



THE BENEFITS OF UTILIZING PREPREG IN YOUR LAYUP



***COMPOSITE
ENVISIONS***



INTRODUCTION

Murphy's Law: a law of nature, anything that can go wrong will go wrong. This especially holds true in composite fabrication. Variables are always going to exist. Between tooling, plycut, layup, bagging, cure, demold, and trim; creating or manufacturing a quality composite is no simple task.

When deciding which layup process to go with, there is not always a right or wrong answer. Often the choice comes with what the user's experience with a certain layup technique. Experience with any combination of these procedures will help build upon picking the right choice for any fabrication.

The use of prepreg material can be great option when things look like they are getting way too complicated, prepreg provides peace of mind over alternative options.

WHAT IS PREPREG

A "prepreg" is a pre-impregnated mixture of uncured resin and fabric that will go on to make a composite laminate. It is designed to have a definitive ratio of fabric to resin. This "resin ratio" provides concise properties of the cured composite such as UTS (ultimate tensile strength) and Modulus (Applied Stress vs Material Strain). This eliminates variables due to "traditional hand layup's" likeliness to variate this resin ratio consequently altering final composite properties.

CONSISTENCY AND CLEANLINESS

Reputable prepreg manufacturers undergo extensive in-house processing and visual testing to ensure to the customer that material will have uniform application of resin throughout the fibers. Uniformity of the material translates to layup as the final thickness of the parts will be consistent and the process made repeatable. When planning to make multiple or manufacture parts, prepregs provide a huge advantage.

Cleanliness when using prepregs is greatly increased. The problem of rollers, cups, mixing tools, resin buckets getting in the way, how excess dry material just finds a way to make the itchiest problem on the face of the earth are, for the most part, eliminated. Focus can be placed into the details of providing the future composite laminate with a patient layup and bagging process.

LESS WASTE, GREATER EFFICIENCY

Prepregs provide peace of mind during layup as the resin is cured by heat rather than solely



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on time. Providing time to properly bag or work through any sudden issues is important during any layup. (So is a lunch break) Using a prepreg provides an advantage over fighting the setup time of the resin. Surface finish of a composite part are also achieved easier relative to traditional hand layups.

Resin Infusion layup is a process in which dry fibers are laid onto a mold surface and resin is drawn through the part with aid of a vacuum pump or venturi system. Typically, a vacuum hose is connected to the part's bagging scheme and resin is placed into the bag by an inlet hose. The resin is then drawn through the fibers and brought to the vacuum outlet in which a resin trap would catch any resin of the process. After allowing the part to cure per resin specification, the part is ready to demold.

When the infusion process is executed efficiently, it offers a competitive advantage over prepregs in cost. Infusion layups are also known to provide high quality laminates, amazing surface finishes, better resin / fiber ratios, and faster cycle times when fabricating multiple pieces (vs traditional layups). Resin infusion offers advantages to hobbyists and even some industrialized manufacturing processes. However, experience in composite fabrication plays a factor in the process's disadvantages. Between the bagging schemes, tooling design, vacuum / resin port placements, the scheme can quickly grow complicated. In addition, a mistake in the bagging process resulting in a leak could result in a scrap part.

MAKING THE RIGHT DECISION

When deciding on what process will fit the needs of fabrication of parts, the following questions will help guide in the most effective choice of layup techniques.

How many parts do you consider wanting to make?

If making a "1-off" part for anything you plan to fabricate, using a prepreg may not make economic sense. One advantage of prepregs being repeatability of being able to make 20-30 or even hundreds of parts. Using traditional layup techniques may be more feasible when only making a single part or if uncertainty arises from design. It is important to note planning ahead of time will greatly mitigate the messiness of traditional layups may bring. Using a little creativity, there are also ways of making your own prepreg versions of material at home using tools you already have.

Is the part going to be vacuum bagged?

Prepreg processes and resin infusion require vacuum bagging as part of the cure process. Traditional layups may be achieved without use of a bag. However, given the option, vacuum bagging yields better primary bonds, improved surface finish and overall quality in parts than strictly air cured composite parts.



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How complex are the contours of the part?

When planning to layup over changing angles in a more complex tooling surface, the workability of prepreg or resin infusion is greater than that of traditional methods. For mitigating weave distortion during layup, preregs are a clear favorite. However, for simple contours, traditional layups would suffice for many situations.

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