

**Composite Engineer's Viewpoint**  
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Designing with Composite Materials  
Part 5 – Design Review

Now that the materials (fibre and resin) have been selected, the manufacturing process determined and the initial stress analysis of the composite laminate undertaken, it is time to review the design against the design requirements (functional specification). Recall that the functional specification was developed before the design work actually started.

The design review is most critical at this stage as no direct costs have been spent on the project and we can determine a more precise feasibility of the project at this stage. Using the tabulated functional specification (I use the Quality Functional Deployment {QFD} approach) we list the attributes of the design as their currently exists against the design requirements. Also note that using the QFD approach we have reviewed several other existing designs as benchmarks, so the design review will also allow use to compare our design against the existing products. The design review is undertaken in a comparative approach, but in a systematic process. The comparative study may look like the following table (note that at this stage not all requirements have been satisfied as these will be determined later if the project is to continue):

**Functional Specification in Tabulated Form**  
(example ... in complete)

Project Title Industrial Pipeline Support Frame	Customer RQMTS Weighting	Weight	Cost/Frame	No. of Frames	Adhesive Cure Temp	Max Design Strain	Max No. of Frame Joints	Manufacturing Steps	Materials to be Used	Assembly Time/Frame	Installation Time/Frame	Design A	Design B
Engineering Specification ⇒  Customer Requirements ↓													
Corrosion resistance	*		3		9		3		3			√	√
All frame members same size	2	3	3	1		9	3		1			1.0	1.0
Common joints	1	3	9	1	1		9	1	3	9	1	1.0	1.0
Common mandrel size (1/4")	*	3	9	9	9				3	3		√	√
Design loads achieved	6	9	3	9	9	9	3		1	1		1.5	0.5
Low cost	4	9	9	9	3	3	3	9	9	9	3	?	?
Maximum frame size 2' x 2'	*	9	9	9		9	9	9		9	9	√	√
Bonded joints in frame	0	9	9	9	9	9	9	9	9	9		1.0	1.0
UNITS		kg	\$	#	deg C	strain	#	#	#	hr	min		
TARGETS		<10	1K	500	125	4,000	10	<50	<5	<2.5	30		
Design A		7.5	?	500	175	4,500	9	40	2	2.25	25		
Design B		11	?	500	125	3,750	9	40	3	2.25	25		

From the tabulated comparison we can ask the following questions:

- Is the design meeting the essential customer requirements?
- Does the design satisfy the engineering specification targets?
- Is the design competitive against the benchmarks?
- Should the design process continue or be cancelled?
- Can the design be improved against the customer requirements and engineering specification?

Your answer to these questions will allow you to make modifications to the composite laminate design, including material types and forms, to meet the general design specifications. The cost of such design changes at this stage of the design process are minimal and could actually save substantial resources. From here we can look at the initial costs of producing the composite laminate product and develop the detail aspects of the design, i.e. holes, joints, local strengthening and stiffening, etc.

In the next article, we will undertake an initial costing analysis. The cost analysis can be accomplished with a relatively simple PC based spreadsheet computer program. I also welcome questions, comments and your point of view. Feel free to contact me via [r.heslehurst@adfa.edu.au](mailto:r.heslehurst@adfa.edu.au). I may publish your questions and comments, and my response in future newsletter.

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