SP Systems

Composite Engineering Materials

SP Fillers

Introduction

This guide describes the relevant properties of different filler powders presently supplied by SP Systems. They are used together with various resins (polyester, vinylester and epoxy resins) to modify their properties. The fillers form three distinct categories: Hollow spheres; Microfibres; Colloidal Silica.

HOLLOW SPHERE

Hollow spheres can be generally described as 'microspheres'. They serve to increase the volume and reduce the density of any filled resin system to make adhesive mixes and filling & fairing mixes. Since microspheres serve to 'displace' resin and do not absorb resin into their internal cavities they are useful for creating low density filler mixes, core bonding adhesives and syntactic foams for cosmetic and structural applications. Within this category SP Systems supply two different types of microspheres:

SP Microballoons

SP Microballoons are hollow phenolic resin spheres which have a distinctive reddish/brown colouration thus making them particularly useful for cosmetic fillet joints and fillers in wood construction, as well as structural adhesives for low demanding applications on softer timbers such as cedar. Although not as waterproof as glass bubbles, microballoons are often preferred for their excellent sanding characteristics. Microballoons are not normally used with polyester or vinylester resins because they can be subject to styrene attack which may cause the spheres to collapse.

When storing microballoons, it is particularly important to exclude air as they readily absorb atmospheric moisture which will affect the performance of the filled mix.

Composition:	Phenolic Resin
Appearance:	Red/Brown Powder, occasionally sticky
Particle Size:	50 microns
Bulk Density:	100g/litre

SP Glass Bubbles

SP Glass bubbles are hollow glass spheres with a more variable particle size than microballoons. Being composed chemically of glass, they are physically harder than microballoons and filled resin mixes are noticeably more difficult to sand. However, glass bubbles produce a more waterproof filler mix and are often used on below- waterline applications on boats. Being significantly less expensive than microballoons they are often preferred if ultimate sanding performance and colour are not of prime importance. They can be mixed with microballoons in any proportion for colour purposes.

Composition:	'C' Glass
Appearance:	White powder, free flowing
Particle Size:	40 - 80 microns
Bulk Density:	100-150g/litre

MICROFIBRES

SP Microfibres are very fine wood-cellulose fibres commonly used to create structural adhesives for bonding both wood and grp. Because any low viscosity resin system is readily absorbed into a wood surface, an unfilled adhesive may have a tendency to give a 'dry joint'. Because of their absorbent properties, microfibres can retain a significant quantity of adhesive within a joint and limit resin absorption into the surrounding wood fibres, thus ensuring an adequate resin supply for adhesion. Where the strongest bond is required, e.g. scarf joints on any type of timber, microfibres should always be used on wood joints, in preference to hollow sphere-types of filler.

For bonding parallel to the grain with lower density, lower strength timbers, such as cedar or obeche, a microballoon mix is adequate.

Composition:	Milled bleached cellulose wood pulp
Appearance:	White 'fluffy' fibrous consistency
Particle Size:	200 - 300 microns
Bulk Density:	100g/litre

COLLOIDAL SILICA

SP Colloidal Silica is an agent which is used to control the thixotropy or 'sag' characteristics of a resin system. By adding colloidal silica in varying amounts to a resin mix containing the other filler types mentioned, the handling characteristics can be controlled. Relatively small quantities added to a resin mix containing glass bubbles or microballoons will give non-sag properties and impart easier handling.

Colloidal silica is also added with microfibres to produce a mix suitable either as a high strength non-sagging structural adhesive (particularly for non-absorbent materials such as grp), or as a 'high density' filler. The inclusion of colloidal silica has the effect of increasing the hardness of the resulting mix which will create more difficulty when sanding. For this reason colloidal silica is usually added in the minimum quantities to any mix for which sanding is anticipated. In some applications this feature can be used to advantage, to create a hard wearing edge or surface.

Composition:	Silicon dioxide
Appearance:	White powder, easily airborne
Particle size:	0.012 microns
Bulk Density:	50g/litre

Recommended Mixing Specification

Filler	Adhesive Mix (for bonding) by weight†	Filler Mix (for filling & fairing) by weight†
SP Microballoons	15 - 20%	25 - 30%
SP Glass Bubbles	15 - 20%	35 - 40%
SP Microfibres	7-10%	n/a
SP Colloidal Silica	5%	3-5%**

†expressed as a percentage of the mixed resin/hardener weight.
*generally used in combination with other fillers - see text.
**0.5-1.5% when added to pre-thixotroped resins (eg. SP120).

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SP Systems therefore strongly recommend that representative test panels and component sections are built and tested by the user in order to define the best process and materials to use for the desired component. This should be done under conditions as close as possible to those that will be used on the final component.

SP Systems' guides are being continuously reviewed and updated. Please ensure that you have the current version before using the product, by contacting SP Systems' Marketing Services and quoting the revision number in the bottom left-hand corner of this page.

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