

SAND


*A Renewable and Virtually
Inexhaustible Resource*

*Satisfying expected
demand for centuries*



A Virtually Inexhaustible Resource

Sand is one of the most abundant minerals on earth. It can be found virtually everywhere - in rivers, oceans, air, mountains and glaciers. Sand deposits occur under a variety of geographic and geologic conditions. Some deposits renew themselves annually or almost annually due to floods, storms, or other acts of nature that move large volumes of sand.



*Known deposits could satisfy
U.S. needs for centuries.*

*World resources are similarly immense.
U.S. and world natural sand resources are
more than adequate to supply current
and projected needs.*



Sand as a Rapidly Renewable Resource

Sand is considered a renewable, even rapidly renewable resource. Sand deposits occur under a variety of geographic and geologic conditions, and some deposits renew themselves annually or nearly annually, due to floods, storms, or other acts of nature.



*Normal, ongoing geological processes
generate new deposits of sand in the
hundreds of millions of tons each year.*

- Abundant sand replenishment in rivers is assured due to the unceasing action of running water carrying sediment.
- Certain riverine sand deposits replenish themselves by trapping some of the moving sediments in mined pits.
- Worldwide sediment discharge rates from the oceans range from 13.5 to 18.3 billion tons per year. North America alone contributes from 1.5 to 1.8 billion tons each year. A substantial amount of this sediment is made up of sand size materials.
- There is even more sediment produced by weathering that is sorted and stored in rivers or lakes along the way. Probably 5 to 10 times the ocean discharge tonnage are in river storage.
- Much more raw sand is generated annually than is used by man.

What is Sand?

Sand is a common material critical to the manufacture of many modern technologies. It is the final product of rock weathering, an important part of the rock cycle. Weathered grains are transported mainly by water on an oft-interrupted quest for the sea. Forces which produce sand occur all over the Earth and so sand is found in all parts of the globe. Sand can be made of many different minerals but industrial sand deposits are made mainly of quartz. Quartz is the most common mineral in the crust of the Earth, comprising 35% of all rocks.

Geologic processes continuously form, liberate, transport, sort, clean, and concentrate huge tonnages of quartz.

Forces

all



which produce sand and sand parent materials occur over the Earth and so sand is found in all parts of the globe.



How is Sand Made?

Weathering

Weathering is the assault of chemical and physical forces upon the rock including temperature changes, wetting and drying, sunlight, microorganisms, and most importantly freezing and thawing of ice or crystallization of other minerals. Rock and mineral fragments, once liberated from their igneous origins, move by gravity, ice, water, or air currents toward the lowest points on Earth, usually the sea floor.

Erosion and Transport

Erosion and transport of grains result in destruction of physically weak minerals as they cascade down mountains, crash into boulders, and grind against each other. The constant jostling reduces the size of mineral grains, grinds off corners and eliminates unstable or weaker minerals. The aggregate of weathered and transported grains is called sediment.



Sediment

The annual sediment discharge from major rivers in the United States alone exceeds 603 million tons or about 245 tons per square mile. Worldwide values exceed 8 billion total tons or 520 tons/square mile.

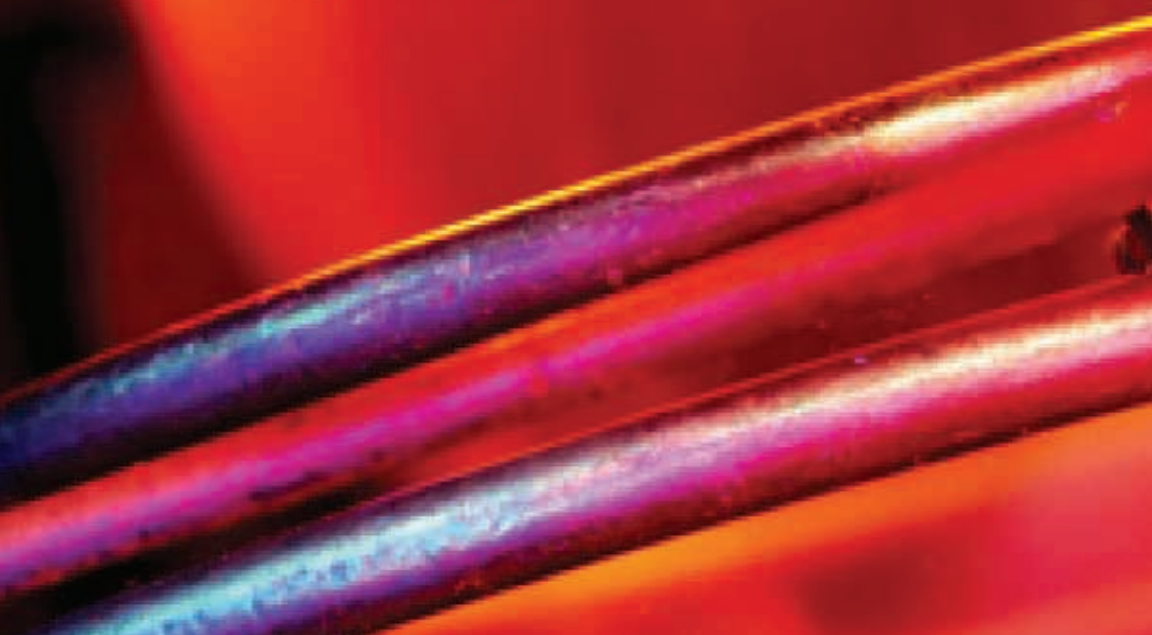
Sand in the Air


Sand is deposited in dune forms where abundant sand materials, dry conditions, and sufficient wind are combined. Wind is an especially good agent for sorting sand grains. Desertification by dune movement can cause severe disruptions to human activity, but it also shows the Earth's ability to replenish sand deposits.



Silica Sand Use

The main use for silica sand is glass making. Different kinds of glass require different levels of purity and grain size. Glass fibers used for reinforcing, insulation, and textiles are made of very pure silica. The raw material is melted at about $1,100^{\circ}\text{C}$ and made into fibers by forcing the melt through centrifugal spinners aided by jets of air or steam.





Fiber Glass Insulation

The U.S. produced 29.7 million metric tons of industrial sand in 2004 (1,736 thousand metric tons were used to produce fiber glass alone) and worldwide production was 115 million metric tons. The U.S. produces nearly 30% of total world production from more than 150 operations. Use of this renewable resource along with use of recycled post-consumer glass produces a product which saves more than 12 times the energy used to produce it in its first year of installation. Fiber glass insulation is the largest secondary market for recycled glass containers. These products go on to save that same amount of energy for the life of the building. Fiber glass insulation is made from a resource that will always be in plentiful supply because of nature's systematic and continuous production of sand.

Amazing amounts of sand are used

*each year to build roads, buildings and
all manner of facilities public or private.*

About NAIMA

NAIMA is the association for North American manufacturers of fiber glass, rock wool, and slag wool insulation products. Its role is to promote energy efficiency and environmental preservation through the use of fiber glass, rock wool, and slag wool insulation, and to encourage the safe production and use of these materials.



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*For more information
or a copy of the paper
"The Time of Sands:
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Resource" upon which
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