



Spherical Ceramic Sand for Foundry

Naigai CERABEADS 60

for Any Kind of Metal

- > Anti-Burn-On
- > Thermal Expansion Control
- > Reduced Waste and Health Hazard
- > Wide Choice of Particle size
- > High Reclamation Yield



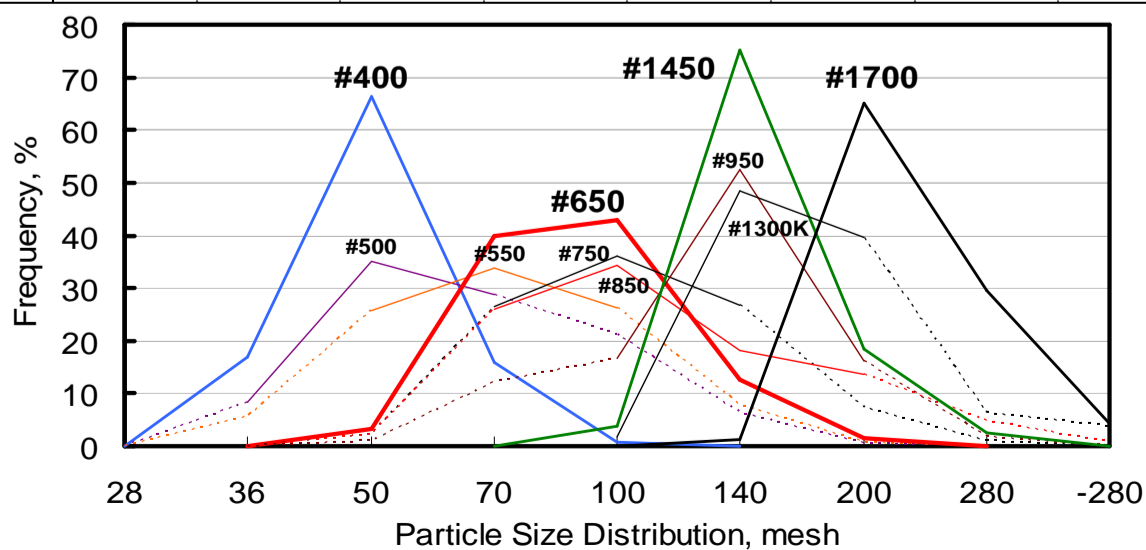
CERABEADS #650



MULLITE BALL 1.0 - 0.2 mm

Particle Size Distribution, % (Typical Value)

mesh	Mullite Ball 1.0 - 0.2 mm	CERABEADS										μ m		
		#400	#500	#550	#650	#750	#850	#950	#1450	#1300K	#1700			
18.5	7.7													850
28	29.3													600
36	41.1	16.9	8.3	5.6										425
50	18.8	66.4	35.0	25.8	3.3	2.3	2.2	0.9						300
70	2.6	15.9	28.8	33.9	39.8	26.6	26.0	12.0						212
100	0.5	0.8	21.1	26.2	42.8	36.1	34.4	16.7	3.8	1.8				150
140	Tr.		6.3	7.8	12.7	26.8	18.1	52.6	75.3	48.5	1.3			106
200			0.6	0.7	1.4	7.2	13.7	16.1	18.3	39.7	65.1			75
280						0.9	4.8	1.8	2.6	6.2	29.5			53
-280								0.8		3.8	4.2			-53
AFS-GFN	28.1	40.1	52.7	56.1	65.8	78.3	85.6	96.7	108.7	129.1	155.5			



Major Properties

Typical Value

	CERABEADS (Japan)	Zircon (Australia)	Chromite (South Africa)	Silica (Australia)
Refractoriness	SK37 (1825 C / 3317F)	SK37 (1825 C / 3317F)	SK39 (1880 C / 3416F)	SK33 (1730 C / 3146F)
Bulk Density *, g/cm ³ / lb/ft ³	1.69 / 106	2.95 / 187	2.81 / 175	1.58 / 99
pH	7.2	5.7	7.9	6.6
Thermal Conductivity, W/mK	0.223	0.305	0.258	0.255
Thermal Expansion, %	-0.03	0.18	0.26	1.50

*Measured after vibration

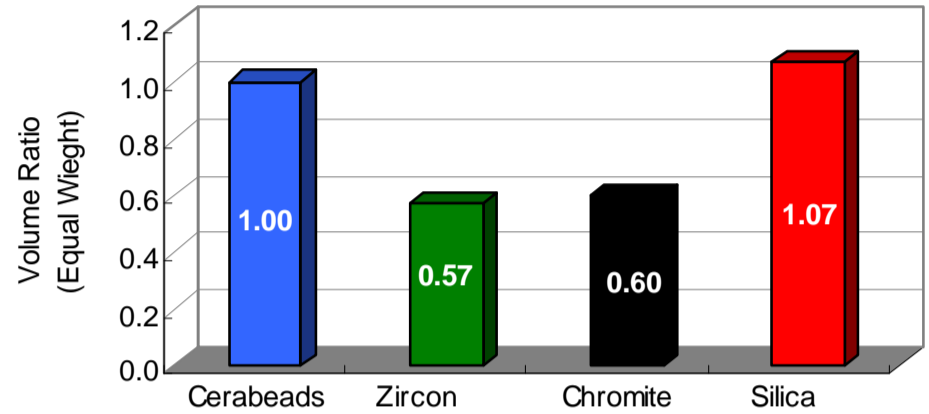
Bulk Density

CERABEADS is **lighter** than other special sand.

Testing method

- 1) Bulk density is measured after vibration.
- 2) Volume ratio is calculated by following formula.

$$\text{Volume ratio} = \text{Cerabeads density} / \text{Other sand density}$$



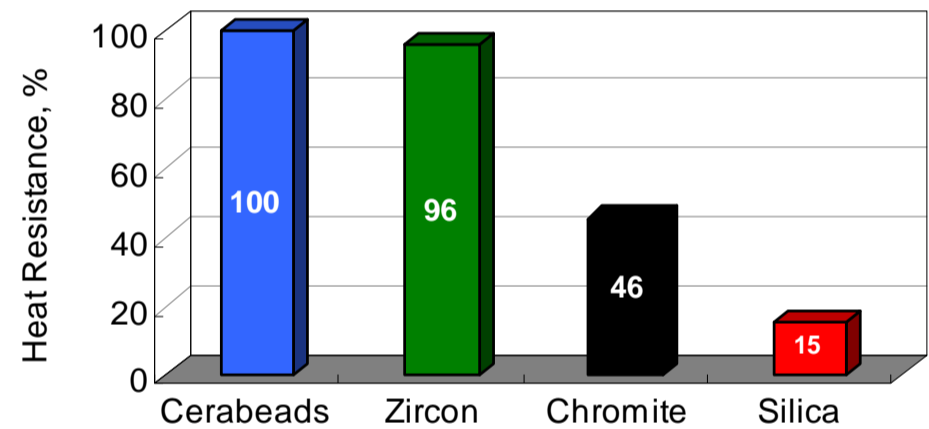
Heat Resistance

CERABEADS has very **High Heat Resistance**.

Testing method

- 1) Sand is heated at 1500 C (2732 F).
- 2) Fused sand is separated by sieve.
- 3) Heat Resistance is calculated by following formula.

$$\text{Heat Resistance} = \text{weight under sieve} / \text{Total weight} \times 100 (\%)$$



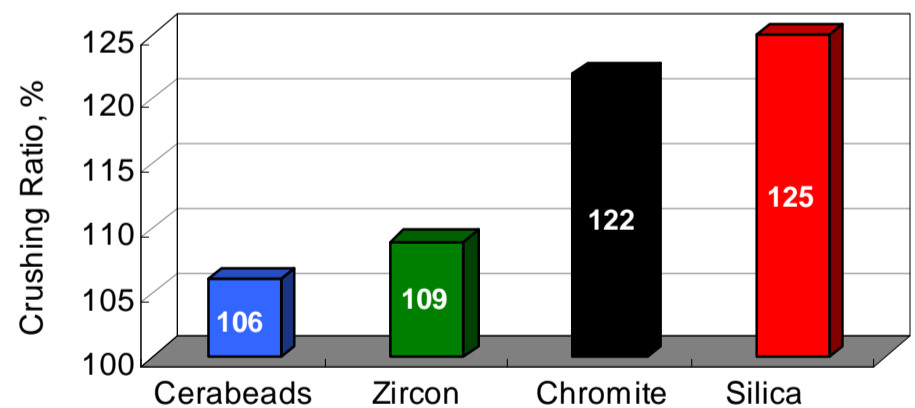
Crushing Ratio

CERABEADS has High Durability (= Low Crushing Ratio). It is possible to **Reduce Sand Waste** and **Increase Sand Reclamation Yield**.

Testing method

- 1) Sand is crushed by pot mill with alumina ball.
- 2) AFS GFN is measured.
- 3) Crushing ratio is calculated by following formula.

$$\text{Crushing ratio} = \text{Crushed AFS-GFN} / \text{Original AFS-GFN} \times 100 (\%)$$

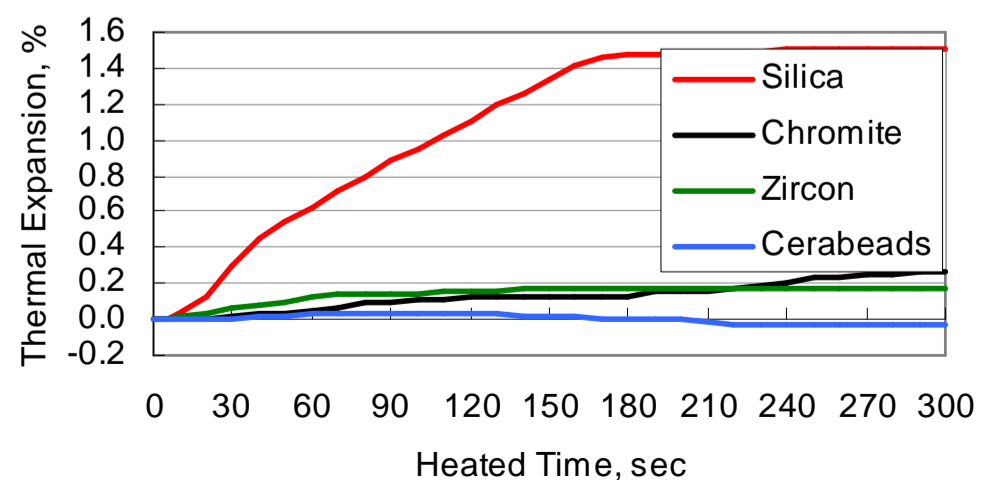


Thermal Expansion

CERABEADS is good sand to **control** thermal expansion of core by mixing to silica sand.

Testing method

- 1) Test piece is formed in shell process.
- 2) Thermal expansion is measured under 1000 C (1832 F).



Major Properties

Chill Effect

CERABEADS provides good heat transfer when used with black iron oxide.

	Heat Transfer (W/m-K)
Chromite	0.790
CERABEADS #650+ Spherical Black Iron Oxide 4%	0.721
CERABEADS #650+ Spherical Black Iron Oxide 8%	0.849
CERABEADS #650	0.691

Testing method

- 1) Test piece is formed in sodium silicate process
- 2) The size of the test piece is 230 x 115 x 50mm.
- 3) Heat Transfer is measured under room temperature.

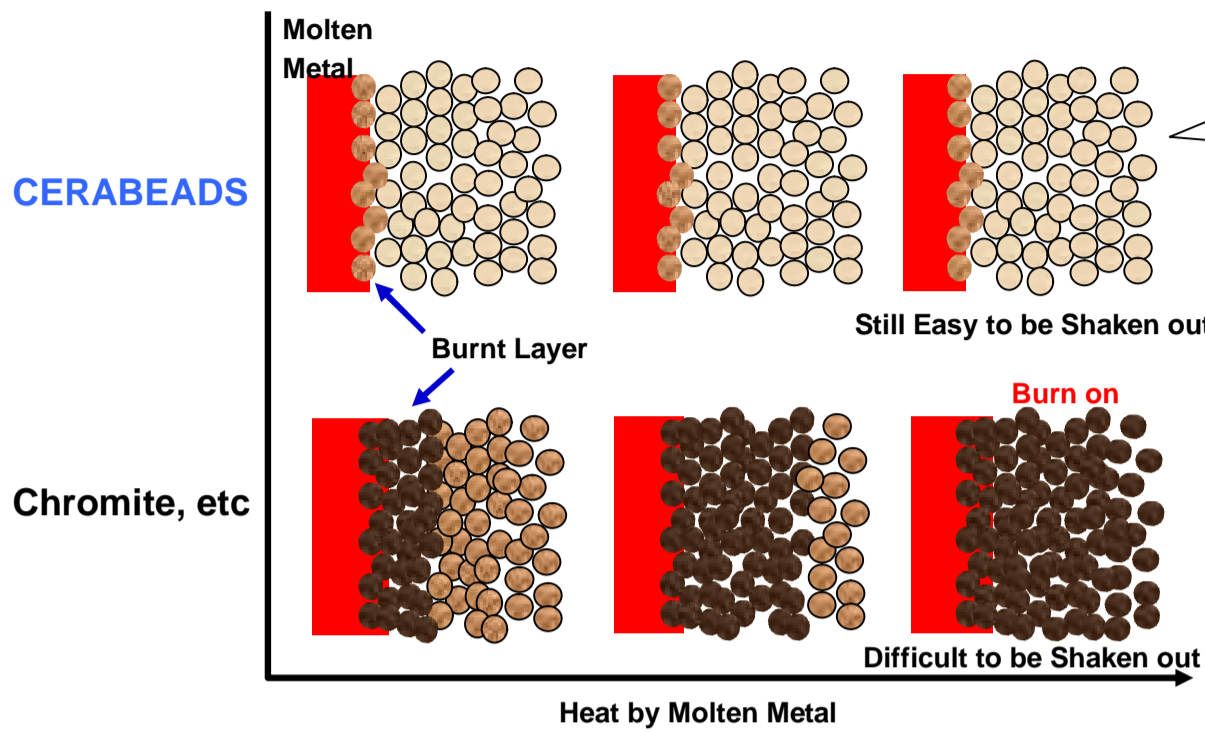
Customers

Customer	County	Type of Metal	Casting Weight	Process	Type of CERABEADS	Purpose of using CERABEADS
A	U.S.A.	Low Alloy Steel, Carbon Steel	1,000 to 7,000 lbs	Phenolic Urethane No Bake	#850	Replacing zircon
B	U.S.A.	Low Alloy Steel	400 to 15,000 lbs	Phenolic Urethane No Bake	#850	Replacing zircon
C	U.S.A.	Stainless Steel, Low Alloy Steel, Carbon Steel	8,000 to 10,000 lbs	Phenolic Urethane No Bake	#850	Replacing zircon
D	U.S.A.	Stainless Steel	1,300 lbs	Phenolic Urethane No Bake	#650	Replacing zircon
E	U.S.A.	Gray Iron	7,700 lbs	Phenolic Co2	#950	Replacing other ceramic sand
F	U.S.A.	Ductile Iron	50 lbs	Shell	#850 (Mixed with silica sand)	Replacing zircon
G	Canada	Stainless Steel	8,500 lbs	Furan No Bake	#650	Replacing zircon
H	Korea	Stainless Steel, Low Alloy Steel, Carbon Steel	66,000 lbs	Ester-Cured Phenolic No Bake	#650 & 850	Better surface finish and reducing sand disposal
I	Japan	Stainless Steel, Low Alloy Steel, Carbon Steel	220,000 lbs	Ester-Cured Phenolic No Bake	#850	Replacing zircon
J	Japan	Stainless Steel, Low Alloy Steel, Carbon Steel	15,000 lbs	Ester-Cured Phenolic No Bake	#650	Replacing chromite
K	Japan	Stainless Steel	90 to 700 lbs	Sodium Silicate	#650	Replacing zircon

In addition to the above mentioned customers, CERABEADS is used by more than 100 foundries all over the world for various types of castings such as mining & construction machineries, automotive parts, gas & oil facilities...etc, just as explained in the following pages.

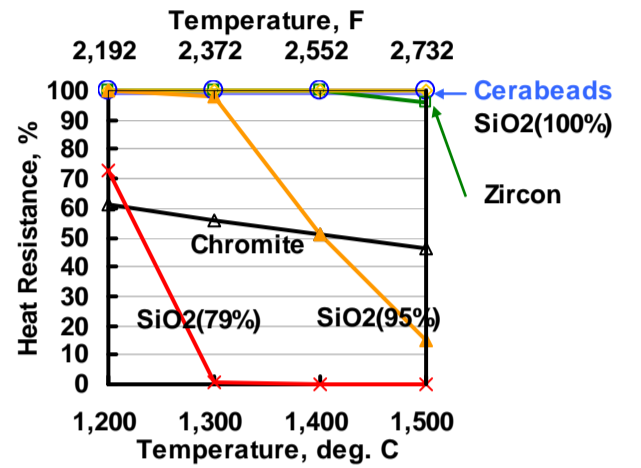
Cast Steel

Anti-Burn-on (Good alternative to **Zircon** and **Chromite** sand)



Metal penetration due to higher head pressure can be avoided with,

- Choice of **Finer size**
- **Black Iron Oxide (BIO) addition** (BIO helps to keep core/mold stable at hot spot.)



Applications

Weight

Process Compatibility

- Alkid Isocyanate
- Furan
- Green sand
- Phenolic Ester & CB
- Phenolic Urethane - NB & CB
- Shell
- Sodium Silicate etc

Carbon Steel 8 t, Phenolic Ester, #650

Low alloy 47 t (Max. 250 t)
Phenolic Ester, #850

Stainless 4.5 t, Phenolic Ester, #650

Carbon Steel 4.3 t, Phenolic Ester, #650

Cr-Mo Steel 4 t, Phenolic Ester, #650

Hi-Mn Steel 2 t, Phenolic Ester, #650

Carbon Steel 740kg, PU-NB, #850

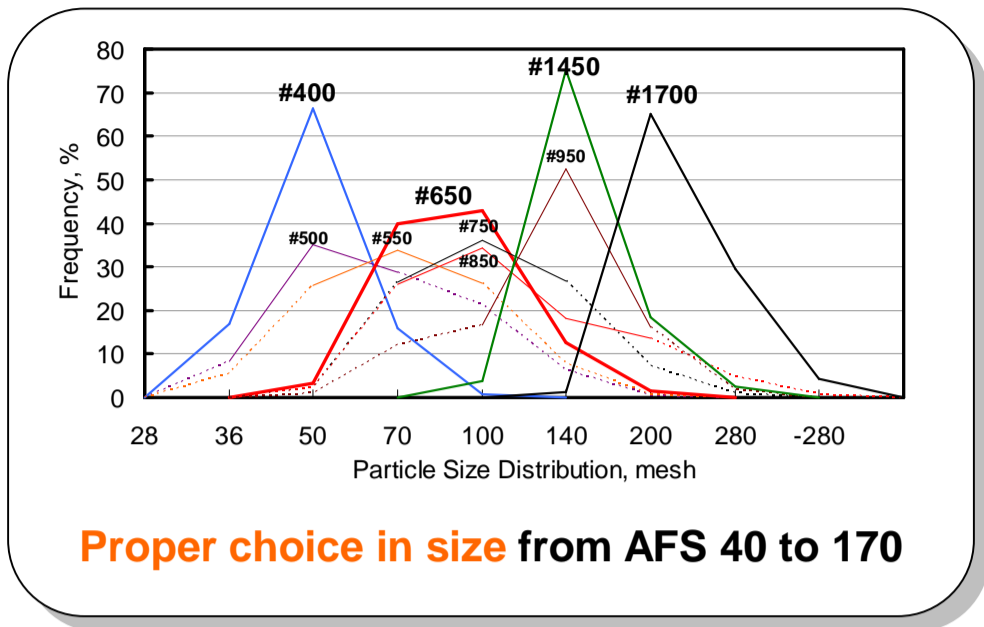
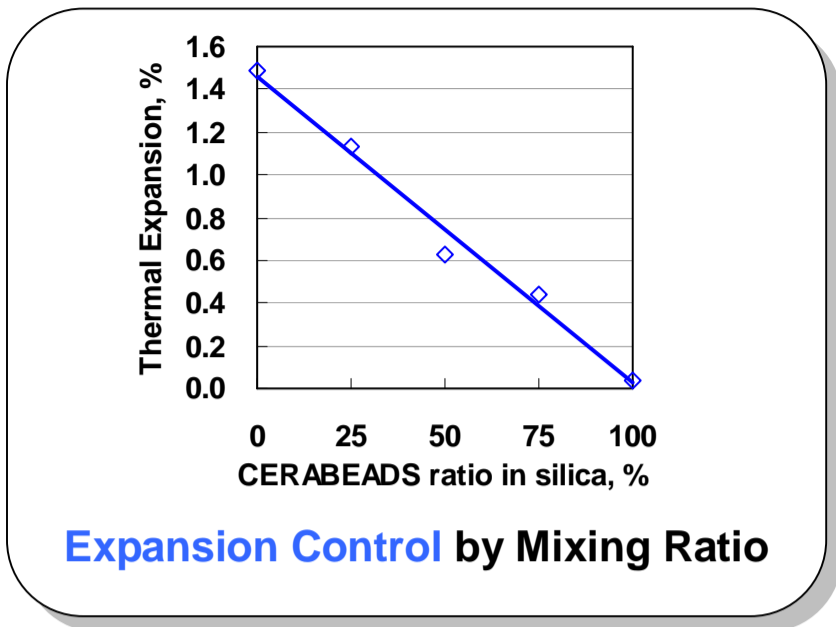
Low alloy 600kg, PU-NB, #850

Heat Resistant Steel 7 kg, Shell, #750

Alloy

Automotive Engine Parts & Others

Thin-Walled Casting and Complex Core





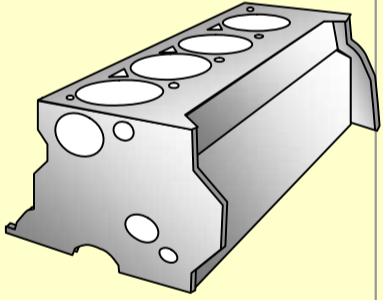
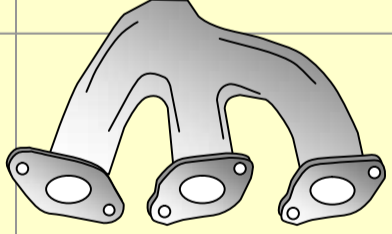



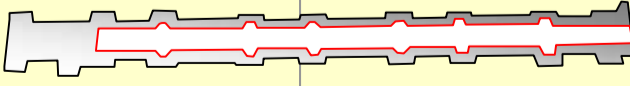
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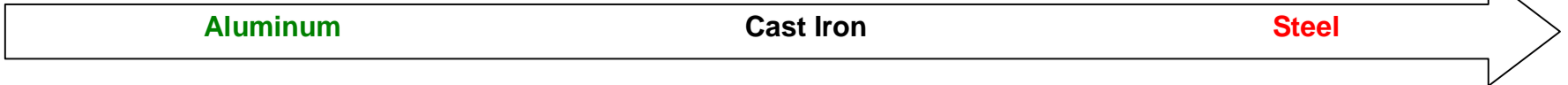
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Net Shaping
Less Defects (Gas & Vein)
Smoother Surface

Applications

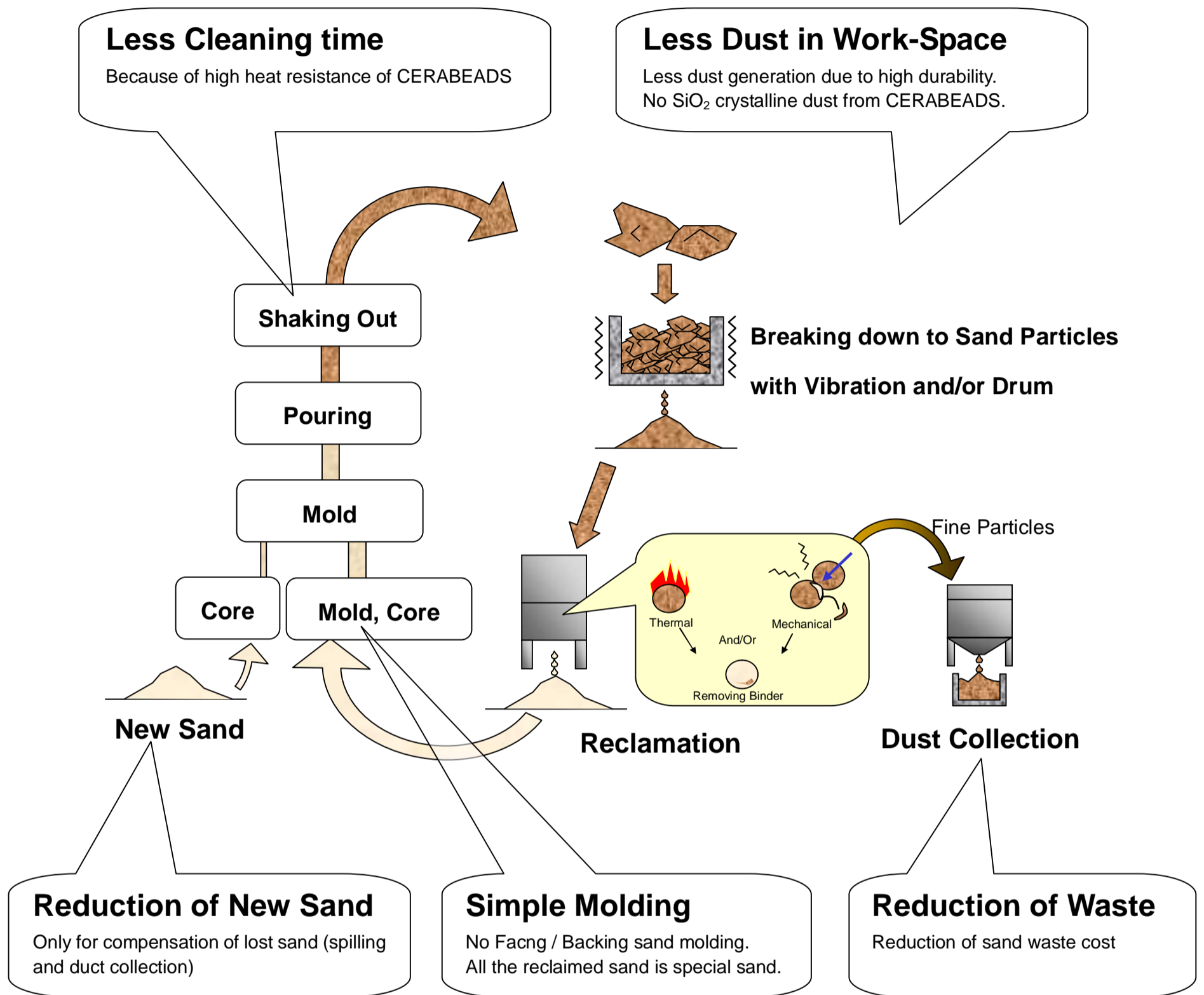


		<p>Process Compatibility</p> <ul style="list-style-type: none"> Alkid Isocyanate Furan Green sand Phenolic Ester & CB Phenolic Urethane - NB & CB Shell Sodium Silicate etc
		
		
		
		

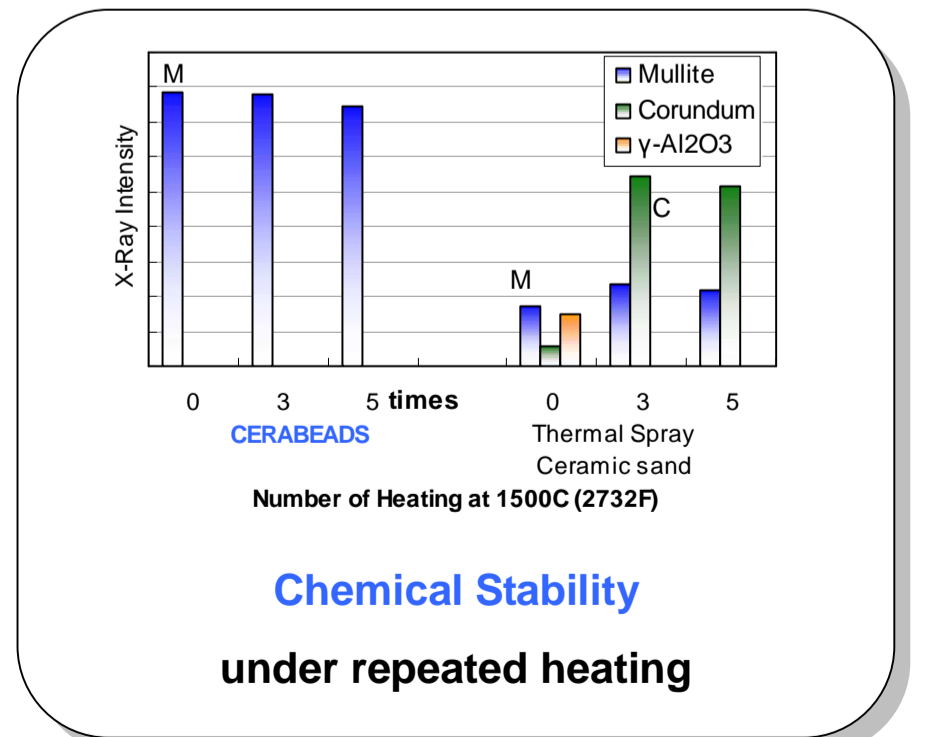
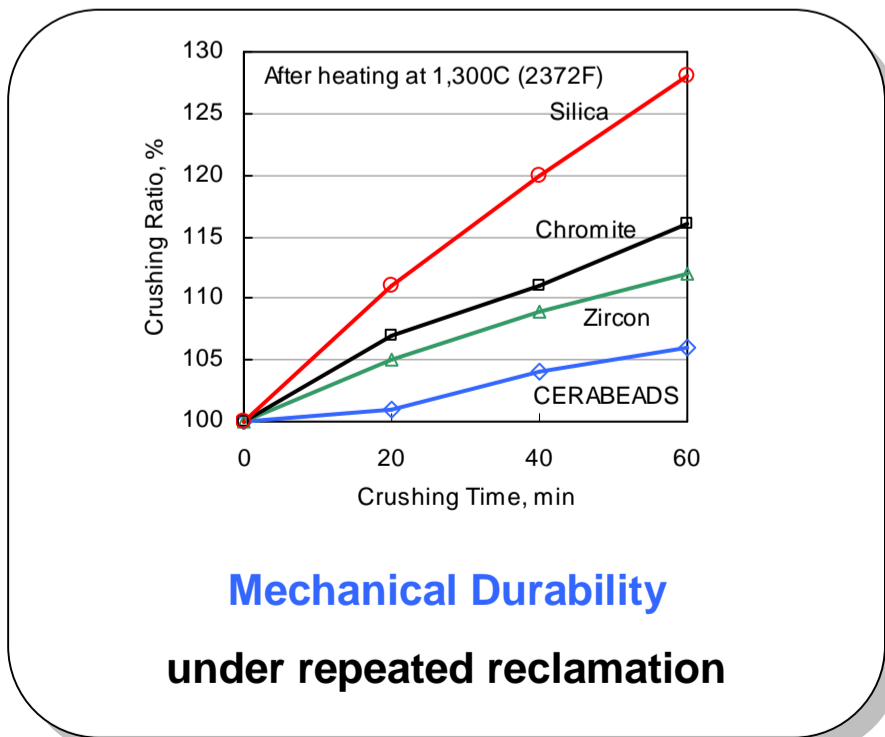


One Sand Loop System (CERABEADS 100%)

Benefits



Advantage of CERABEADS

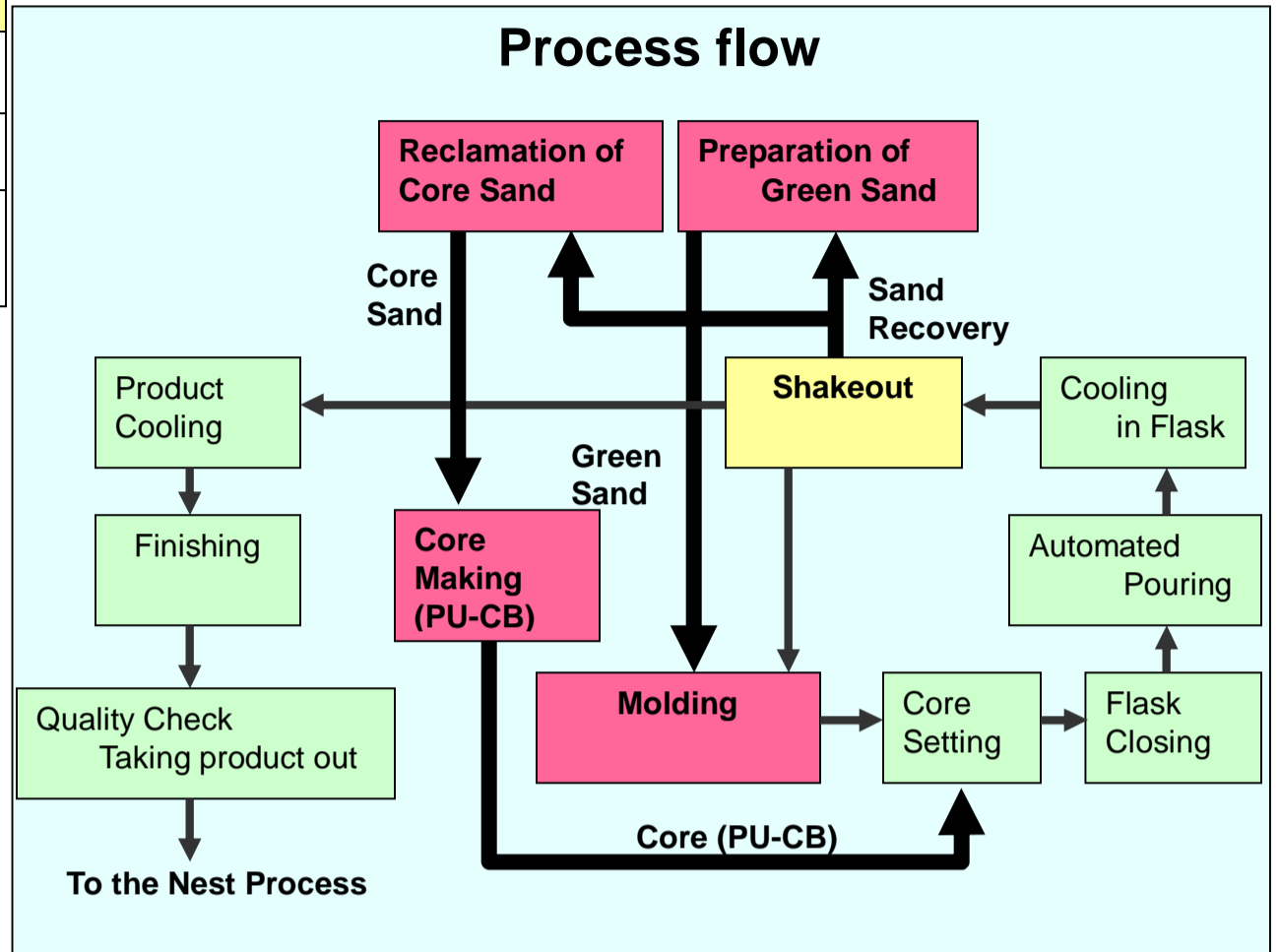


Choice in Size Stable Supply Technical Support

Applications (One Sand Loop System)

Green Sand Line

	Contents
Products	1,000 cc Cylinder Brock (Gray Iron)
Process	Mold: Green Sand Core: Cold Box (with paint)
Effect of CERABEADS	High dimensional accuracy Thickness (Wall of Product): 3 mm Reduction of Sand Waste



Phenolic Ester Line

1. The Purpose for using Cerabeads, and Effects

Purpose	Effect
Reduction of New Sand and Resin Cost	-20 %
Reduction of Sand Waste	-92 %
Simplification of Molding	-20 % (Working Hour) 3 Layer Molding → 1 Layer Molding (1 sand 1 process)

2. Products and Molding condition

	Contents
Products	Products: Turbine casing for Thermal power generation The pump runner for Hydropower generation, etc. Metal : Carbon steel, Low alloy steel, Stainless steel Weight : 1 t □ 250 t/piece Thickness: ave.150 mm (50 - 1,000 mm, Specialize Max 5 m)
Amount of Resin	Phenolic Ester 1.7 %
Sand /Metal Weight Ratio	ave. 1.2 - 1.4



Turbine Casing (47 t)

Other Typical Applications

Product	Process	Type of CB	Reclaimer	L.O.I.	Yield
Hi-Mn, Hi-Cr Steel	Phenolic ester	#650	USR	0.9 %	97 %
Mining tool	Shell	#950	Thermal system	Tr.	-
Stainless pump parts	New Furan	#650	Sand Shiner	1.6 %	-
Mining tool	Phenolic ester & Shell	#950	Thermal & NRR	Tr.	99 %
Vessel parts	Phenolic ester	#650 #850	NRR type	- 0.6 %	97 %
Waterworks	Phenolic ester	#650	2 Pattern Shiner	0.8 %	98 %
Stainless impeller	VRH	#650	Sand Fresher	0.3 %	98 %
Hydraulic valve	Lost Form	#400	Non	-	>99 %
Exhaust manifold	Green Sand & Shell	#650	outside suppliers	-	-