

Difference Between Densified and Undensified Silica Fume



Silica fumes, also known as micro silica, play a key role in enhancing the durability and solidity of concrete.

When you add silica fume to concrete, it remains inactive at the initial stage. But once the water and cement in the mix begin hydrating and reacting to each other, they generate certain chemical compounds.

Calcium Hydroxide (CH) is one of the chemicals, and the other is Calcium Silicate Hydrate(CSH). The CH, also called free lime, is the chemical responsible for lining available pores within the concrete as a filler or leaching out of inferior concrete. CSH, on the other hand, is the strength generating crystallization.

The CH and the silica fume create a pozzolanic reaction that produces more CSH in many voids surrounding the hydrated cement particles.

This extra CSH creates an overall effect of giving the concrete an improved flexural, compressive, and ductile strength. It also gives the concrete a denser matrix, especially in areas that are easily susceptible to ingress and corrosion.

Silica fumes generally come in three forms, depending on their density: densified, half densified, and undensified. But what differentiates densified silica fume from the undensified silica fume?

We'll get to that. But first, what's the production process of silica fume?

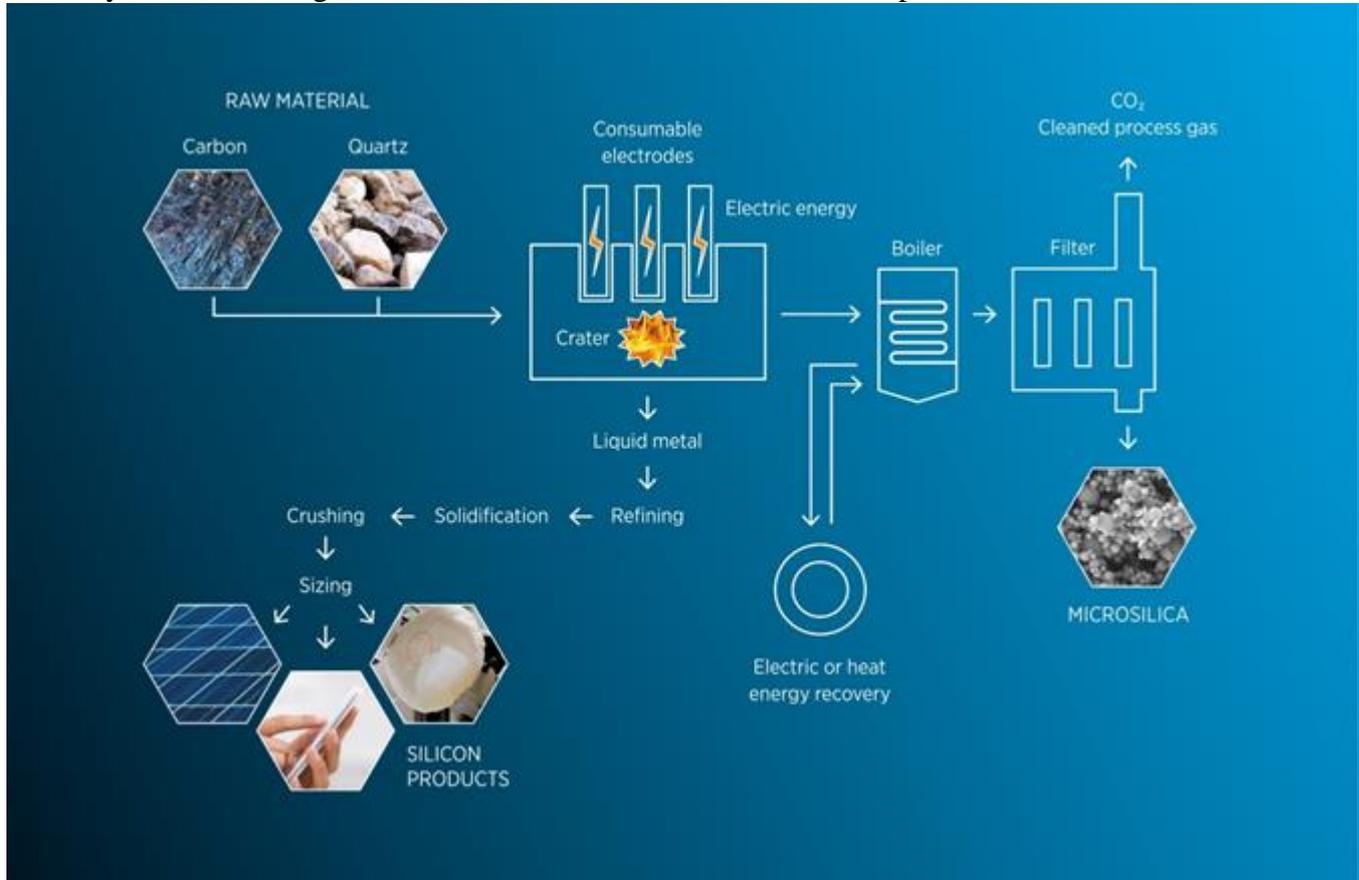
The Production Process of Silica Fumes

Silica fume is made from the smelting process of ferrosilicon alloys and silicon metal used for steel and aluminum production. The raw materials, coal, and quartz are smelted in an electric arc furnace at high temperatures.

During this process, Silicon monoxide is created as an intermediate product in the reaction area in the furnace, which is where the gas moves upwards through the charge.

A part of the silicon monoxide gas is condensed above the reaction zone in the cooler charge. Then the remaining part of the gas escapes from the charge and gets oxidized by the supply of air in the arc furnace above the charge and creates particulate amorphous silicon dioxide (SiO₂).

After that, the particulate amorphous SiO₂ is recovered from the furnace off-gases in a filtration system, normally the baghouse filters where it is packed for commercial use.



What is the Difference between Densified and Undensified Silica Fume?

Micro-silica or silica fume comes in three fundamental product forms: undensified, half densified, and densified. Densified silica fume is the most common type of silica fume used by concrete manufacturers.

It is made by treating undensified silica fume to increase the mass density up to a maximum of around 400 to 720kg/m³. This growth in the bulk density is typically accomplished by tumbling the micro silica particles in a silo. This tumbling causes surface charges to accumulate leading to the contraction of the micro-silica.

The differences between densified and undensified silica fumes can be viewed from various angles, which include:

#1. The density

Both undensified and densified silica fumes have particular weight sizes. And you can detect the difference by simply weighing both silica fumes.

The weight size for densified or compacted silica fume is generally between 550-650KG/m³. On the other hand, the weight of undensified silica fume is between 250-350KG/m³.

#2. The packaging

When it comes to the bagging of undensified micro silica, silica-fumes companies typically use 600KG, 500KG, and 25KG plastic woven bags.

For densified micro silica, silica fumes companies bag them in 25KG 1MT woven plastic bags. They also use 20KG and 10KG water-soluble paper bags.

Microsilica companies make use of water-soluble bags because of the easy method of disposal. They can easily throw in water-soluble bags inside the mixer without debagging.

This will cause less dust and ensure the elimination of environmental pollution that comes from having used bags all over the place.

#3. Product characteristics and application

Both undensified and densified silica fumes have a similar chemical cost but differ in density.

Densified silica fume is made of agglomerates. These agglomerates can range from 1-100 micrometers in size. This makes it difficult to disperse into separate fume spheres.

However, densified silica fume can be dispersed through moderate ultrasonic treatment, which reduces it into smaller clusters.

In some cases, the densified silica-fume doesn't successfully change form but remains largely as agglomerates.

On the other hand, undensified silica fumes are very light, active, and easy to reach. Its density is about 150-200kg/m³, and its size 0.2µm, which makes transportation of the undensified silica fume very expensive. This makes it necessary to make the undensified silica fume densified.

Advantages of densified silica fume



Although there is no clear difference between densified and undensified apart from the density, densified silica fumes still offer some advantages. These advantages include:

- **Cost reduction:** The smaller the size of the product, the lower the price of transportation. And since densified silica fumes are in a compressed state, there is a reduction in the product's cost of shipping or transportation.
- **Dust reduction:** The densified state of the silica fume ensures that there is less dust during its use. The dustless nature of the silica fume creates a better working environment for workers. This makes them safe from the health risks involved in constantly inhaling the dust of silica fume.
- **Easy mechanical pumping which enables great stirring:** The compactibility of the silica fume plays a role in allowing for easier mixing as little quantity can be used for a large mix. It is particularly suitable for mechanical pumping, which is great for stirring.

Contact Us

[Henan Superior Abrasives Import & Export Co., Ltd](#) is one of China's leading micro silica producing companies. We supply high-performance Silica Fume products to concrete and refractory industries all around the globe.

We specialize in the production of densified and undensified silica fumes. Over time we have established a strong clientele network as a result of our quality products. But what makes us different from other micro silica companies?

- Fast delivery
- Proper inspection of products before shipping
- Fast response to requests
- Lack of radiation in our products
- Adequate experience in the production and delivery of silica fume