Silica Fume In Various Applications

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Silica Fume usage is varied and open to the imagination of the designers. It has become 10
an integral part of many of the items we use in our daily life. In this section we have chosen some of the applications that demonstrate the versatility of the product. From High Performance **Concrete** (HPC) in construction projects to filler in lawn care products it is rather amazing how far this “smoke” by-product has evolved.
The earliest applications for high-strength **silica fume** concrete were in columns for High-rise structures . As concrete strength increases column size can be reduced and reinforcing steel designs in the columns can be simplified. Smaller columns equates to more overall floor space available to the owner of the structure and a significant cost advantage, particularly in urban settings.

Cast in place parking garages also moved quickly to incorporate High Performance Concrete into the structures (Illustration # 7). From a design standpoint it’s used for many of the same reasons as high-rise structures. However in this case service may be the most important factor, which is greatly affected by the parking decks susceptibility to chloride attack. The problem is caused by salt in the melting snow. Salt laden snow builds up on cars during driving in the inclement weather, when these cars eventually park in a garage the snow and salt melts leaving puddles of salt enriched water to seep into the concrete eventually attacking the reinforcing steel and causing deterioration of the concrete. By using High Performance Concrete designers have found that the situation can be mitigated due the decreased porosity and increased durability of the HPC concrete.

Marine applications are another area where resistance to chloride penetration is critical. Direct salt-water contact (Illustration # 8) as well as airborne sea salts effect structures such as; Pilings for bridges, wharfs, piers, break walls, and bridge decks. This structure would have been better prepared to resist the aggressive salt environment if silica fume HPC concrete was used in the construction..

Many chemical plants use **silica fume** in their concrete for the reduction in permeability and increased durability. They find that this concrete is much more resistant to attack by acids or other aggressive chemicals. Slowing down the rate of deterioration or time between repairs in extremely aggressive chemical processing areas. Additional benefits also come from the higher strength and increased abrasion resistance.
Nuclear waste storage facilities (Illustration # 9) because of their massive size and complex design have found **silica fume** concrete as a valuable component. By adding **silica fume** to the concrete during the placement of these structures, designers have been able to achieve high early strength for form stripping, long life, and controlled temperature gain for the concrete.

Oil well grouting is another area where **silica fume** is used extensively. In both primary oil well grouting, when the grouting is used as a hydraulic seal in the well bore and secondary grouting such as leak repairs, sealing splits, and closing depleted zones. The addition of silica fume to the oil well grout produces a blocking effect that prevents gas migration. **silica fume** 's ability to decrease the permeability of the grout, slows or stops gas leakage from the well. Increased strength of the cured slurry provides greater durability of the installation and the addition of **silica fume** to the slurry, improves its flow, so the installation is more effective.

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Shotcrete applications such as tunnels, mines, tanks, repairs and domes use large quantities of **silica fume** . The increased cohesion from **silica fume** allows for greater application thickness, particularly overhead, significant reduction in rebound and increased flexural strength. In the construction industry, shotcreting can be either wet or dry. Dry shotcreting is gunning in **refractory** terminology and wet shotcreting is shotcreting. The equipment is the same for both industries as are the installation techniques. Usually wet shotcreting is the installation method of choice because the water is precisely controlled when added to the dry mix in the transit truck, not at the nozzle tip by the applicator as with gunning. In addition there is less rebound with wet mix which translates into a faster installation. Coupled together no rebound and the nozzle man not in control of the water addition, means a more consistent installation.

In the tidal repair of piles and seawalls, the improved cohesion of the shotcrete to itself means greater resistance to washout. **Silica fume** provides higher bonding strength for rehabilitation projects. Lower permeability plus proper air entrainment results in better freeze thaw durability. **silica fume** concrete's high electrical resistivity mitigates reinforcing steel corrosion in chloride rich environments. Bridge columns are a good example of concrete deterioration from the use of road salts.

Concrete roofing tiles and siding is an application that has embraced silica fume. Six years ago, the Japanese export market grew substantially. They had become very conscious of the harmful effects of the asbestos that was an integral part of these construction products in their country and needed to remove it. Research determined that **silica fume** would impart the same properties to these construction products as did the asbestos and a new market was opened.

Fertilizers use **silica fume** along with the weed and feed in order to provide added volume to the fertilizer. It helps in the pelletizing process, provides strength to the fertilizer pellets and causes no harm to your lawn, pets or children. It can also be found in some granulated herbicides.

Rubber and plastic industries also consume **silica fume** . It is an essential part of the "rubber compound" used to make tires. **silica fume** is also a critical compound for the companies making golf balls and for many other plastic and polymer producers. **silica fume** adds to the tensile strength and elongation of these rubber products.

Another interesting use for **silica fume** is in the manufacture of "dry wall". Gypsum based wallboard comes in many forms. The standard grade is used in most of the rooms of your house; a water resistant board used in bathrooms and laundry rooms; and a fire retardant grade used around furnaces and hot water heaters. We have been told that **silica fume** aids in the flow ability of these products during production. But the main use of **silica fume** is in the fire retardant grades because of its heat resistance capabilities.

As you can see the areas of use for **silica fume** and **silica fume** high performance concrete are continually growing as technology advances. New products are engineered and designed almost daily and so the calls come in for samples and information on **silica fume** . Where it will end up is anyone's guess. However to date **silica fume** manufacturers are pleased with the advancements made using this by-product that was once just tossed in a landfill.

This label: Silica Fume