

Most people know that when you machine HYTAC® materials correctly by following the CMT Machining Guidelines, you will get a plug with a great surface. What is not so clear, however, is *why*, *when* and *how* you might want to modify the surface of the plug through polishing.

Why modify the plug surface?

Temperature, substrate, surface finish, motion, dust and many other factors affect the plug/sheet interface. HYTAC® materials should be polished to a smooth surface finish condition for optimal performance.

A properly polished plug will offer the following benefits:

- Reduced scratching
- Reduced build-up on the plug
- Improved repeatability in the forming process

How should plugs be polished or modified?

There are different schools of thought on *what media to use* to modify the plug surface. Here are some options:

- **Silicon carbide sandpaper:** most commonly used. Can be dipped in water to help reduce dust build-up. **Important note:** water cannot be used with B1X or XTL.
- **Open mesh** or **micro mesh sandpaper:** can be used to reduce the amount of dust or build-up in the grit.
- **Scuff pads:** these are sometimes referred to as ScotchBrite or Beartex pads.

In terms of *methods and tools*, the following have all been used successfully:

- Sanding blocks
- Manual polishing
- Lathe
- Drill press
- Vertical mill
- Dremel or small power sander

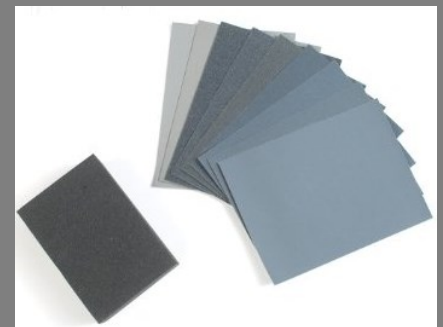
KEY SUCCESS FACTORS

Follow CMT Machining & Turning Guidelines to achieve optimal surface conditions before polishing.

Treat thermoplastics (B1X and XTL) differently than epoxy (W, WF, WFT) and co-polymers (FLX, FLXT, C1R, HTF).

Dip sandpaper in water for epoxies and co-polymers. NOT SUITABLE for B1X and XTL.

Use progressively finer grit polishing media until desired surface is achieved. Avoid heat build-up.

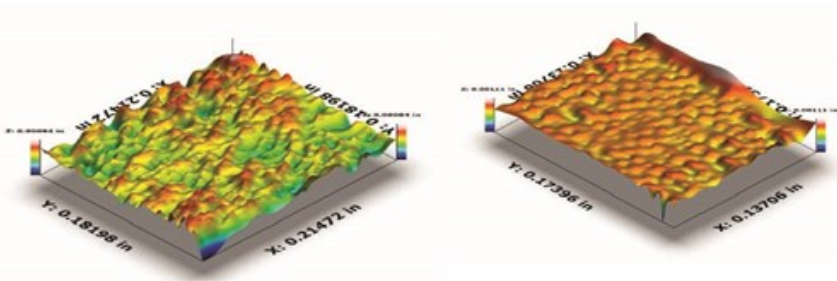


There is no one correct method as the geometry of the plug and the preferences of the user will ultimately determine how to polish the plug.

Where to polish?

It is logical to focus on the contact points where the plug first meets the plastic sheet. Depending on the tool layout and the requirements for the thermoformed part, consider a different finish at key stretch points.

Do not underestimate the impact that polishing can have on a plug assist!



Typical machined plug surface before polishing. Color changes show height variation.

Plug surface after polishing. Rounded peaks prevent scratching. Valleys create air gap for better release.

Some notes on cleaning plugs

To clean HYTAC® plugs, the following options can be used in conjunction with a cloth rag or a fine-mesh scuff pad:

- Sodium bicarbonate (baking soda) and water
- All-purpose cleaner
- Alcohol

Harsh cleaners such as acetone should be avoided.

KEY SUCCESS FACTORS

For manual polishing, use random motion.

For drill press or other mechanical polishing, hold plug in position and rotate at speed.

Start with a grit level just rough enough to reach existing surface imperfections. Avoid creating new marks or gouges. It is typical to start at 400 grit, advancing to 1200, 1500 or 2000 grit as needed for your requirements.

