Mold Release, Break-In, Maintenance and Storage

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CCP
COOK COMPOSITES & POLYMERS
Smart start. Great finish.

Mold Release Requirements

- Form a barrier between the mold and molded part
- Provide a lubricating film which allows the molded part to be easily removed
- Protect the mold surface from chemical and mechanical attack
- Maintain the mold finish and dimensions on the part

Factors Affecting Release

- Resin
  - Chemical type
  - Aggressiveness
  - Abrasiveness
- Process
  - Compression
  - Hand lay-up
  - Resin transfer molding
- Release agent
  - Formulation
  - Application
- Mold
  - Material
  - Shape
  - Quality
  - Temperature

Release Agent Types

- Permanent (not used in Composites)
- Sacrificial (waxes)
- Semi-permanent (polymer)

Sacrificial Release Agents

- Thick chemical barrier between part and mold
- Must be applied after every part pull (labor intensive)
- Great for micro porosity, gouges
- Comfort level with this older technology
- Can “see” what is applied and know that it has been coated
- Prone to excessive mold buildup since half remains with part and half with mold
- May not withstand excessive exotherms due to low viscosity at high temperatures

Sacrificial Release Agents

- Silicones
- Waxes
  - Low cost
  - Good slip
  - Poor solvent resistance
  - Compatible with gel coat
  - Buff on coating (labor intensive)

General Paste Wax Application Procedures

- Apply with a pad or clean cloth; do not use sock method
- Let it haze up before polishing; solvent must come off
- Use two cloths for polishing or change cloths when a drag is felt
- 5 to 7 coats needed
- Start each coat at least 12 inches from where the previous one was started.

Semi-Permanent Mold Releases

- Semi-permanents are the preferred product for FRP composites production
- Huge labor and time savings over sacrificial
- Chemically bond to mold
- Low buildup, micron thin film
- Multiple release between applications
- Longer mold life

Semi-Permanent Mold Releases

- Consistent part quality due to easy, consistent release
- Improved cosmetics, excellent gloss
- High temperature stability
- Excellent solvent and chemical resistance

Semi-Permanent Mold Releases

- Start With a Clean Mold
  - Mold must be clean for semi-permanent release agents to bond to surface
- Just like painting a wall
- Typical soils
  - Buffing compound residue
  - Waxes
  - Dust
- The durability of the release film relies heavily on a clean mold surface

Cloth and Rags Used in Application

- Use 100% cotton rags
- Synthetic polymers in rags can be dissolved into solvent based mold cleaners and release agents
- Rags should be just damp with sealer or release; over application can result in streaks
- Constantly change rags to prevent soil redeposit ion when cleaning
- Wipe on, wipe off application dictates using clean cotton cloths
- Keep container closed when not in use.

Mold Seasoning Procedures

- Wash the mold with a mild detergent solution (dish soap) and water.
- Apply primer/sealer
  - All new molds have micro porosity
  - Gel coat will mechanically adhere
- Apply mold release; follow the manufacturers recommendations
- Spray a blow coat of gel coat; for large molds divide the area into work zones and apply one section at a time.
- Strip the blow coat when it reaches film gel stage
- If no sticking occurs update the mold release system
- Spray production part and laminate; if no sticking update the mold release system
- Build 3 production parts updating the mold release system after each part
- Build 2 production parts without update the mold release system; after the second part update the mold release system
- Gradually increase the number of parts built between mold release updates until the mold release interval is known
- Implement mold maintenance procedure

The Tape Test

- Simple masking tape-same roll
- Apply and rub on tool surface
- Tape helps to determine the effectiveness of the release products you are applying
- Tape will adhere to all mold surfaces but the level of adhesion will vary
  - Lots of release agent-low adhesion
  - Clean mold-high adhesion
- Always use fresh tape for each test

Additional Release Protection

- A film forming agent such as PVA should be considered for extra release protection
  - New molds or resurfaced/repaired molds
- PVA (Polyvinyl acetate) is a water soluble polymer
  - Not for use with coatings or resins that contain or emit water during cure
- PVA may impart surface roughness so sanding may be required.
- PVA release must be cleaned from part and mold

Mold Maintenance

- What isn’t mold maintenance?
- What is mold maintenance?
- What is the real benefit?
- When is it best done?

Mold Maintenance is NOT….

- NOT re-sanding the gel coat surface…..
- NOT repairing knife cuts…..
- NOT fixing gel coat cracks…..
- NOT replacing blistered gel coat…..
- NOT adding laminate back side bracing…….
- NOT repairing every part in the same place…..$$$$$

Mold Maintenance is

- Preventing or minimizing mold damage
- Maintenance must occur BEFORE damage
- Once damage occurs, you are doing
  REPAIR
- Poor mold maintenance leads to wasteful repair and $$$$$

Mold Release

- Mold release systems wear away
  - Solvent attack
  - Abrasion
- Residues accumulates on and in the mold release layer
  - Wax build-up (if using a paste wax - nonskid)
  - Polystyrene (either release system)
  - Must be removed either from mold or all parts

WHAT Is Mold Maintenance?

- Preventing scratching, gouging, crushing, tearing, delaminating or fracturing the mold
- Keeping the mold release system effective
- Removing polystyrene haze

Worst Way to Remove Polystyrene Haze

- Grinding or Sanding
  - Works with ANY amount of residue
  - Requires finish sanding and buffing
  - Requires complete re-application of mold release
  - Labor intensive and time consuming

<u>This is mold REPAIR!</u>

Mold Repair is:

- Actions taken to restore a damaged mold to a serviceable condition
- Do not confuse with mold maintenance

Best Way to Remove Wax Build-up or Polystyrene Haze

- Use a mold cleaner
  - Only works for light haze
  - Requires only 1or 2 coats of paste wax to renew
  - Relatively quick and easy
  - This is mold maintenance for conventional paste wax mold release

Removing Polystyrene Haze

- Wiping with a self stripping liquid release
  - Only works for light haze
  - Relatively quick and easy
  - Best done right after de-mold
    - Residue still somewhat green
  - This is mold maintenance for semi-permanent type mold release

When to Remove Polystyrene Haze

- When it is very light
- While it can be buffed or wiped off with cleaner
- Before it requires sanding

How To Avoid Build-Up

- Don’t use styrene to clean a mold
- Make and keep the mold as smooth and glossy as possible
- Update the mold release as needed
- After break in, record the number of pulls until slight haze or sticking; this tells you need to reapply release after one less pull then this number
- Use only plastic tools to scrape and de-mold
- Don’t use razor blades to clean tape lines
  - Use sharpened Formica chips
  - Pull tape lines at the right time

Storing Molds

- Best Conditions:
  - Indoors
  - Heated during periods of extreme cold
  - Away from sources of dust and over-spray
  - Covered with painter’s plastic

Storing Molds

- Acceptable Conditions:
  - Outdoors
  - Upside down on pallets
  - Covered with a water-proof, sun-proof tarp
  - Washed with mild detergent and water before use

Storing Molds

- Worst Conditions: $$$$$
  - Outdoors
  - Uncovered
  - In direct sunlight
  - Full of water with a few handfuls of sand and gravel

Molds are Tools for Making Quality Parts

- In good condition they make money
- In poor condition they cost money