Finite Element Analysis

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Finite Element Analysis (FEA), sometimes referred to as FE, or FEM, is a computer simulation technique that allows any design product or equipment to be analysed in great detail to carry out a stress, vibration or heat transfer analysis and many other physical analysis.

FEA is one of a number of simulation and analysis software that be used as a 'standalone option' or as a suite of analysis options, including CFD that the PES team use in developing and evaluating a product during the design process. Whilst it does add initial 'upfront cost' to the project it will save time and money further 'down-stream' prior to prototype stage and during the design optimisation process. FEA is especially beneficial for more complex materials such as carbon fibre. In some sectors FEA analysis can be a prerequisite to certification or validation.

The benefits of incorporating FEA into the design process is our designer engineers can verify that the product / equipment can be reviewed and will conform to a client's performance criteria early in the design process. This can accelerate the product development process and also, if the results are do not meet expectations, the design team can optimise and review the design at an early stage saving time and money.

PES also uses Finite Element Analysis in our product optimisation process, as it can identify the cause of in-service failures of existing products and then deployed to design and optimise viable solutions within the constraints of the existing geometry. Again whilst FEA can be used on all materials and equipment it is especially valuable whilst working with complex materials and geometries.

Carrying out accurate and technically meaningful finite element analysis requires highly skilled and experienced engineers. Not only do we provide finite element analysis using the worlds most advanced FEA software, but all of our team our qualified engineers with rare level of experience working in multiple high performance sectors. Crucially, as a technology development and Design engineering solution company we work with our clients to optimise and deliver best fit solutions.

If you would like any information or discuss your current or planned project then please do not hesitate to call us for as chat. Whether FEA Services, Design optimisation, Troubleshooting, Product Qualification or independent finite element analysis of your products, we have engineering expertise, resources and experience to meet your requirements.

WHAT IS FINITE ELEMENT ANALYSIS (FEA) SIMPLIFIED

FEA allows detailed visualization of where structures bend or twist, and indicates the distribution of stresses and displacements. The software provides a wide range of simulation options for controlling the complexity of both modelling and analysis of a system. Similarly, the desired level of accuracy required and associated computational time requirements can be managed simultaneously to address most engineering applications. FEA allows entire designs to be constructed, refined, and optimized before the design is manufactured.

This powerful design tool has significantly improved both the standard of engineering designs and the methodology of the design process in many industrial applications. The introduction of FEA has substantially decreased the time to take products from concept to prototype and manufacture. It is primarily through improved initial prototype designs using FEA that testing and development have substantially improved delivery times and also greater confidence in the structural performance of a product.

FEA BENEFITS SUMMARISED

1. Increased accuracy.

2. Enhanced design and early evaluation of critical design parameters.

3. Virtual prototyping.

4. Fewer hardware prototypes which can be aligned to rapid prototyping.

5. Efficient and less expensive design cycle.

6. Increased productivity, and profit.

7. De-risked design process

8. A powerful and visual tool to help our client understand

9. A report can be produced as part of a quality control and audit process

10. Certification or verification**

11. Maximise performance through material selection and positioning and cost efficiency

12. Reduced R&D and development costs

** The simulation data output is only as good as the input data. At PES we have the engineering experience, expertise and calibre to identify and potential anomalies. We will cross check and carry out calculations to ensure the data output is correct. FEA is a key tool in the design process but not a ‘standalone’ solution

OVER ENGINEERING

At PES we have huge experience working in multiple sectors and applying technologies to maximise the performance whether in a highly critical and hostile environment or a day to day product that will be mass produced. Whatever the scenario it is crucial we meet our client's requirements. Our aim is to maximise the performance of everything we design to ensure it is efficient, cost effective and within the performance criteria.

FEA can significantly reduce product cost by eliminating unnecessary over-engineering allowing excess material to be removed or cheaper material grades to be employed. The level of insight and accuracy provided by modern FEA simulations greatly reduces companies' exposure to technical risk and is sufficient that far fewer physical prototypes are necessary, far less prototype testing is required and hence the time-to-market and cost-to-market are both dramatically reduced.

Applications of Finite Element Analysis Services:

- Stress Analysis: Stress, strain, failure points, fatigue, creep.
- Thermal Analysis: Conduction, convection, radiation, conjugate heat transfer.
- Vibration Analysis: Modal, harmonic, random, transient dynamic.
- Seismic Analysis: Equivalent static, response spectrum, transient dynamics.
- Impact & Crash Analysis: Equivalent static, short duration explicit simulation