Our easy to use toolset provides engineers with the capability to tackle the challenge of balancing the fuel cell stack, without requiring specific fuel cell expertise and knowledge. The Modelica library contains all the components relevant to the fuel cell systems modelling for typical fuel cell electric vehicle simulations:

- Cathode side - compressor, intercooler, humidifier
- Anode side - hydrogen tank, recirculation blow, pressure control valves
- Thermal - pumps, heat exchangers, thermostat
- Controllers,
- Sensors, and
- Fluid media (hydrogen, water, glycol, air)

Ricardo Software's complete toolset enables the design and analysis of methods for evaluating and optimizing a complete system, thereby improving the efficiency of the overall system.