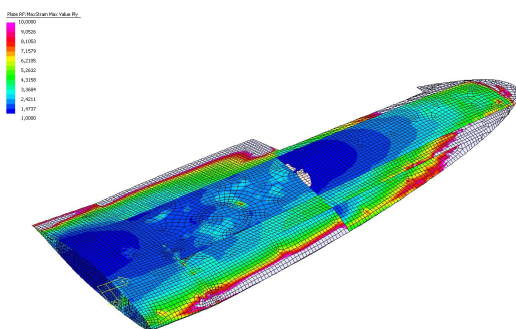
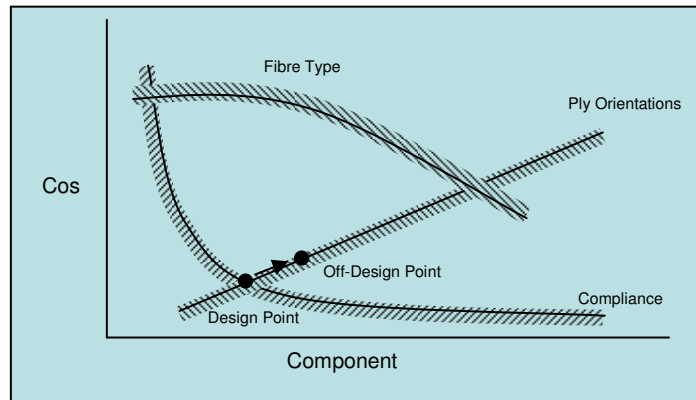


Composite Engineer's Viewpoint
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Designing with Composite Materials
Part 9 – Design Optimization

In this article, we conduct an optimization of the design. With design optimization we consider changes to the design with the aim to reduce weight and/or cost, but at the same time maintaining or improving the overall structural performance of the component. An equally important aspect of this stage of the design process is to check the robustness of the design against small changes in design parameters.

During the design optimization process we consider two or three dependent parameters and vary these whilst maintaining the performance requirements. The results are plotted in a design space diagram as illustrated to the right. The boundaries of the required performance produce a design space envelope that defines the ideal design point. Note that moving away from the design point is known as the off-design point performance. Clearly, some performance requirements are more sensitive to off-design point changes. These are indicated by the higher slope of the boundary curve.



An important part of design optimization is to undertake detailed design of the structure. These days optimization is typically done with numerical analysis packages such as finite element modeling (FEM). The application of FEM can provide significant insight into the areas of major stress states where an increase of the plies is typically needed. Likewise the low stress states can be considered for ply reduction (drop-off). There are some

issues in using FEM such as how to effectively model the laminate. Do you use orthotropic properties on a global scale or model individual plies?

In the next article, we look at the final chapter of the design process - detailed design and putting the structure together. I also welcome questions, comments and your point of

view. Feel free to contact me via r.heslehurst@adfa.edu.au. I may publish your questions and comments, and my response in future newsletter.
