Using Fillers to Transform Resins

When added to polyester or epoxy resins, fillers can dramatically change the properties of the final product.

Use fillers when you want to:
- thicken resin into putty for patching or filleting
- cause low viscosity resin to hang on a vertical surface
- create an easy-to-sand resin
- reduce the cost of a resin mixture
- strengthen bonding properties
- improve abrasion resistance
- reduce weight, shrinkage, or exothermic heat

Both polyester and epoxy resins readily accept fillers with similar results. When resins with fillers are used for bonding and adhesion, epoxy is recommended because of its adhesive properties. Fillers can affect the pot life of the resin. It is always best to experiment with small quantities first to understand how much working time (pot life) you will have to complete your project.

Where to Use TAP Filler

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* Different Fillers and Micropheres, see paragraphs below.

Tips

Some fillers can be difficult to mix by hand, due to their extremely fine particle size. Use a Squirrel Mixer (available in a TAP store) for mixing fillers thoroughly into resin. However, when mixing Microspheres with a Squirrel Mixer, do not over-mix, as they may break apart causing a reduction in their beneficial properties.

Add fillers in small quantities, especially as you approach the thickness you desire. Resin can thicken suddenly with the addition of very little filler.

Use resins that provide adequate preparation time. Mixing fillers can be a time consuming process which depletes your working time. Fillers can reduce the shrinkage of polyester resin.

Beware of heat build up during the curing process. Excessive thickening of resin can get quite hot and possibly damage the surface being bonded.

Experiment with cure times. Fillers can affect the cure times of the resin. It is always best to experiment with small quantities first to understand how much working time (pot life) you will have to complete your project.

Add fillers in small quantities, especially as you approach the thickness you desire. Resin can thicken suddenly with the addition of very little filler.

Add to polyester or epoxy resins to:
- make resin easy to sand
- strengthen bond properties
- thicken resin to patch/fillet
- reduce cost of resin mixture
- improve abrasion resistance
- reduce weight, shrinkage, or exothermic heat

TAP Plastics

14 PRODUCT BULLETIN
Fillers
Cab-O-Sil
Microspheres
Milled Glass Fibers
Chopped Fiber Glass

15957 SW 72nd Avenue 503 620-4960
710 9th Avenue North 206 389-5900
2770 B Santa Rosa Ave 707 544-5772
606 South B Street 650 344-7127
1008 Blossom Hill Rd 408 265-6400
1212 The Alameda 408 292-8685
4506 Florin Road 916 429-9551
4538 Auburn Blvd 916 481-7584
2842 NE Sandy Blvd 503 230-0770
6010-C Johnson Drive 925 460-8214
1479 Contra Costa Blvd 925 798-0430
6079 C Johnson Drive 510 796-3550
12021 NE Northup Way 425 977-4440
1212 The Alameda 925 798-0420
4232 196th St. SW 425 977-4440
1008 Blossom Hill Rd 510 895-8249
710 9th Avenue North 425 502-7225
707 S. Santa Rosa Ave 707 544-5772
206 389-5900

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Safety

Always work in a well ventilated area. Wear a dust mask when working with fillers, and especially when sanding. Avoid skin contact with resin. Wear rubber gloves.
Milled Fibers
Milled fibers are a fine blend of fibers that thicken resin and give it the strength of glass. The bond-strength and gap-filling properties increase when Milled Fibers are used. Good choice when maximum strength is needed.

Chopped Strand
Chopped Strand uses short (under 1/2”) strands of fiberglass to dramatically increase the strength of resin, especially in bridging gaps. It is not recommended for filleting or where sanding will be required. Reduces shrinkage of polyester resin.

Choosing the Resin
There are many brands of pre-mixed filler/resin compounds. However, mixing your own has two advantages.
1. You can create exactly the properties you desire.  
2. By using TAP resins and fillers for your project, you ensure maximum compatibility throughout all parts of the process. This eliminates the problem of one brand product interfering with another brand.

- TAP fillers work well with both polyester and epoxy resins. If maximum secondary bonding is essential, epoxy is recommended. If secondary bonding is not as important (such as in filleting, surfboard repair, etc.) then polyester works well and is more economical than epoxy. If the surface being repaired is epoxy, then epoxy MUST be used for the repair in order to achieve an acceptable bond. When bonding to oak, teak, redwood, or mahogany, epoxy is recommended.
- TAP has many polyester and epoxy resins. Read the labels and Product Bulletins to decide which resin best suits your purpose. A TAP salesperson will be glad to help you.

How To Use Fillers

Bonding Dense, Nonporous Wood
Bonding nonporous surfaces presents special problems because the substrates (materials being bonded) do not absorb the resin well, creating a weaker bond. Epoxy is recommended for such bonds because of its superior adhesive properties.

- To bond such surfaces successfully the following steps are recommended:
  - Roughen the surfaces with sand paper (60 grit or course).
  - Be sure there is no surface contamination. Avoid using solvents on the wood.
  - Make sure the wood is warm (70 to 80°F) and DRY. Warm wood lowers the viscosity of the resin, promoting better penetration.
  - Coat both surfaces with mixed epoxy and allow time for any absorption.
  - Thicken the resin/hardener mixture to a consistency like peanut butter with Cab-O-Sil.
  - Apply the thickened mixture to one of the surfaces.
  - Using only moderate pressure, clamp the two surfaces together, being careful not to squeeze all the resin out of the joint as this will weaken the bond.
  - To ensure that the two pieces do not squeeze out all the resin, put a layer of fiberglass cloth in the joint. The thickness of the cloth will prevent the two hard surfaces from coming in contact with each other.
  - Allow the bond to fully cure before putting in service (7 days for epoxy).
  - When possible use woods other than oak, teak, mahogany, and redwood for fiberglass applications.

Filleting
A fillet is a cove shaped surface that changes an inside right angle to a smooth curve. Fillets provide more bonding surface and a stronger bond. They also provide backing for fiberglassing inside corners.

To create a fillet:
- Mix Cab-O-Sil with resin to a consistency like peanut butter.
- Apply mixture to the inside corner. If you are currently bonding two pieces, apply the mixture to the surfaces before putting the pieces together. As the pieces are squeezed together, excess mixture will form along the joint.
- Drag the curved end of a stir stick along the inside corner, pulling along excess thickened resin and leaving behind a cove fillet.
- Remove any excess resin with the edge of the stir stick.
- Allow resin to cure and then sand.

Bonding Porous Surfaces
Porous surfaces are often improperly bonded when gaps between surfaces are not filled and the porosity of the surfaces wicks the resin out of the joint, leaving the joint starved and weak.

- Mix apply resin that has not been thickened to both surfaces in need of bonding.
- Watch the surfaces for absorption. As the surfaces absorb the resin, reapply until the surfaces are saturated. The surface will remain shiny wet when saturation is achieved.
- Mix more resin with Cab-O-Sil (or Milled Fibers) to a consistency like peanut butter.
- Apply a bead of the mixture along one of the surfaces and clamp the two pieces together. Do not clamp tight enough to squeeze out all the resin.

Definitions

Viscosity: The resistance of a fluid to flowing. Water is low viscosity; catup is high viscosity.

Thixotropic: The tendency of a fluid (whether high or low viscosity) to stay in place until agitated. Example: A low viscosity (thixotropic) resin may be thixotropic because of its ability to hang on a vertical surface without significant sag.

Viscosity and thixotropy are related but not synonymous.

Notes:
- By using TAP resins and fillers for your project, you can create exactly the properties you desire.
- Mix more resin with Cab-O-Sil (or Milled Fibers) to a consistency like peanut butter.
- Avoid using solvents on the wood.
- Make sure the wood is warm (70 to 80°F) and DRY.
- Coat both surfaces with mixed epoxy and allow time for any absorption.
- Thicken the resin/hardener mixture to a consistency like peanut butter with Cab-O-Sil.
- Apply the thickened mixture to one of the surfaces.
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