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Use of Zeeospheres® to Reduce Cost and Increase Performance in Highly Filled, Resin Based Construction Compounds

At first glance, Zeeospheres® Ceramic Microspheres appear to be more costly per pound than the typical fillers or aggregates used in grouts or troweled flooring systems. In fact, they actually result in a lower overall cost per gallon by increasing overall particle packing and replacing expensive resin. Their fine particle size and spherical shape allow Zeeospheres® to squeeze between the other filler/aggregate particles and still retain good flow and workability. The improved particle packing also contributes to increased compressive strength and reduced permeability, which improves chemical and corrosion resistance. Zeeospheres® are already widely used in a variety of flooring and grouting systems.

Because of their fine particle size, spherical shape, and a particle distribution that contributes to very efficient packing, Zeeospheres® are known to have the ability to fill the empty spaces between irregularly shaped aggregate particles. In so doing, they can enhance flow (because of their "ball bearing" qualities), increase particle-to-particle contact, and displace a fair amount of the expensive resin normally required to fill these spaces.

Zeeospheres® are already widely used in resin based construction materials including flooring materials, grouts, sealants, mastics, adhesives, and coatings. In these systems, users normally report improvements in cost, strength, application characteristics, and surface finish. These improvements had never been quantified, however.

This study, therefore, examines and quantifies the effect of adding Zeeospheres® to such materials.

Summary of Evaluation Techniques Used

For purposes of this study, a sand-filled epoxy flooring system was used as the test system. It was assumed that the Zeeospheres® effect on filler loading potential, physical properties, flow and handling characteristics of other highly filled, resin based construction materials would be similar.

As a starting point, a "typical" sand-filled epoxy flooring formula was selected. The typical formula shown was based on published starting formulas from several major epoxy resin producers. Although such a typical formula may not represent the optimum achievable without Zeeospheres®, it is believed to be sufficiently representative of many commercial systems to be a valid basis for comparison.

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Below is a "typical" sand-filled epoxy flooring system, based on suggested starting formulas from several major resin suppliers. We have increased the overall filler loading, by adding Zeeospheres® to the point where we believe we have optimized the particle packing.

Material	Product	Wt./Gal	"Typical" System		System "Z"	
			Pounds	Gallons	Pounds	Gallons
Epoxy Resin	Epon 813	9.5	10	1.053	7.90	0.832
Hardener	Epi-Kure 3072	8.13	3.30	0.407	2.60	0.321
Sand	Wedron 320	22.13	57.80	2.612	52.70	2.381
Sand	Wedron 710	22.13	28.90	1.306	26.30	1.188
Zeeospheres®	Zeeospheres® G-800	16.7			10.50	0.629
Total			100.00	5.378	100.00	5.351

	Without Zeeospheres®	With Zeeospheres®
Aggregate/Binder Ratio	86.7/13/3	89.5/10.5
Formulation Weight per Gal.	18.69	18.59
Total Cost per Pound	$0.2695	$0.2363
Total Cost per Gallon	**$5.01**	**$4.42**
Compressive Strength	**7,300 p.s.i.**	**10,700 p.s.i.**

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