Power plant materials

TEHTY SUOMESSA
MADE IN FINLAND



GR-Granuli

Alkali-resistant bed material

FESCON

GR-Granuli

Optimisation of the combustion process using fluidised bed material

Natural sand is commonly used as a fluidised bed material in fluidised bed boilers. The problem with natural sand beds is the sintering of the fluidised bed, which studies show is caused by the reaction of quartz found in the natural sand with the alkalis sodium and potassium found in the fuel. The reaction between the quartz and the alkalis forms a mixture with a low melting point on the surface of the quartz particle. This mixture causes the particles of the bed material to stick together, leading to a reduction in fluidisation and, in the worst case, to a complete cessation of fluidisation. Biomass fuels, especially forest residues and sludges, are rich in alkalis and pose challenges in the combustion process. The solution to these problems is GR-Granuli, an alkali-resistant fluidised bed material.





Uninterrupted energy production

Bed sintering causes significant disruption to the availability of combustion plants and, in the worst case scenario, considerable costs if energy production has to be stopped completely due to bed sintering. The sintering of the fluidised bed can be avoided by choosing GR-Granuli as the fluidisation material.

GR-Granuli is a quartz-free fluidised bed material processed from a by-product of the steel industry. GR-Granuli is produced in a molten state, which guarantees the homogeneity and uniformity of the product. GR-Granuli is a product of circular economy and environmentally friendly.

- GR-Granuli is a mineral with a structure similar to natural sand.
- GR-Granuli is slightly lighter than typical natural sands.
- The lightness of GR-Granuli and the refining process make it possible to adjust fluidisation. For example, in the case of low power demand or start-up, fluidisation can be reduced.
- GR-Granuli has a chemical composition similar to natural sand and does not contain any heavy metals or harmful substances.
- GR-Granuli can be recycled in a fluidised bed for much longer periods than natural sand due to its low fouling levels and inertness to alkalis.
- GR-Granuli is more heat resistant and less abrasive than natural sand.
- GR-Granuli enables cleaner combustion in many different ways.

Properties of GR-Granuli bed material

- Quartz content < 5%
- Melting temperature / thermal resistance > 1,300°C
- Bulk density 1.3 kg/dm^3
- Typically, the need for replacement of the fluidised bed is reduced by 70% compared to natural sand. The fluidisation characteristics of the bed can be adjusted as required.
- GR-Granuli contains no combustible material.
- The consumption of GR-Granuli is 25% lower than that of sand when the consumable material is a low-density superheater tube.
- GR-Granuli allows lower flue gas emissions.
- GR-Granuli helps prevent chlorine corrosion of heat exchanger surfaces.

ELEMENT CONTENT	WEIGHT %
Sodium, Na	0,39
Magnesium, Mg	5,1
Aluminium, Al	4,9
Silicon, Si	15
Sulphur, S	1,5
Chlorine, Cl	0,01
Potassium, K	0,46
Calcium, Ca	30
Titanium, Ti	1,2
Vanadium, V	0,08
Manganese, Mn	0,32
Iron, Fe	0,53
Strontium, Sr	0,05
Zirconium, Zr	0,02
Barium, Ba	0,08

Summary

- With GR-Granuli the need for bed replacement is typically reduced by 70% compared to natural sand, as there is no particle agglomeration caused by alkali reactions. A sieve can therefore be used to recycle the bed and remove lumps and non-burnable materials that come with the fuel.
- GR-Granuli floats better than natural sand and swells more due to its lower density, allowing the use of a thicker fluidised bed.
- GR-Granuli's high melting temperature inertia of > 1,300°C allows higher temperatures than that of the sand, thus enabling optimal combustion.
- The GR-Granuli bed fouls much more slowly than a natural sand bed, allowing for a longer service life, which also significantly reduces the amount of bed sand waste generated.
- GR-Granuli is a less consumable material compared to natural sand.

References

We already have 16 satisfied power plant customers in Finland and Sweden using GR-Granuli as their bedding material.



Metsä Board, Kaskinen, Finland

- Introduction of Granuli in September 2016.
- Fuel consists of wood bark and water treatment plant sludge with varying sodium content.
- Bed material consumption reduced by about 70% compared to natural sand beds.
- The amount of bed sand waste has decreased proportionately.



UPM, Tervasaari, Finland

- Blast furnace slag introduced at the UPM Tervasaari plant in June 2017.
- Main fuels are logging waste, by-products wood processing, peat and REF fuels.
- The bed material exchange rate has reduced from 10 to 15 tonnes per day to the current 2 tonnes per day.

FESCON

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