Ceres Power Catalyst of change

A fuel cell based domestic combined heat and power unit designed and developed for volume production derives technical and business benefits from Dassault Systems (DS) technology.

Modern domestic boilers are highly efficient and generate heat at greater than 90% efficiency. However, electricity supplies to domestic installations lose much as 65% of their energy through heat loss at either generation or distribution.

A WASTE OF ENERGY

According to the International Energy Agency, more efficient production and use of energy could be the single largest and most cost-effective contributor to reductions in CO2 emissions. The adoption of Combined Heat and Power (CHP), which utilises the thermal energy that is normally wasted, would be a significant technical and commercial benefit.

The combination of the materials used to make the fuel cell components, the type of fuel used and the operating temperature allow electricity to be generated directly via a chemical reaction rather than burning the fuel and then using a more traditional and inefficient mechanical generation. Ceres Power use DYMOULA and Abaqus to simulate and evaluate the potential and behaviour of design options without having to build physical prototypes.

The software also allows us to introduce “faults” to check system response and take appropriate design or control programming decisions.

DYMOULA provides insight into the affects of changing a component specification or arrangement, in this context. The software also reveals its implications for the control system which is developed against the same models using co-simulation technology. This re-use of effort is vital to being a competitive company.

DYMOULA demonstrates great benefits to Ceres Power’s communication with its supply chain by allowing very accurate target specifications to be issued and balances to be introduced on target cost/performance criteria. Mark commented: “Risk is reduced with this methodology and high level decision support is introduced because DYMOULA is able to simulate in real-time, the precise operational characteristics of design options. It also allows us to introduce faults to check system response and take appropriate design or control programming decisions.”

DYMOULA and Abaqus are key to our product development and offer significant technical and commercial benefits.

POWER LINES

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DYMOULA demonstrates great benefits to Ceres Power’s communication with its supply chain by allowing very accurate target specifications to be issued and balances to be introduced on target cost/performance criteria. Mark commented: “There is always a trade off between price and performance in the supply chain, DYMOULA helps us to get maximum value at the best possible price while fully understanding both commercial and technical cost benefit choises, and their implications.”

THE POWER OF THREE

DYMOULA is of benefit in three distinct areas at Ceres Power. In the Advanced Engineering environment it helps develop and support component design through the simulated application of physics. In relation to Control Systems development, it allows functions to be observed and programmed and their effects monitored and developed. A systems integration role DYMOULA reveals inter-relationships and ensures that electric and mechanical systems and the software that links them all work in harmony.

Another aspect of Product Lifecycle Management, PLM, at Ceres Power was explained by Matt Harrington, Ceres Power Lead Engineer. He spoke about the use of Abaqus FEA software from SIMULIA. “Abaqus is used alongside DYMOULA to simulate mechanical forces and resultant stresses arising through manufacturing and assembly. Furthermore, by integration with third party CFD software, component and assembly responses to thermal and pressure differentials can be clearly visualised and functional designs enhanced. A common use is assembly simulation of gasket sealing stresses integrated with component designs. A new application is current field visualisation around electrical contacts within the fuel cell, further illustrating the range and versatility of the Abaqus FEA solution.”

Matt concluded: Abaqus allows mechanical engineering simulation, in great detail, to continually improve understanding and functional performance of our Fuel Cell Stack. This is at a supporting sub-level to DYMOULA which invaluable provides overall system operability simulations.

Together DYMOULA and Abaqus FEA are enabling Ceres Power to develop and perfect a highly efficient, price competitive, advanced fuel cell based CHP system that will be making a strong contribution towards lowering our carbon footprint into the future.

For more information: www.cerespower.com
www.claytex.co.uk