P109

Practice of Mould Maintenance

Practice document

Document Type	Practice	
Document Identifier	109	
Themes	• Thermal management • Materials deposition and consolidation management • Residual stress and dimensional control management	
Tags	• Production scaling • Size scaling	
Objective functions	**Cost**	Maintain
	Rate	Maintain
	Quality	Maintain
MSTE workflow	Development	
Prerequisites	• Effect of equipment in a thermal management system • Effect of shape in a thermal management system • Effect of tooling in a thermal management system • Heat of reaction • System interactions • Thermal behaviour	

Overview[edit | edit source]

Proper mould preparation and the use of suitable preparation products are critical steps in ensuring that composite parts are fabricated smoothly and efficiently. Typically, several products are used to achieve optimal results including mould cleaning, mould sealing, and mould release products. Commercial examples include Loctite, Frekote 710-LV release, ChemTrend Flex-Z 3.0 release agent, mould release wax, and ChemTrend Zyvax Sealer GP as a mould sealant. It is essential to understand the correct procedures for mould preparation and release agent application, as these processes directly impact the quality of the finished part.

If you are looking for best practices during demoulding, see Practice for Developing a Demoulding Step - P159.

Significance[edit | edit source]

Proper mould preparation and the application of release agents and sealants prevent issues like part sticking, delamination, and defects, while extending the life of moulds and improving production efficiency. Strict adherence to safety protocols is also crucial when handling solvent-based materials.

Practice[edit | edit source]

When working with sealants and release agents, safety is paramount. Always ensure that proper safety equipment, including safety glasses and gloves are worn, and all regulatory laws and guidelines are followed. Many sealants and release agents are solvent-based and highly flammable, so they must be handled with care in a well-ventilated environment.

Mould Preparation and Surface Polishing[edit | edit source]

Before applying any release agents, the mould surface must be properly prepared. If the tool has been machined, any scallops or machining marks must be sanded down. These markings can affect the quality of the finished part if not addressed.

1. Sanding the Surface:

- Depending on the initial surface quality, begin with a coarse grit sandpaper (~220-grit) to knock down and smooth out rough spots or scallops.
- Gradually work through finer grits sequentially, moving up to 800-grit wet sandpaper to refine the surface.
- For a more polished finish, a 1200-grit wet sandpaper may be used depending on the surface requirements for the part.

2. Cleaning the Surface:

- After sanding, clean the surface thoroughly using a solvent such as acetone and microfiber paper towels folded over to make a 2x2 square. This removes any residue left behind from sanding.
- Allow the solvent to evaporate for approximately 15 minutes before proceeding.

3. Polishing the Tool:

- Apply a small amount of a polish such as Mothers Aluminum/Mag Polish to a clean paper towel and work it into the tool surface using circular motions.
- Once the polish darkens, allow it to sit for a few seconds before wiping it off with a clean microfiber towel. The result should be a mirror-like finish.
- Let the tool sit for 30 minutes to ensure the polish is fully set before continuing.

4. Stripping Residue and Preparing for Sealer:

- Once the polish has set, use a solvent such as acetone again to remove any excess residue from the surface, wiping it with paper towels until no residue shows on the paper towel.
- Allow the solvent to flash off for 15 minutes before continuing to the sealing process.

Sealing the Tool[edit | edit source]

Once the surface is fully cleaned, use tape to tape-off the perimeter of the tool, the perimeter will later on be used for vacuum tape. Green painters tape is usually used because of its light adhesive; this will make it easier to peel off after the process is done. A mould sealer, such as ChemTrend Zyvax Sealer GP, is essential to ensure optimal release agent performance and prolong the mould's lifespan. The sealer fills in the porosity of the mould surface, preventing mechanical bonding during layup.

- Soak a paper towel in the sealer by placing it over the opening and allowing it to absorb a sufficient amount.
- Apply the sealer evenly onto the tool surface, overlapping each pass by about half an inch.
- Wait for the sealer to flash off before wiping it with a clean towel. Repeat the process for a total of four coats, allowing 15 minutes between coats.
- For straight-to-mould tools, no gel-coat applied, and RTM tools, only two coats are necessary.
- Wait 30 minutes after the last coat before moving to applying the release agent.

Release Agent Application[edit | edit source]

Once the sealer has cured, the next step is to apply the release agent. Release agents help prevent parts from sticking to the mould during the demoulding process, ensuring smooth removal without damaging the part or the mould surface.

1. Loctite FreKote 710LV Application

- Loctite FreKote 710LV is a commonly used release agent for aluminum surfaces. It is applied in a similar fashion to the sealer, by soaking a paper towel and applying it in even coats, overlapping by half an inch.
- Allow the release agent to flash off before applying additional coats. A total of four coats should be applied, with 15-minute intervals between each coat.
- Once applied, wait 30 minutes before using the mould.
- With FreKote and flexZ there is no need to wipe off after application of agent. Solvents in the release agent flash off as you wipe it on.

2. Wax Mould Release for RTM and Straight Mould Tools

- For RTM and straight-to-mould tools, wax mould release is typically used instead of solvent-based release agents. Apply four coats of wax using circular motions, ensuring even coverage.
- Once each coat has dried slightly, buff the area using a microfiber cloth or an electric buffer for larger areas, such as the flange. Test if the wax is ready to buff by gently touching it with your finger—if it turns a milky white color, it’s time to buff.
- For tighter geometry, use a hand buffer to ensure a smooth, even finish.

Surface Care and Maintenance[edit | edit source]

Maintaining the tool’s surface after each use is essential for preserving its integrity and ensuring consistent part quality.

- After demoulding a part, inspect the mould for any residual debris, such as dry resin or imprints from the material used in the layup process. This debris can interfere with future part fabrication if not removed properly.

Use paper towels to wipe down the tool, applying enough pressure to remove any dried resin.

- If dried resin proves difficult to remove, use a plastic putty knife to carefully scrape it off, ensuring no damage is done to the mould surface.
- After cleaning, you may choose to reapply a single coat of release agent, particularly along the perimeter where vacuum tape will be applied. This helps to maintain the release properties of the mould and ensures smooth operation in subsequent fabrications.

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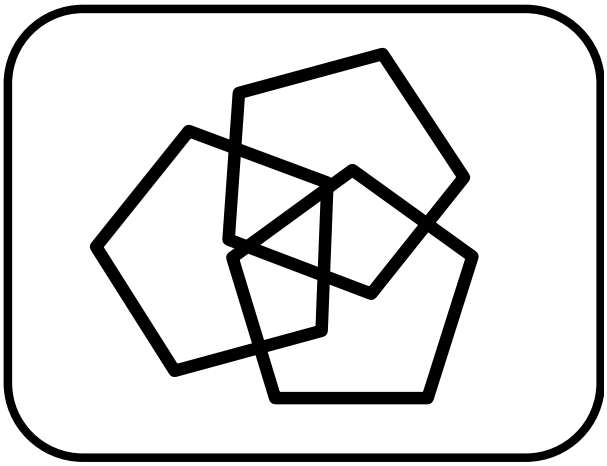

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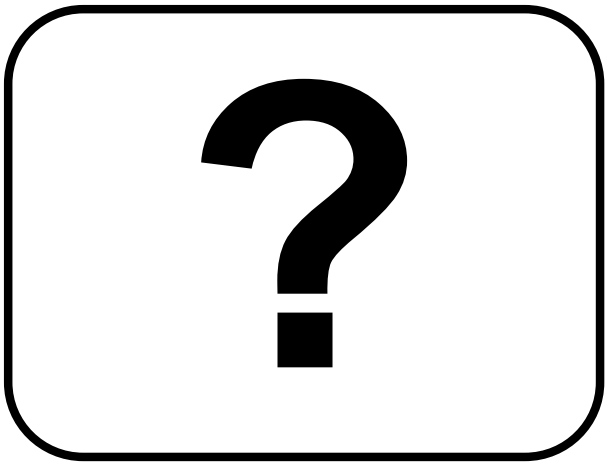

Help

Engineered materials (designed to have specific properties) made from two or more constituent materials with different physical or chemical properties. The constituents remain separate and distinct on a macroscopic level within the finished structure.

The failure mode characterized by a partial or full separation of adjacent laminae. Delamination is unique to laminated structures, and can be induced by impact load, fatigue load, and quasistatic load. (Also known as interlaminar separation)

Resin transfer moulding (RTM) involves loading a preform into a two (or more) piece, matched tool, closing it, and injecting resin under pressure (~15-100 psi, or ~1-7 bar).

Well suited to small to medium sized parts, limited to large sizes due to injection pressure loads and tool cost.

For polymer matrix composites (PMCs), resin refers to the matrix; the continuous material phase that binds the reinforcement together, maintains shape, and transfers load. Resins are divided into two main groups: thermosets and thermoplastics.