COMPOSITE ENVISIONS KNOWLEDGE HUB
PRACTICAL AND INSIGHTFUL COMPOSITES INFORMATION

SHELF LIFE & STORAGE OF COMPOSITE MATERIALS

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SHELF LIFE & STORAGE

INTRODUCTION

“Shelf” or “Storage” life are both important characteristics in nearly all composite fabrication products. It is a given material or product’s “expiration date” when stored under the manufacturer’s storage recommendations. Keeping these storage recommendations ensure the product quality is kept for the life span of the storage.

This topic will cover the average shelf life of various composite products, how to properly store them, ensuring quality in each future composite fabrication. It is best practice and of high importance to read and understand each product’s technical data (TDS) and safety data sheets (SDS). Following materials’ SDS will ensure proper storage, handling, and chemical compatibility requirements are met.

With storing any composite material, cleanliness is best practice. Keep products away from any Foreign Object Debris (FOD) that could come in contact with the material. FOD can contaminate nearly any composite product and may be evident in anything from dust accumulation to food & drink spillage, or even from sweeping a dirty floor while material is out. Most often it is the small details that mean the most in composites, proper storage techniques and shelf life is one to pay close attention.

RESINS

Typically, all resins are best stored at room temperature and kept tightly sealed from earthly elements, which is inside its original packaging. Most resins are best kept indoors as some may not perform well after a series of temperature swings. Proper storage prevents resins and hardeners from prematurely crystallizing due to contamination, whether from moisture intrusion or air-borne foreign object debris (FOD). Most often the “hardeners” or “catalysts” of a resin system that fail or degrade first. Hardeners hold the volatiles that are important to a resins cure characteristic and when contaminated or degraded, the mixed resin will no longer perform as intended. It is important to store resins in dark areas away from sunlight.

As a precaution or best practice, placing sealed resin containers inside a sealed plastic container off the ground may aid in keeping resins safe from storage / handling damage and promote cleanliness in the work area. When ordering resin, research the amount(s) needed for the project and order appropriately. It is best practice to tag or write pertinent information such as the manufacture and expiration date on the container for reference in use. That way, if using multiple resin containers, the oldest can be arranged to be used first like a FIFO lane (First in, first out).

Epoxy resins have the longest shelf life of available resin systems, lasting on average of ~3 years. However, it has been proven that epoxy may last longer when stored under favorable conditions. Epoxy resins and hardeners themselves do not as quickly “expire” by time but by exposure to contaminating conditions presented such as moisture or air-borne

contamination.
Polyester resins hold a general shelf life of ~6 months. After this time, polyester resins may begin to become harder to work with and are more susceptible to cure failures during fabrication. This can be seen by the resins becoming lumpy or jelly-like in consistency. At this point the resin is no longer usable. Polyester resins are generally much cheaper than epoxy resins but are however more restrictive in terms of storage life. They are also more susceptible to cure failures after their shelf life has expired. Likewise, Vinyl Ester resins have a shelf life of ~6 months. Vinyl Ester resins have chemical additives placed into it during its manufacture that degrade over time, yielding it basically useless after its designed time period. It is not suggested to go beyond that.

It is best practice to use a resin within its shelf life for any structural application. This assures the resin is up to the designed task. Past structural applications, resins may last longer and still yield a usable product. Performing a “Pot Life” test may help determine if a given resin is adequate for use beyond its shelf life. A pot life test can easily be performed by mixing a small batch of the resin and hardener, once mixed, observe and allow it to cure. Check that the cure was executed in such a time that the manufacturer originally states. If it does it may give reassurance that the product is still good for more cosmetic or nonstructural critical application. If not, the resin should be disposed of properly.

FABRICS & PREPREGS

Fabrics and prepregs also degrade gradually over time. In composite laminates it is not the fiberglass, carbon fiber or Kevlar fibers themselves that initially degrade. It is the sizing or fiber primer however that degrades over time. Sizings are placed upon the fibers to make them more compatible with a given resin system during cure. As time goes on fiber sizings diminish, weakening the future link between the fabric and the resin, thus yielding a possibly weaker composite laminate.

The exact storage life of most sized fabrics is not always listed on a technical data sheet. Often one may need to research further into a manufacturer’s technical manuals for an expected shelf life of a fabric sizing. Fiber sizing life can range from a year to beyond five when stored under favorable conditions. For prepreg materials a general shelf life is first a year. After a year or after initial expiration some fabrics and prepregs may be re-tested for performance against its original stated performance specifications and bonding characteristics. In the case of a DIY project possibly using expired fabrics it is important to test a laminated section of the expired fabric to ensure its quality is up to par for its intended use.

FABRIC STORAGE

Fabrics are best stored indoors in stable room temperature and dry humidity conditions (less

than ~50%) inside of their sealed original containers. If product is partially used and placed back into storage, re-wrap the fabric and place it back into its original containment. This does not have to be vacuum bagged but is best kept completely fully sealed from possible contamination and physically protected from possible damage from high traffic areas. (Inside a cardboard box for example) If the product is partially used and placed back into storage, re-wrap the fabric (Shrink wrap works well) and place it back into its original containment. It is important to note that exposure to sunlight or wet conditions can weaken sizings and degrade fabrics.

PREPREG STORAGE

Prepregs are stored much like that of regular fabrics but generally stored at (0 deg F) in a sealed bag inside original containment boxes. Prepreg material should be stored in a horizontal position supported on each end of a given roll off the ground. In other words, don't place the weight of the fabric on a surface, let the end of the cardboard rolls do the work. There are also room temp prepregs that may be continuously stored at room temperature. Always reference a material's technical data sheet (TDS) and safety data sheet (SDS) for pertinent information regarding storage requirements before purchasing!

EXPANDING FOAMS

Shelf Life of polyurethane expandable foams is generally ~6 months. After this period, the foams' properties begin to degrade. Expandable foams should always be stored in their original containment and sealed appropriately, much like that of any resin storage. Expandable foams are not as susceptible to temperature variation as resins but are to moisture contamination and best stored sealed in a dry environment.

CORE STORAGE

Composite core products, such as Nomex or metallic honeycomb or foam, do not have as tight restriction on shelf life in composites. However, its storage requirements are to be met with more delicacy. Many core materials are susceptible to handling damage. For core pieces it is important to store in original containment until the time for indented use. It is a good practice to sandwich core between flat sheets of cardboard for transporting core. This provides a degree of more rigid protection when handling core pieces. After opening, it is best practice to store all core pieces in a sealed bag with an added moisture desiccant bag to prevent moisture intrusion (silica gel). Once sealed, Nomex honeycomb, balsa, and foam are best stored at room temps in lower humidity environments (below 65%). It is also important not to touch core materials with bare hands as oils from our hands may transfer to the core materials causing possible delamination.

VACUUM FILM STORAGE

Vacuum films do not have a defined expiration. Sealed vacuum bag material stored in a dry, dark indoor area at room temperature can last nearly forever when stored properly. However, like fabrics, vacuum films should be handled and stored with extreme caution and out of the high traffic areas of fabrication. Films are highly susceptible to punctures or misuse due to handling. Bagging film may easily be characterized by being fragile but not like glass breaking in an antique shop. For example, a heavier roll of exposed bagging film falling on any sharp object could ruin much of the film's roll. Handling or storage damage is not something a fabricator will want to find upon bagging a part.

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