Vacuum bagging of wet laid composites

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Content

- Process overview
- Pros & Cons
- Consumable materials & their correct application
- Common problems
- FAQ’s
- Questions

Typical applications

- Large & one off components
- Difficult tooling geometry (undercuts etc)
- De-bulking
- Bonding operations

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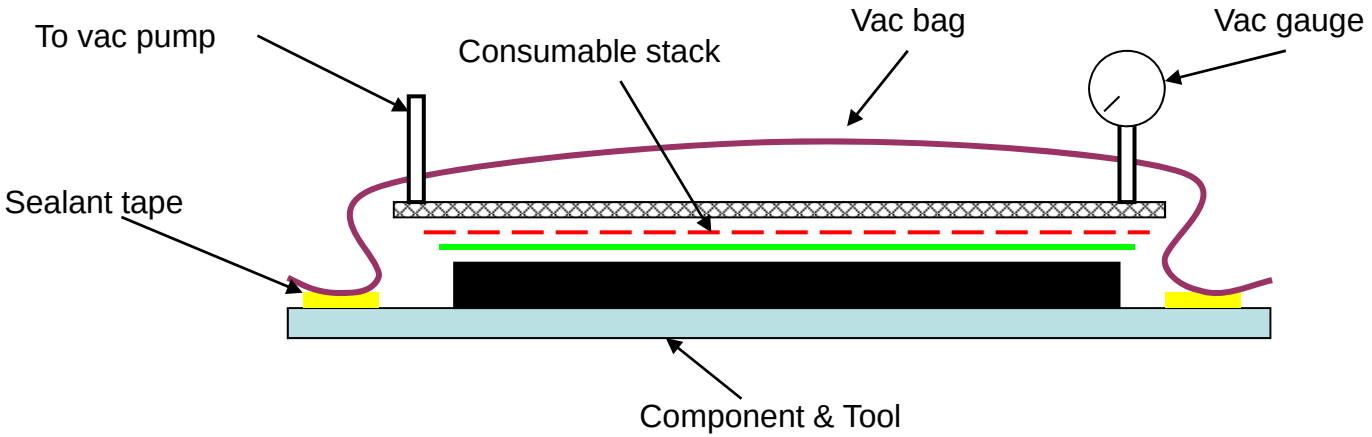
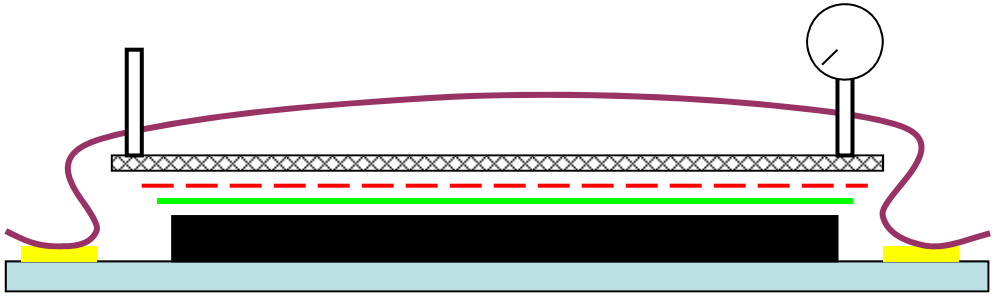
Process overview

- Application of a vacuum bag and associated consumables to aid with component consolidation
- How does it work?
  - Bag is sealed around the tool periphery to create an impermeable membrane
  - Air is extracted from the bag
  - The pressure differential provides 14psi (29”Hg) of consolidating pressure acting all over the component surface
  - Component is allowed to cure under the vacuum bag

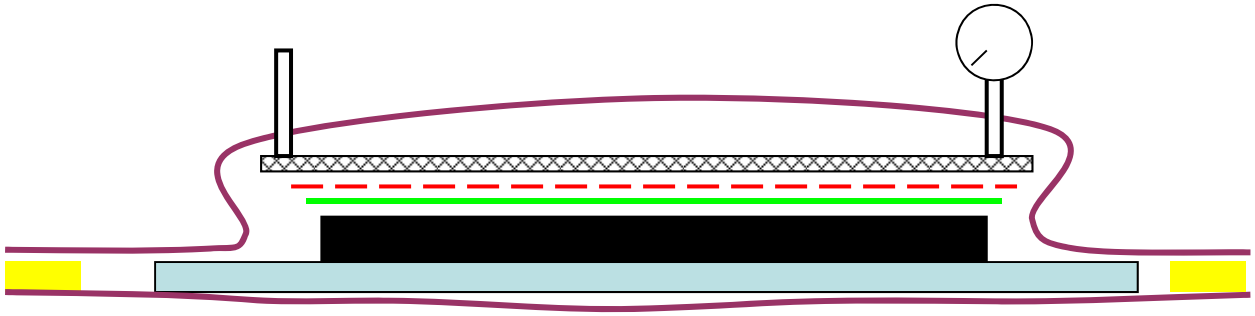


Process overview

1. **Surface bagging**; tape is sealed onto the tool flange. Tool must be vacuum integral



2. **Envelope bagging**; bag encapsulates the whole tool & seals to itself. Easier than surface bagging but relies upon lightweight manageable tooling



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Pros & Cons

- Advantages
  - Even resin distribution throughout the laminate
  - Higher fibre content compared with standard wet lay up, due to bleed out of excess resin
  - Reduced void content
  - Reduction in dangerous volatile gases given off during cure

- Disadvantages
  - Additional cost
  - Extra process
  - New skill
  - Increased waste
  - Labour intensive
  - Requires good quality tooling

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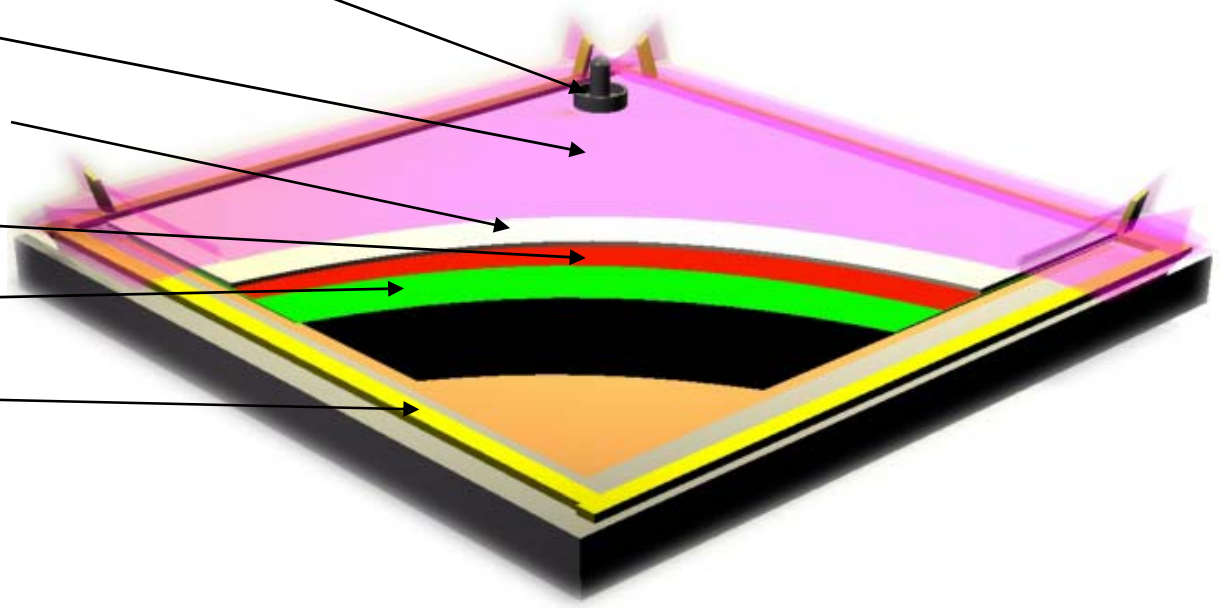
Consumables

- Vacuum Breach Units (VBU's)
- Vacuum bagging film
- Breather/Bleeder fabric
- Release film
- Peel ply
- Sealant tape
- Flash tape



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Consumables

- Sealant tape
  - Butyl rubber adhesive tape
  - Supplied with protective backing paper
  - Suitable for use up to 90°c
  - Single use product

  - Should be applied to a clean, undamaged tool flange
  - Do not remove backing paper until ready to seal the bag
  - Bagging film can be snapped off the sealant tape to allow repositioning of film
  - Can be used to seal leaks
  - Can also be used to make small intensifiers when wrapped in non-perforated release film

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Consumables

- Flash tape
  - Polyester adhesive tape

  - Used to reduce resin bleed from the laminate edge
  - Has limited release characteristics, do not use underneath the laminate
  - Resistant to resin attack
  - Used to secure consumables

Consumables

- Peel ply
  - Woven nylon/polyester fabrics
  - Coloured to stand out against the laminate surface
  - Single use product

  - Used to key the laminate surface in preparation for painting / secondary bonding
  - Apply in direct contact with laminate surface
  - Allow excess material at edges to aid removal
  - Can be overlapped

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Consumables

- Release film
  - Blended films to promote good release characteristics
  - Available in solid & porous formats to control resin bleed

  - Used to provide a release layer between the component and breather fabric
  - Can be used in direct contact with the laminate surface, or in conjunction with a peel ply
  - Care needs to be taken when applying into female corners to prevent bridging
  - Can be “scrunched” and “pleated” to aid conformity

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Consumables

- Breather/Bleeder fabric
  - Non-woven Polyester fabric
  - Conforms well to component geometry
  - Single use product

  - Allows air & volatiles to be extracted from the vacuum bag & laminate
  - Absorbs excess resin from the laminate
  - Care must be taken when applying into female corners to prevent bridging
  - Must be applied all over the laminate surface
  - Must be separated from the laminate with suitable release film/peel ply

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Consumables

- Vacuum bagging film
  - Nylon based multilayer films for vacuum integrity & good resistance to resin attack
  - Moisture sensitive
  - Cannot be re-used

  - Should be applied with plenty of excess material to easily conform to the component geometry without stressing the bag
  - Pleats are required anywhere there's a change in component geometry
  - Must be separated from the laminate with suitable release film/peel ply

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Consumables

- Vacuum Breach Units (VBU's)
  - 2 part self cutting VBU
  - 50mm (2") base plate
  - Aluminium base, steel cutting unit
  - Silicone rubber gasket
  - Non-return quick release brass plug

  - **MUST BE APPLIED OFF PART**
  - Generally 1 VBU per sqm of component required

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Common problems

- Resin rich areas
  - Not enough resin bleed
  - Inadequate vacuum
  - Breather/bleeder not applied correctly
  - Wrong release film
- Vacuum loss
  - Poorly secured vacuum fittings
  - Damaged mould
  - Incorrectly applied sealant tape
  - Leak paths, folded film, stray fibres etc breaching the seal
  - Damaged bagging film

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Common problems

- Bridging
  - Pleats / tucks not large enough or located correctly
  - Peel ply, release film & breather not applied correctly
  - If problem persists, an intensifier can be used to reduce the problem
  - Film not manipulated correctly
- Pinching
  - Pleats / tucks not large enough or located correctly
  - Not enough bagging film used
  - Film not manipulated correctly
- Dry laminate
  - Lack of debulk
  - Incorrect vacuum level
  - Excess resin bleed

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Frequently asked questions

- Why does the bagging film appear to have pin holes in?
- Does the peel ply colour the laminate?
- Do I need breather on the underside of a tool when envelope bagging?
- Will the cut out piece of film from the VBU be sucked into my vacuum pump & damage it?
- Are the products reusable?
- How can I bleed more resin out?
- Why can’t I just use a cheap polythene bag?

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