Tooling Backing Structures

Importance of Tooling Backing Structures

BACKING STRUCTURES CAN BE USED TO INCREASE STRENGTH AND STIFFNESS ON COMPOSITE MOLD/TOOLS

Key considerations when designing tooling backing structures include:

1. **Tolerances**: Determine the demands from the final part design and what contribution can be expected from the mold/tool.

2. **Environment**: Identify what processing conditions the mold/tool will be subject to (e.g., ambient, oven, or autoclave).

3. **Matching CTE**: The backing structure should match as closely as possible to the tool if there is a mechanical connection between the two. A mismatch of coefficients of thermal expansion (CTE) will produce thermal distortion as the mold tool is subject to changes in temperature and could potentially cause inaccuracies in the final cured part.

4. **Attitude**: Determine how the mold tool is presented for its primary function. For example, a simple shop floor tool that might be fixed to a mobile cart would remain on the ground and horizontal. Or, a large ATL tool requires rotation through a number of axes in conjunction with the robotic deposition head.

5. **Airflow**: This needs to be maintained behind the finished mold tool to encourage even heat distribution.

6. **Connection**: Consider the interface between the mold/tool shell and its backing structure. If mismatched materials are to be used, then movement between the two structures must be allowed using flexible adhesives or slotted mechanical fixings (typically on metallic backing structures).

These considerations offer the best opportunity to match the physical properties of the mold and utilize standard products readily available to our customers.

CHOOSING THE “EGG CRATE” TECHNIQUE

A popular method for stiffening mold tools is the “Egg Crate” technique where a cellular support structure is created with panels using materials similar to those used in the mold tool construction.

Typical example: Carbon/epoxy prepreg mold panels could be made from monolithic carbon/epoxy prepreg laminates or sandwich panels utilizing carbon/epoxy skins.
Backig structures can be a significant contribution to the investment in a composite mold/tool. In some cases, customers have quoted up to 50% of the total cost. Production of these panels in-house allows costs to be minimized. TenCate AmberTool® HX-series prepregs—typically HX42 12K Carbon 650gsm 2x2 twill 35% resin content by weight—can be used to facilitate the construction of backing structures. Customers must account for this material when ordering product.

Additionally, utilizing computer-aided designed profiles allows the structure to be premade and a kit of parts ready to assemble and attach to the initially cured mold tool. TenCate recommends this is fitted while the laminate is still attached to the original master pattern and prior to post cure.

TenCate Advanced Composites is currently developing increasingly more efficient reinforcement options for these backing structure applications within the AmberTool® range. We are looking forward to working with our customers to deliver even more cost-effective solutions for this process.

To understand the context of backing structures within the creation of autoclave cured tools, please refer to step 7 of the TenCate AmberTool Tooling Prepreg Processing Guide. To download a copy please refer to our website www.tencatecomposites.com/guides.