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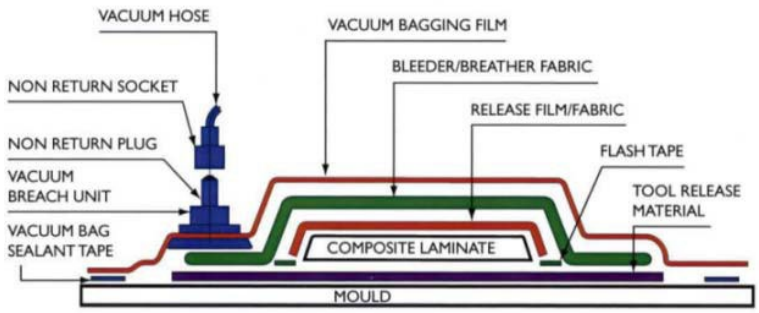
GUIDE TO VACUUM BAGGING

Vacuum bagging techniques have been developed for fabricating a variety of components but mainly for complex shapes, double contours and relatively large components. The technique is employed either to consolidate a wet layup or a prepreg layup during cure. The process is principally suited for moulding low cost components too large and/or complex to be pressurised by other means.

The technique utilises a flexible sealed bag under which a vacuum is drawn, hence applying an even pressure up to 1 atmosphere (14psi) to the laminate in the mould. The assembly can then be heated in an oven, as in the case when using prepregs, to promote flow and cure of the resin. The process requires low cost equipment and tooling and is capable of producing composite components of good quality.

The diagram below illustrates a cross section of a simple vacuum bag lay up. The constituent parts and their function are described below.



VACUUM BAGGING FILM

These materials are used to form the vacuum bag. The film is sealed to the edge of the mould with vacuum bag sealant tape. Vacuum bags must be completely airtight to ensure no leaks occur at full vacuum during the final cure.

The most commonly used material is nylon film due to its excellent physical properties. As well as being extremely tough, it has good flexibility and high elongation. Special additives allow it to be used at high temperatures and make it the most cost effective material available. Nylon films are supplied either in tubular or sheet form.

Elastomeric films provide much higher elongation than nylon allowing the bag to more easily conform to complex profiles.

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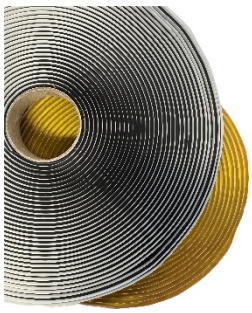
SEALANT TAPE

Also none as “tacky tape”, it is used to provide an airtight seal between the tool / master model and bagging film. The tape must have sufficient tack to adhere well to the mould surface but not so much tack that the bag cannot be stripped away from the tape for re-positioning during lay up. The tape must also strip cleanly from the mould surface after the cure cycle has been completed.



RELEASE FILM

Release films are used to control resin flow during cure and to release the vacuum consumable lay up from the laminate following cure.

The particular film chosen will be dictated by the cure temperature, the shape of the component being laminated, the amount of resin bleed required, and the resin system involved. Various perforation patterns are available to govern the amount of resin bleed from the laminate during cure.

BLEEDER / BREATHER FABRIC

Non-woven polyester bleeder / breather fabrics are used to allow the free passage of air across the bag face of a laminate while under vacuum or autoclave pressure. This allows air and volatiles to be pulled from the laminate and an even pressure applied to it. The secondary use of these fabrics is the absorption of any excess resin which is bled from the laminate during cure.

Various constructions are available and selection will depend on the temperatures and pressures they must withstand during the cure.

RELEASE FABRIC

Commonly known as peel plies, they are placed against the laminate to provide a moulded surface suitable for secondary bonding or painting. After peeling off from the laminate the fabric leaves an impression of its weave pattern.

They can be applied dry or impregnated with the same resin as the laminate. Dry peel ply bleeds out a controlled amount of resin from the laminate without bonding to it. Impregnated peel ply does not bleed any resin from the laminate stack, which is particularly useful when processing thin laminates using zero bleed resin systems.

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FLASH / RELEASE TAPE

High temperature capable tapes used for the removal of resin flash at the edge of the laminate, holding the consumable package in place and taping down the pleats of the vacuum bag to prevent movement during autoclave curing.

SELF ADHESIVE TOOL RELEASE MATERIALS

These materials are an alternative to release waxes and liquids, eliminating the need for repeat operations between cures. They can also temporarily seal porous tools, such as those constructed from wood or MDF. Tool release materials are available as either PTFE coated glass fabric, or un- reinforced skived PTFE film.

SHRINK TAPE

Polyester tape which when heated undergoes shrinkage in the length wise direction only. This characteristic is used to consolidate mandrel wound composites to form high quality low voidage components.

VACUUM FITTINGS

Three basic items are used to connect the vacuum bag to the vacuum pump;

- vacuum breach units
- two-part, non return, plug and socket couplings
- vacuum / autoclave hoses

Vacuum gauges are important in checking the vacuum achieved by the bagging operation, and to ensure there are no leaks in the system.

Further information, including product data sheets, can be obtained from;

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