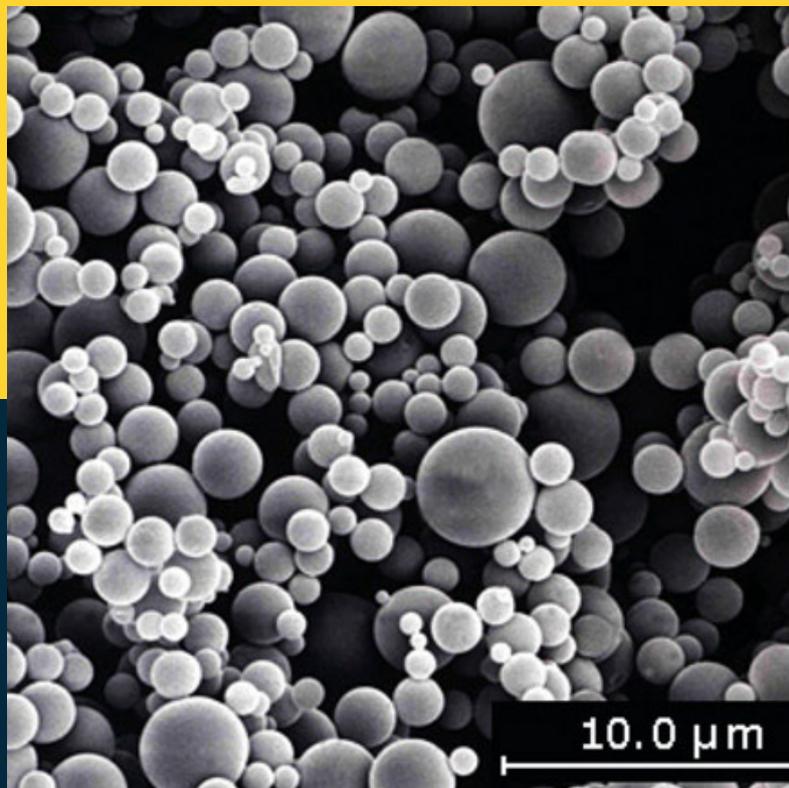


# Marine *Newslink*



WITH YOU ALWAYS

MAY 2020



## **FEATURE ARTICLE**

Cenosphere

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## **PHOTO(S) OF THE MONTH**

Properties of Cenosphere

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## **BONUS ARTICLE**

World for Cenospheres

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## **BACK TO BASICS**

Question Of The Month



spheres, hollow ceramic microspheres, micro balloons, or glass beads.

Cenosphere are chemically inert & are reclaimable and labelled as Environmentally sound.



## CENOSPHERES

The name 'Cenosphere' comes from two Greek words: 'kenos' (hollow) and 'sphaira'(sphere).

Cenospheres are light weight, inert hollow sphere comprising largely of silica & alumina and filled with air or inert gas. Cenospheres are a naturally occurring by product of the burning process of pulverized coal fired boilers. They are formed during the molten state of ash and attain spherical shape to have minimum surface tension. Any gas bubbles (generally inert gases e.g. N<sub>2</sub>, Co<sub>2</sub>, unburnt coal particles etc.) flowing along the combustion gas stream, are also trapped inside the spheres. These bubbles cause the production of Cenosphere; bubbles may occur in multiple forms within the frozen particles, or as a single, concentric form, that are nearly as great as the diameter of the particle. They are found floating on the surface of fly ash lagoon.

Cenospheres are unique free flowing powders composed of hard shelled, hollow, minute spheres. A small proportion of the pulverised fuel ash (PFA) produced from the combustion of coal in power stations is formed as Cenospheres. Cenospheres are made up of silica, iron and alumina. Cenospheres have a size range from 1 to 500 microns with an average compressive strength of 3000+ psi. Colors range from white to dark grey. They are also referred to as microspheres, hollow

Properties of Cenospheres are: Spherical Shape, Lightweight, Inert, Free Flowing, Insulating, High Melting Point, Hard, Electrical Properties, Low Oil Absorption & have Good Packing Factor Applications.

Cenospheres is versatile filler with applications in a wide variety of products, both commercial and industrial. These are as diverse as oil well cementing and PVC cushion vinyl flooring. However, in each case, Fillite is used for its unique properties, such as strength, low density and chemical resistance. As fillete, it finds application in Polyurethane, Cement, Latex Emulsions, PVC, Epoxy Resins & Unsaturated Polyester Resins.

These hollow light weight spheres are produced around the world. Most of the Cenosphere produced today are recovered from ash ponds or lagoons typically onsite at the coal fired power plant.

Fly ash, or the residue from coal after combustion, has been a long-standing challenge for the Indian power sector, which is dominated by coal. Currently, 53 per cent of the total installed power capacity in the country is based on coal. Given that Indian coal has a very high ash content, in the range of 35 to 45 percent, the country currently

generates approximately 160 million tonnes of fly ash, of which only 80 million tonnes is being utilized.

SSI (Sphere Services Inc) was one of the first companies to introduce Cenosphere to the world on the internet. Since that time the Cenospheres have become more widely used and demand has increased for the product. The main benefits of Cenospheres are reduction of weight, increased filler loading, reduction of shrinkage, reduction of viscosity, increased fireproofing, increased lubricity, increased refractoriness and transport savings.

#### **Cenospheres (Fly Ash):**

Used commonly in Syntactic Foams and Low-Density Concrete. The aluminosilicate spheres form naturally from oxide decomposition. They form low density (0.2 to 0.8 g/cm<sup>3</sup>) spheres making them easy to harvest from ash ponds because of natural separation. However, because they are a by-product vs. an engineered, there can be some variability; either facility to facility or on the consistency of the coal burned.

#### **Cenospheres grades can be classified into different categories according to their:**

- colour, such as white / off white or light grey / grey
- chemical analysis, such as Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O and/or Na<sub>2</sub>O content
- physical properties, such as density and (compressive) strength

#### **As a result, the different grades of Cenospheres have their own typical industrial applications, to name a few:**

- a component in lightweight insulating (refractory) products
- a filler for paints, lacquers and plastics
- a light weight aggregate in concretes
- a filler in soundproofing bituminous rubbers, etc.

## WHITE CENOSPHERES



A CENOSPHERE or MICROSPHERE is a light weight, inert, hollow sphere made largely of silica and alumina and filled with air or inert gas. The colour of Cenospheres varies from grey to almost white, with a typical size between 5 and 500 microns. White microspheres naturally occur less frequent and are mainly used in applications, where 'resistance to higher temperature' and/or colour is important.

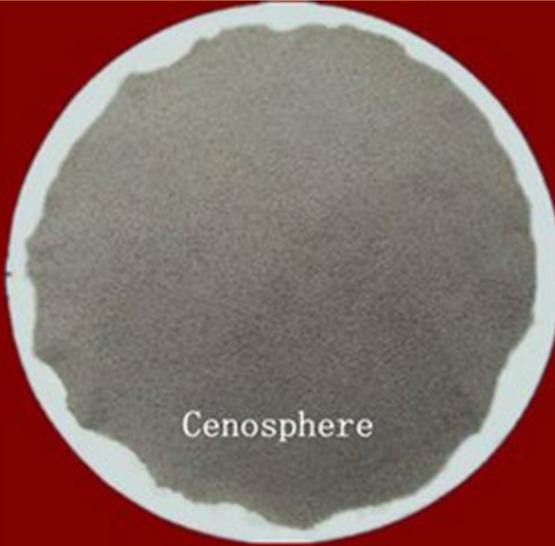
The applications for (white) Cenospheres are for example:

- a component in lightweight insulating (refractory) products
- a filler for paints, lacquers, coatings, plastics and adhesives
- a light weight aggregate in special concretes

White Cenospheres have, in comparison with GREY CENOSPHERES, amongst others a high Al<sub>2</sub>O<sub>3</sub>, low SiO<sub>2</sub> and low Fe<sub>2</sub>O<sub>3</sub> content. Therefore, these microspheres are especially suited for refractory, foundry and other higher temperature applications.

Other trade names used for Cenospheres are microspheres, cennaspheres, e-spheres, enviro spheres, fillite. Sometimes Cenospheres are classified as glass spheres or ceramic spheres.

# GREY CENOSPHERES



Grey Cenospheres naturally occur more frequent than white Cenospheres and are used in many applications as a lightweight aggregate in for example concretes, resins, plastics, paints, coatings, bricks, rubbers, foils and fillers.

Grey Cenospheres have, compared to WHITE CENOSPHERES, a lower Al<sub>2</sub>O<sub>3</sub>, higher SiO<sub>2</sub> and higher Fe<sub>2</sub>O<sub>3</sub> content. Generally grey microspheres are used in applications, where 'resistance to higher temperature' and colour are less important.

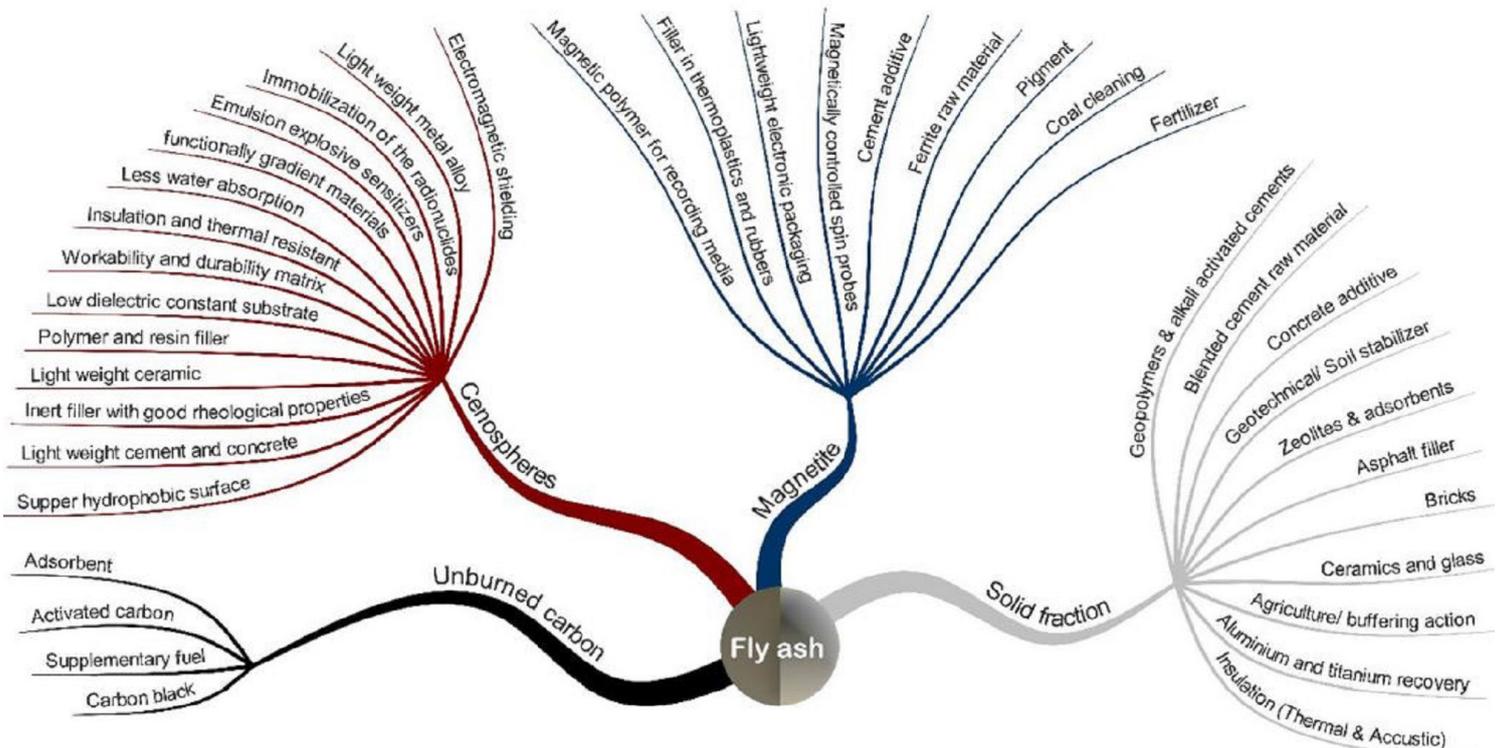
# USES:

Industries such as oil and gas, building, plastics, aerospace, automotive, and surface coating continue to be some of the leading consumers of Cenospheres and new application areas are being devised at an encouraging pace. Owing to their natural properties, Cenospheres can be used in forms such as dry, wet, or slurry. Owing to their inert nature, Cenospheres are not affected by acids, alkalis, water, or solvents. Hence, Cenospheres have an impressive reusability quotient. Cenospheres are nearly 30% lighter than conventionally used resins and nearly 75% lighter than most minerals used as fillers or extenders.

Cenospheres, Ceramic and Glass (Solid and Hollow) Microspheres and Expandable Polymer Microspheres

## Ceramic Microspheres:

There are a great many uses for Cenospheres in the paint and industrial coating industry, due to the additional qualities they provide. For example, Cenospheres are often used in coatings to control infrared radiation, giving those coatings an advantage over ones that merely attempt to limit thermal conductivity. Used commonly in architectural paints and coatings for their durability and resistance to sag. Made from alkali aluminosilicate with a density of 2.4 g/cc. They are UV transparent and have the highest crush strength of any sphere formed additive.



### **Cenospheres in Syntactic Foams**

These are specialized solids which use Cenospheres as a filler to provide any number of advantages, from lower cost, to added strength, sound proofing, buoyancy and thermal protection.

### **Cenospheres in Plastics and Polymers**

Cenospheres also have a use in the manufacture of plastics and polymers, as their re-formable shape or strength helps to avoid shrinkage in thermoplastics and thermosetting plastics.

### **Cenospheres in Pharmaceuticals**

Cenospheres have been used in the pharmaceutical industry for many years, as the small balls can act as a near-perfect transport device when coated with drugs.

### **Cenospheres in Advanced Industries**

Cenospheres are also being used in the development of metal matrix composites (MMC), a variety of materials that attempts to combine the high energy absorption, impact resistance, and low density of the spheres with the qualities of other substances.

### **Solid Glass Microspheres:**

Their retro reflectivity characteristics make them ideal for construction paints. At 1.59G-2.5 g/cc solid glass spheres are one of the heavier additives used as a resin extender. They provide stability, high compressive strength and combat shrinkage in materials like Nylon 6/6. Different production methods including heating irregularly shaped glass and using fusion flow breaking to produce glass droplets.

### **Hollow Glass Microspheres:**

Used for pipeline thermal insulation, drilling cements their buoyancy (0.4-0.6 g/cc) makes them ideal for several offshore applications.

### **Expandable Polymer Microspheres:**

Used widely in flexible PVC in conjunction with a high load of plasticizer concentration for density reduction to 0.5-0.65. Also used in thermoplastics, thermosets, glass and polypropylene composites. Polymer microspheres lower weight extend resin and provide a closed cell foam with good durometer and surface finish control. They also have ultra-low expanded densities ranging from 0.004 to 0.036 g/ml.

Some technologies are more narrowly focused while others have a broader application range.

## **PACKAGING**

Primarily Cenospheres are shipped in jumbo hdpe bags ranging from 1 ton to 5 tons each but can also be shipped in standard hdpe/lDpe bags of 50 kgs and in paper bags with inner plastic liners. Paper bags that can carry up to 100 kgs are also used.



In addition, any other type of packaging like, plastic drums, cardboard drums or even paper or plastic bags are used, this usage depends on whether Cenospheres were filtered using wet method or dry method.

## **TRANSPORTATION**

Cenospheres can be containerised or shipped in break-bulk form in bagged condition. Bags can be directly loaded in ship's cargo holds or on trucks or even in rail wagons.

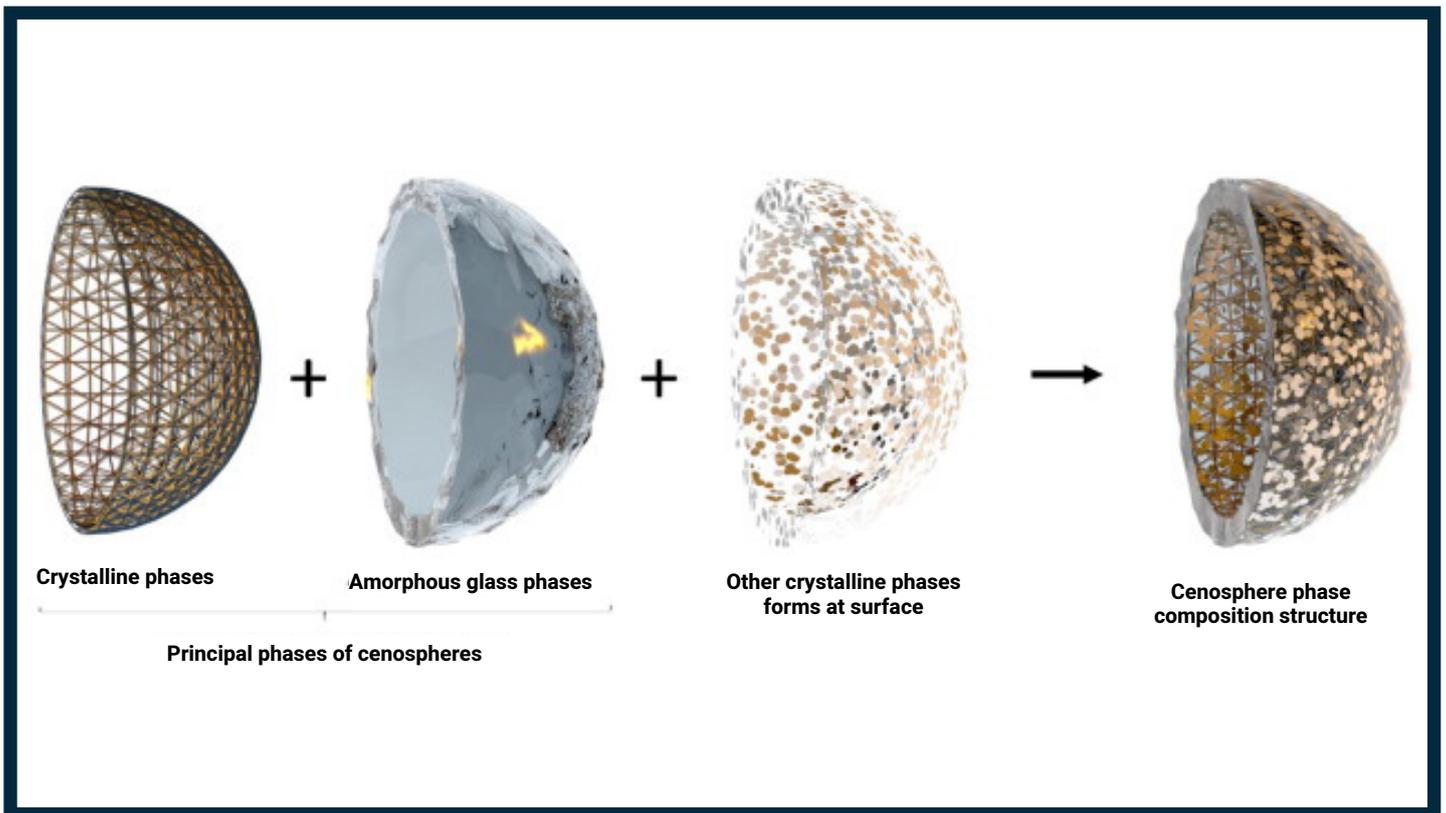
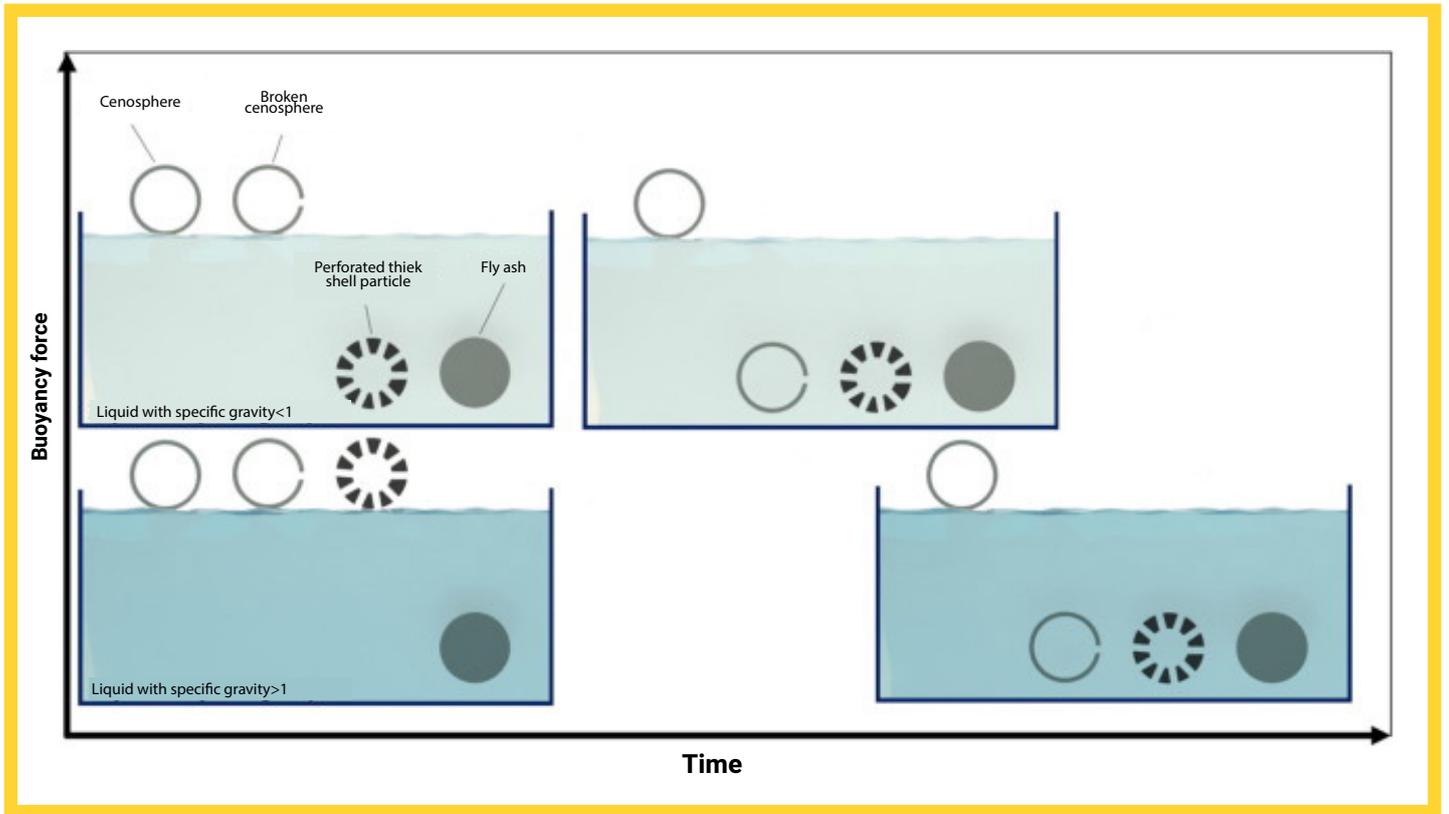


## **RISK**

Cenospheres become alkaline when exposed to moisture or water. Adding water produces (caustic) calcium hydroxide. Reacts exothermically with (some) acid. Exposure to this mixture can cause chemical burns or severe irritation of the mucous membranes, skin, eyes, and other exposed areas.

Incompatible Materials: Strong acids. Metals & Halogens.

# PHOTOS OF MONTH PROPERTIES OF CENOSPHERE



## BONUS ARTICLE WORLD FOR CENOSPHERES



Cenospheres are providing emerging opportunities along with the future effects of major drivers and challenges that support the managers to make cost-effective decisions in favour of the business. The increasing demand from end-use industries including refractory, construction, paints and coatings, and oil and gas, which is expected to take the market to the next level soon.

The global Cenospheres market was valued at USD 346.8 Million in 2016 and is projected to reach USD 689.2 Million by 2022, at a CAGR of 12.16% from 2017 to 2022. The growing demand from end-use industries, such as paints & coatings, refractory, construction, and oil & gas is expected to drive the market in near future. However, limited sources of raw material and lack of quality control across emerging countries are major factors that may restrain the growth of the market.

The grey Cenospheres segment is expected to witness the highest growth from 2017 to 2022, as they are widely used across industries. The demand will increase also because the grey cenosphere is produced more frequently as compared to the white cenosphere in fly ash. The demand for grey cenosphere suppliers from India is rising because they deliver quality material which contains a low content of alumina and is high in silica and iron content that has found uses in several applications such as plastics, concretes, coatings, resins, bricks, and rubbers.

North America is projected to be the fastest-growing Cenospheres consumer market during the forecast period, due to the growing oil & gas and automotive industries. The market in Middle East & Africa, Asia-Pacific, and South America is also expected to witness significant growth, due to growing demand for Cenospheres from the oil & gas and construction industries in these regions.

Industries such as oil and gas, building, plastics, aerospace, automotive and surface coating continue to be some of the leading consumers of Cenospheres and new application areas are being devised at an encouraging pace. Owing to their natural properties, Cenospheres can be used in forms such as dry, wet, or slurry. Owing to their inert nature, Cenospheres are not affected by acids, alkalis, water or solvents. Hence, Cenospheres have an impressive reusability quotient. Cenospheres are nearly 30% lighter than conventionally used resins and nearly 75% lighter than most minerals used as fillers or extenders.

The main application of Cenospheres as bulk fillers in all the end-user industries is expected to act as catalysts for the growth of the overall Cenospheres market over the forecast period. Moreover, as Cenospheres are small and have great compressive strength they are used as a structural lightweight filler, thus the Cenospheres market is expected to see rapid growth in all developed and developing countries in the future.

# BACK TO BASICS

## QUESTION OF THE MONTH

**Which country is the largest producer of Cenospheres in the world?**

### LAST MONTH'S QUESTION

Insured is holding a Marine transit Open policy with INLAND TRANSIT (RAIL/ROAD/AIR) CLAUSE – A (all Risk) 2010.

A reefer truck load of food items (insured under this policy) is on its way from Gujarat to Chennai, Tamil Nadu. The LR date is 17th March 2020. The truck enroute to Chennai is not allowed to move onwards from Vijaywada in Andhra Pradesh on 20th March 2020. The cargo was temperature sensitive in nature, so to safeguard it against temperature excursion, the transporter stored it in a transporter's godown with necessary facilities by incurring additional expenses. There was a short circuit on 28th March 2020 and a fire broke in the godown where cargo was storage and damaged the cargo. The policy excludes storage which is not in ordinary course of transit.

Question: Is this loss due to fire admissible under the policy?

### LAST MONTH'S ANSWER:

The transporter had stored the consignment/Goods in their Godown during the ordinary course of transit and it cannot be said as intentional storage which is excluded in the policy. Also, as per Duration clause the consignment had not reached the destination, i.e. Chennai. Hence the transit was not over and damage to consignment during the ordinary course of transit is covered.

Hence the answer to the above question is – Yes, loss due to fire is admissible under subject case.

### CORRECT ANSWERS SENT BY: (In order of replies received)

- SHRADDHA JAIN - Tata AIG General Insurance Co. Ltd., Pune
- NIRAV SANGHAVI - Tata AIG General Insurance Co. Ltd., Ahmedabad
- SAURABH AGRAWAL - Tata AIG General Insurance Co. Ltd., Noida
- HEMA RAGHAV - Optima Insurance Brokers Pvt Ltd., New Delhi
- BHARAT BHUSHAN - Optima Insurance Brokers Pvt Ltd., New Delhi
- MD MAAZ SHAIKH - Tata AIG General Insurance Co. Ltd., Parel, Mumbai
- VIJAYANAND V - Mahindra Insurance Brokers Ltd., Chennai

**PLEASE SEND YOUR REPLIES/ANSWERS TO ADDRESSES  
GIVEN ON LAST PAGE OF THE MARINE NEWSLINK.**

**IF YOU HAVE ANY COMMENTS / FEEDBACK  
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