

Issue # 10
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Solutions for Cement Plants!!



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No, it's not a hairstyle from the 80's, it is a refractory mineral with numerous beneficial qualities.

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Low Cement Gunitite

A lot has been said of the technology that allows customers to install low moisture, low cement castables by pumping and shotcreting them on a wall, hundreds of feet from a pump. What hasn't been discussed as often, is the just as remarkable developments in refractory gunites that allow the installation of low cement gunites that rival castables in speed of installation and properties. Mt. Savage's brand name for these gunning materials is the same as the castables, **ULTRA-TEK**.

As discussed in a later article, with refractory shotcrete an activator is added at the nozzle to cause a stiffening reaction to allow the material to stick. With low cement gunitite, an activator is added as a dry powder to the gun mix. The material is fed dry through the gun and the water at the nozzle dissolves the activator, allowing the material to stick on the wall. It takes a half a second or so for the activator to dissolve, allowing a little bit of flow with the gunitite on the wall, just like in shotcrete. This flow allows the material to densify enough to get good grain to grain contact, which is essential to develop strength and abrasion resistance in a low cement monolithic.



A Blastcrete, rotary gunitite machine is an excellent choice for modern, low cement gun mixes.



Buzzi says "A water booster pump will ensure proper mixing in the nozzle, leading to less dust, lower rebounds and better properties."

Mt. Savage has known this trick for quite some time; some other refractory manufactures are just coming out with this practice now. When put together with the right grind, and with the care and consistency one uses with shotcrete materials, these products can be the best gunning products available. Mt. Savage offers a wide variety of gunning compositions for the cement industry including **ULTRA-TEK 60 GM** for general and abrasion applications, **ULTRA-TEK 60 ARZ GM** for alkali and build up resistance, and **ULTRA-TEK 50 ALK GM**, a cost effective, alkali resistant product for lower temperature areas where build up is less of an issue.

How do the performance and properties for these gunning materials compare to shotcrete? A couple years ago a contractor had issues with both pumps on a major repair and had to finish the job over the weekend so the plant could hit its schedule. They ended up putting two trucks of **ULTRA-TEK 60 GM** into the tower next to several trucks of competitive shotcrete material. After a year, a thorough inspection showed a definite difference between the gunning mix and the competitor's shotcrete. The gunning mix showed less wear and cracking! Mt. Savage takes a lot of pride in their shotcrete mixes, but also feels comfortable using their **ULTRA-TEK** gun mixes anywhere that a shotcrete material would be used in a cement plant.

Refractory Shotcrete

There is an old saying, high quality, fast service, and reasonable price; pick any two. With Mt. Savage's shotcrete materials, that saying can be tossed out the window; you can have all three. Shotcrete is what Mt. Savage does best, understanding the technology and the importance of bag to bag consistency, to avoid issues in the field.

Refractory shotcrete is relatively new technology. In 1996, two patents were issued for shotcrete, one by Allison, the other by Langenohl and Hughes. The patents are slightly different and both stand today. The main difference between the two is in the activator used to stiffen the materials. Allison teaches hydrated lime as the activator while the other uses a soluble salt solution. MSSR uses the Allison method, as it has several advantages. What both teach is a method to turn a nice flowing, low cement castable into a sticky material that will stay on the wall. Compared to conventional gunite, both have the advantages of better installed properties, lower dust and rebounds, and much faster installation rates.

The key to Mt. Savage's success in shotcrete is consistency. There is an old saying that one bad apple ruins the barrel. This is extremely true when it comes to refractory shotcrete materials. To achieve good, consistent installed properties, every bag of material must be able to be mixed at a consistent water content, pumped hundreds of feet, and react with an activator in a predictable manner. One bad bag can plug or even break a piston pump, causing long delays during installation. The simple key is, don't have any bad bags!!

The basic technology at MSSR is applied to a series of products specifically designed for the cement industry. The workhorse of the family is **ULTRA-TEK 60 ARZ**. This 60% alumina product contains a zircon addition to help against alkali and resist build-ups. This

product is commonly used in lower stages of preheater towers and in calciners and risers. The ease of installation of this product first gets a customer's attention. Its performance over the years keeps it. With its high strength and abrasion resistance giving it tremendous flexibility, it is often used everywhere in a cement plant where shotcrete is used.

More severe areas of the cement tower such as the riser and calciner, call for something more rugged. For these areas MSSR recommends **ULTRA-TEK AZS**. AZS stands for alumina-zirconia-silicate and is based on a fused grain of alumina and zircon. A product based on this grain offers excellent refractoriness, strength, alkali and build-up resistance.

For less severe applications, MSSR has had tremendous success with **ULTRA-TEK 50 ALK**. This cost effective mix is based on high purity fired kaolin and contains an alkali resistant additive. This has been successful in loop ducts and cooler applications. During the winter of 2011, well over a thousand tons were installed in two applications that started at above 250 feet in elevation without one shutdown of the pump due to a material problem. Even startups, generally the hardest part of a shotcrete installation, went without hesitation.

The success of these products and others speak for themselves. During the 2011 cement season, over 2500 tons of MSSR shotcrete were installed. Every bag placed in the pump was successfully installed. Every customer was a repeat customer, and had increased their use of MSSR products due to previous performance.

Cement turnarounds are stressful enough, MSSR believes you shouldn't have to worry about your shotcrete material not making it to its destination.

Trouble Spots = Q-TEK

Every cement kiln operator has a trouble spot in their preheat tower where nothing seems to work. At Union Bridge, Maryland, it was the top of the calciner where the combination of chemical attack and abrasion wore away any cement bonded material within six months. Two years ago they installed **Q-TEK 30 GM**, a two-component, phosphate bonded gun mix. After six months, no noticeable wear was seen and after a year, no repair was necessary.



This year, after two full years, it was thought that this area would be ready for another repair and a truckload of **Q-TEK 30 GM** was shipped to the site. When we got into the vessel and inspected the area, it was apparent that no significant wear was visible. Mt. Savage ended up taking the truck back.

Q-TEK GM is a two component system. A predampening mixer is needed to add the phosphate component to the dry mix. As the predampened mixture is a little on the wet side, a rotary gun with large feed pockets is employed to gun the material. Water is added at the nozzle and dust and rebounds at the nozzle are very low. An activator in the dry component reacts with the phosphate to form a room temperature set. The alumina phosphate bond strengthens the product as the temperature goes up. The final result is very much like a rammed plastic lining without the high labor of ramming the product. The link listed below, shows **Q-TEK** being gunned in a cooler (not cement), demonstrating how well the product goes on the wall.

Q-TEK gun mixes install with very low rebound, and provide outstanding physical properties.

Another advantage of the **Q-TEK** system as a patching material is that it bonds to existing refractory better than cement bonded gunning mixes. Though the best scenario is to have proper anchoring on the patch area, phosphate bonded products will adhere more strongly to existing refractory surfaces than cement bonded products. **Q-TEK** can also be rapidly dried (the Q stands for quick), making them ideal materials for fast turnaround repairs.

In most areas of a cement kiln preheater, calcium-aluminate bonded products are not an issue. Phosphate bonds, however, are more resistant to certain chemical attacks than calcium aluminate cements. If you have one of those areas where nothing seems to work, **Q-TEK**, with its combination of physical and chemical properties, could very well be your answer.

Visit the following YouTube link to see a recent installation of Q-TEK 32 GM:
<http://www.youtube.com/watch?v=QKRD2e49bAo>

Precast Shapes

Precast refractory shapes are an increasingly popular way to install refractories in cement kilns and other associated equipment. Their use in refractories is certainly not new. Precast shapes have been used for many years in steel, glass, aluminum and many other industries.

Precast shapes offer several advantages to the user. Being cured and dried prior to installation means that they do not have to be cured and dried in place. Unless there is field mixed castable installed in the same area, precast shapes can be heated up at the same rates as brick linings. Precast shapes also generally have better properties than field installed materials. This is because they are cast and cured in a more controlled environment. The water content is generally lower and ambient temperatures are controlled to be in the ideal range for strength development.

Applications for precast shapes are virtually limitless, assuming access to where they need to go allows for them. They can be designed into almost any shape or size you can imagine. Precast shapes have provided great service in kilns as nose rings, tail rings and lifters; in cooler curbs, bull noses and impact/drop-out walls.

Producing high quality precast refractory shapes is not exactly rocket science, but does take a little attention to details. Mt. Savage has developed a family of **ULTRA-TEK VC** castables which are optimized for vibration casting. **ULTRA-TEK VC** low cement castables have an attractive combination of casting consistency, quick set and high performance that make them a great choice. They are available in most of the same varieties as the **ULTRA-TEK** pumping, gunning, and shotcreting grades you already love!!

Ask Dr. Dirt

Dear Dr. Dirt;

Our cement tower is pretty high, what is the key to getting refractory shotcrete up to the top of the tower?

Brad in MO

Dear Brad;

It may seem illogical at first, but it is actually easier to pump a long distance vertically than it is a long distance horizontally. The reason for that is when pumping horizontally the coarse materials tend to roll in front of the finer ones and lock up in the hose. When pumping vertically, that obviously doesn't happen. The key to making something pumpable is to have it hold onto its water and have a low resistance to kinetic energy. The technical term used for something that is resistant to kinetic energy is dilatant. Wikipedia defines dilatant as a property of a material that causes increased viscosity with increased shear rate. Water itself is dilatant,

as if you jump from a high height into water, the shear you will cause in the water when you hit it will make it seem more like concrete. All castables are dilatant to a degree. The ones that are less dilatant will pump better, thus Mt. Savage tests several samples of every lot for degree of dilatancy, to make sure your 300-foot vertical pump job runs smoothly, with no headaches.

Dr. Dirt.



Marvelous Mullite

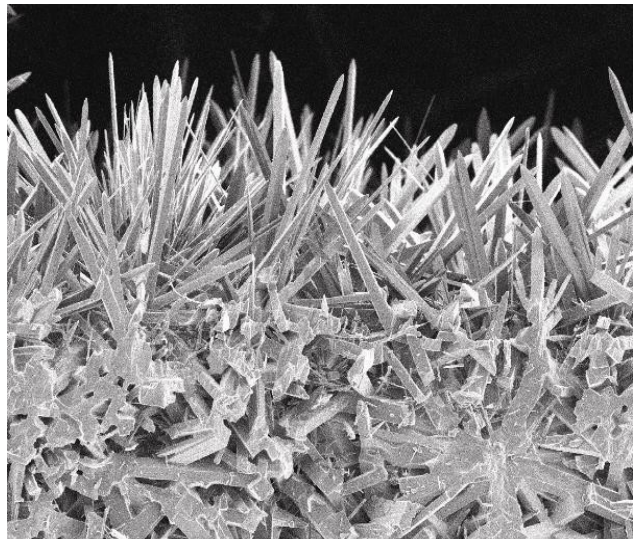
Mullite is a mineral first found in nature on the Isle of Mull in Scotland. This mineral is very rare in nature, but very common in the world of refractories. When alumina and silica are added together and heated to high temperature, usually at least some mullite is formed. In the proper ratios of alumina to silica (approx 72% alumina to 28% silica) it can be mostly mullite, as long as there are not a bunch of other impurities around to interfere. One naturally occurring material, a 70% alumina bauxitic kaolin found in Georgia and Alabama, when fired produces a refractory aggregate that is largely composed of mullite. This product is commercially available from CE Minerals as Mulcoa 70.

A refractory that is based largely on mullite has significant advantages over materials based on lower and higher alumina aggregates. Mullite tends to be very volume stable which allows better thermal shock resistance than many aggregates higher in alumina. With a melting temperature of 1840°C (3345°F), it is extremely refractory, meaning it can withstand much higher temperatures than lower alumina aggregates. This volume stability and refractoriness combined with a grain that has excellent structural integrity and low porosity allow some outstanding products to be made.

One such product that Mt. Savage supplies to the cement industry is **ULTRA-TEK 70 UL** and its coarse version **ULTRA-TEK 70 ULC**. These products are used in firing hoods,

precast shapes, burner pipes, transition rings and a variety of other severe applications. The strength of these products at 2700°F is actually twice as high as bauxite based castables that tend to be more expensive. These marvelous properties can only be achieved by using a majority of the Mulcoa 70 aggregate. Products made with a combination of bauxite and lower alumina aggregates, though less expensive, do not have the same strength and thermal shock resistance.

If you have a severe application in your cement kiln, do not automatically think that higher alumina is better. Often, the in between product, 70% alumina, mullite based castable, can be by far the most cost effective.



Pure mullite crystals

Product data & other useful updates are available on our website. Please visit us at...

www.mtsavage.com
