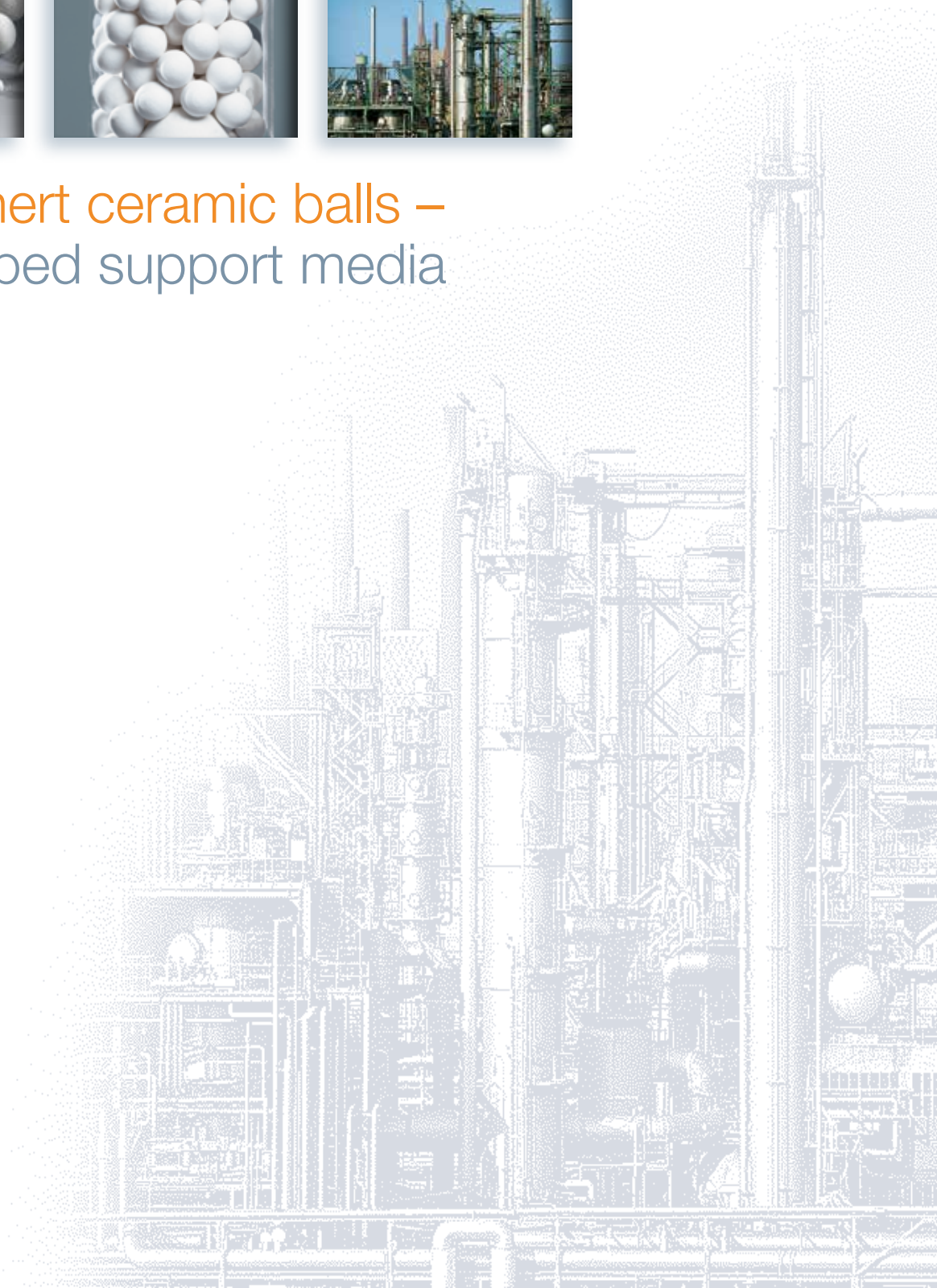




HiDur™ inert ceramic balls – Catalyst bed support media



RVT Process Equipment GmbH – What you can expect

RVT Process Equipment has offered a full array of products and services to the Chemical and Oil & Gas Processing industries for more than 30 years.

In addition to a complete line of mass transfer equipment consisting of random packings, column internals and fractionation trays, RVT Process Equipment offers both random and structured ceramic packings. As a traditional manufacturer of technical ceramics, RVT Process Equipment has a proven record of delivering quality products to well-known global companies. Our experienced engineers and ceramic specialists provide complete support for our customers.

RVT Process Equipment is familiar with the standards of the chemical and petrochemical industries and has maintained a ISO 9001:2000 Quality Management System since 1996. Quality assurance and service orientation is the focus of our daily business.

Our global headquarter is located in Germany with subsidiaries in the United States (RVT Process Equipment, Inc.) and China (RVT, Kunshan, Process Equipment Co, Ltd.). Furthermore, RVT Process Equipment works with 19 agents and distributors around the world.

RVT Process Equipment's global activities include maintaining stock inventory of ceramic random packing near customer sites in convenient global locations such as the USA, Europe, Singapore, China and Japan. This immediately available inventory allows RVT Process Equipment to provide prompt delivery in response to local customer needs. RVT Process Equipment can also accommodate any requested special packaging requirements.



HiDur™ inert ceramic balls – Our philosophy

The HiDur™ name represents a product that meets and/or exceeds the quality standards of our customers. Our mission is to serve our customers to their complete satisfaction as a preferred vendor. Our core focus is on:

- Quality products,
- Quality procedures, and
- Customer satisfaction

RVT Process Equipment is able to provide superior product and service to its customers by identifying manufacturers who have implemented our quality procedures. Additionally, our staff perform quality tests at RVT Process Equipment GmbH facilities on appropriate samples from all production before any product is released for shipment.

RVT Process Equipment has been certified according to ISO 9001 since 1996, and according to ISO 14001 since 2010.

We have been a member of the Fractionation Research, Inc. (FRI) since 2005.





HiDur™ inert ceramic balls

Technical data and properties

HiDur™ inert ceramic balls

HiDur™ Inert Ceramic Balls are designed for a wide range of applications acting as carrier layers or cover layers of catalyst packings, absorbents, molecular sieves and silica gel. Due to excellent crush strength and high resistance to thermal shock HiDur™ inert ceramic balls are suitable for a wide variety

of industrial processes like claus reactors, reformers, hydrocrackers, hydrotreaters, dryers, desulphurization plants, and others. HiDur™ inert ceramic balls have performed failure-free in operation in industrial plants for decades due to superior physical properties.

HiDur™ inert ceramic balls

Nominal size inch	mm	Bulk density		Specific surface area		Minimum crush strength N(min)
		kg/m ³	lbs / ft ³	m ² /m ³	ft ² /ft ³	
1/8"	3.2	1,350	84.3	720	219.5	300
1/4"	6.4	1,350	84.3	520	158.5	600
3/8"	9.5	1,350	84.3	360	109.7	1,200
1/2"	12.7	1,350	84.3	275	83.8	2,300
3/4"	19.1	1,350	84.3	190	57.9	4,300
1"	25.4	1,350	84.3	144	43.9	7,950
1 1/2"	38.1	1,350	84.3	100	30.5	9,100
2"	50.8	1,350	84.3	72	21.9	9,100

Typical chemical composition

SiO ₂	< 80 %	MgO	0.6 - 1.2 %
SiO ₂ +Al ₂ O ₃	> 90 %	CaO	0.6 - 0.9 %
TiO ₂	0.5-0.8 %	K ₂ O	2.3 - 3.0 %
Fe ₂ O ₃	0.4-0.8 %	Na ₂ O	0.5 - 0.8 %
Leachable iron	< 0.1 %		
Water absorption	< 2.0 %		

Typical physical properties

Density	g / cm ³	2.3 - 2.4
	lbs / ft ³	143.6 - 149.8
Sphericity	d _{max} /d _{min}	< 1.15
E-Modulus	GPa	60
Mohs hardness	-	7 - 8
Heat capacity	J/kgK	840
	BTU/ lb °F	0.20
Thermal conductivity	W/mK	1-1.5
	BTU/inch ft ² hr °F	7-10.5
Heat expansion	(20°C-600°C) 10 ⁻⁶ K ⁻¹	4.7
Thermal resistance	up to °C	1,000
	up to °F	1,800





HiDur™ alumina oxide balls

Technical data and properties

HiDur™ alumina oxide balls

HiDur™ alumina oxide balls consist of > 99% wt of alpha-alumina oxide with a maximum content of 0.2% wt of silica dioxide. This composition is ideal for applications requiring extremely high crush strength and thermal resistance. These balls are typically used in high temperature environments such as steam shift

operations. The extremely low SiO₂ and Fe₂O₃ content prevent the poisoning of catalysts or fouling of downstream processes. Typical applications are in ammonia plants, ethylene crackers and polymerization units within the petrochemical industry.

HiDur™ alumina oxide balls

Nominal size		Bulk density	Specific surface area		Minimum crush strength	
inch	mm		kg/m ³	lbs / ft ³		m ² /m ³
1/8"	3.2	2,000-2,200	124.6-137.1	720	219.5	500
1/4"	6.4	2,000-2,200	124.6-137.1	520	158.5	2,500
3/8"	9.5	2,000-2,200	124.6-137.1	360	109.7	4,000
1/2"	12.7	2,000-2,200	124.6-137.1	275	83.8	6,000
3/4"	19.1	2,000-2,200	124.6-137.1	190	57.9	10,000
1"	25.4	2,000-2,200	124.6-137.1	144	43.9	14,000
1 1/2"	38.1	2,000-2,200	124.6-137.1	100	30.5	18,000
2"	50.8	2,000-2,200	124.6-137.1	72	21.9	25,000

Typical chemical composition

Al ₂ O ₃	> 99 %
SiO ₂	≤ 0.2 %
TiO ₂	≤ 0.1 %
Fe ₂ O ₃	≤ 0.12 %
MgO + CaO	≤ 0.2 %
Na ₂ O + K ₂ O	≤ 0.4 %
Leachable iron:	≤ 0.01 %

Typical physical properties

Density	g / cm ³	3.0 - 3.6
	lbs / ft ³	206 - 224.7
Sphericity	d _{max} /d _{min}	< 1.15
E-Modulus	GPa	300
Mohs hardness	-	9
Heat capacity	J/kgK	850 - 1,050
	BTU / lb °F	0.203 - 0.251
Thermal conductivity	W/mK	19 - 30
	BTU / inch ft ² hr °F	131.7 - 208
Heat expansion	(20°C-600°C) 10 ⁻⁶ K ⁻¹	7 - 9
Thermal resistance	up to °C	1,500
	up to °F	2,730

HiDur™ quality assurance – Quality control from manufacturing to the customer

Test methods for HiDur™ inert balls

The quality of our products is assured through process control and reaffirmed by quality assurance testing as described below. These quality checks can include raw materials, mixing, forming, drying, firing, screening, packaging and shipping. Standard test methods are employed before any product is released for shipment. Additional testing is available on customer's request.

Standard test methods

- Shape and size
- Drop test

Shape and size:

This test assures the achievement of the specified geometrical data and overall shape and surface of the balls and at the same time indicates of a proper drying and firing process, thus ensuring product quality and consistency.

Drop test

This test verifies the structural integrity of the balls in order to prevent breakage during installation or bed loading, which can lead to clogging resulting in pressure drop increase.

The above tests are executed by RVT personnel for all production. The test reports are delivered to RVT's quality manager for analysis. No delivery can ship without the approval and release of the quality manager.



Additional testing methods available

Besides the described standard test methods performed for every delivery, the following additional testing methods are available:

- Crush strength
- Chemical analysis
- Leachable iron
- Water absorption test
- Thermal shock crush strength test
- Autoclave test
- Others per request

Crush strength

This test ensures that the balls are of a homogeneous material and are free of mechanical defects which can lead to bed failure during operation.



Chemical analysis

Determines the composition of the material by traditional "wet chemistry" methods. This test is performed according to DIN 51 001.

Leachable iron

The leachable iron is related to the chemical resistance of the material, and is tested according to ASTM C 279.

Water absorption test

This test determines the porosity of the balls. The test is performed according to DIN VDE 0335, part 2.

Thermal shock crush strength test

High temperatures and fast temperature changes can impact the durability of the balls. This test simulates an extreme temperature shock.

Autoclave test

High differences in pressure together with high temperatures can impact the durability of the balls.

This test simulates a high pressure drop (within less than 1 sec.) of a reactor filled with hydrogen at a high temperature.

Other tests

Other tests can be performed per customer request.



The way to RVT Process Equipment



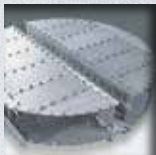
Tower packings for mass and heat transfer



Structured packings for mass and heat transfer



Column internals



Mass transfer trays



Biological carrier media



Turn-key units for waste gas scrubbing



Ammonia recovery processes



Combustion plants for the disposal of exhaust air, waste gases and liquid media



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