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NUTEC

THE POWER OF INSULATION

VACUUM FORMED PRODUCTS

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Nutec Vacuum Formed Products

Nutec has been recognized as a leader in the vacuum forming industry. In order to take the business to a World Class organization, Nutec decided to acquire an operation near Bilbao, Spain now known as Nutec Procal.

In addition, Nutec invested in a new state of the art facility in Ramos Arizpe, Coah., Mexico. The combination of these operations allowed Nutec to expand the product line not only with board products, but also in the shape market.

Vacuum forming is a wet forming process that uses various fiber types and binders to form the wet product. After forming, we dry and finish the product to desired tolerances.

We can manufacture in both the traditional organic system as well as the inorganic systems. Each system has its own unique characteristics and limitations but often can be interchangeable in most applications.

Vacuum formed products have numerous characteristics such as low thermal conductivity, high temperature stability, resistance to thermal shock and resistance to chemical attack. The corrosive material exceptions include phosphoric, hydrochloric and sulfuric acids. In addition, concentration of alkalis and halogens can be corrosive with any vacuum formed product.

Both formulations, inorganic and organic, have excellent rigidity for easy handling. The modulus of rupture and hardness will vary with the density of the product.

The organic formulation depends on the flocing of the raw material. The combination of the raw materials forms a floc due to the ion charges. The floc ties up the raw materials to have a homogeneous product. The result is a product with excellent machining qualities.

Organic products do contain a small amount of material that will burn off between 450°F (232°C) and 600°F (316°C) which leaves the product white in color. It must be noted that a color change may start at a lower temperatures and the change is also time related.

Inorganic products have been formulated for customers who require no loss on ignition (LOI) to eliminate contamination in their application. Product parameters between the two systems are different.

In addition, various fiber compositions can be used based on the customer request and temperature needs. Temperature grades include 1900°F (1038°C), 2300°F (1260°), 2600°F (1427°C), and 3000°F (1649°C).

maxBoard®

maxForm®

Boards & Shapes

There are two major categories of products made using the vacuum forming process: Boards and Shapes.

Boards would include any flat process with a parallel top and bottom. For most vacuum formers, boards would be considered the primary product. At Nutec, boards can be manufactured at thicknesses beginning at ½" to 3" standard product. The maximum size for length and width would be 48"x48".

Densities of the board products include LD (low density 14pcf to 20pcf) and HD (high density 20pcf to 28pcf). There is an MD (medium density 21pcf to 25pcf) which can be special ordered. Standard size boards are inventoried for customer convenience.

Shapes are made in a similar manner to that of boards. Therefore, they can be considered to have similar characteristics as the boards based on the formulas used.

Shapes are typically not kept in inventory unless we are assured of repeat business. Often times, customers inquire about the manufacture of product specific to a unique application. In most cases, lead times are required since molds must be developed and built to the customer's requirement. In order to enhance our ability to manufacture shapes, we have engaged the use of a 3D printer to make molds for small parts.

Shapes can be made in both the inorganic and organic formulation. Slight changes in the formulas may occur due to critical dimensions and the ability of the slurry to fill those dimensions.

Some of the typical applications for vacuum formed parts but not limited to include:

- Molten Aluminum Contact
- Furnace Hot Face Linings
- Flue & Chimney Linings
- Insulation Backup
- Appliance & Heat Processing Insulation
- Ladle Liners & Covers
- Riser Sleeves
- Burner Blocks
- Bullnose Tiles
- Expansion Joints
- Heat Shields
- Gaskets & Seals
- Combustion Chambers

MaxForm™ Shapes are processed from alumina and silica blends for applications with temperatures up to 3000°F (1650°C).

MaxForm™ Shapes are ideal for boiler ducts, furnace and stack linings due to their low thermal conductivity, low heat loss and storage. MaxForm Shapes are made to resist high velocities and vibration.

FEATURES

- Low Thermal Conductivity
- Low Heat Loss & Storage
- Lightweight
- Resistant to High Velocity
- Easy to Install
- Resistant to Non-Ferrous Metals
- Contains No Asbestos

TYPICAL APPLICATIONS

- Refractory Lining for Industrial Furnaces
- Combustion Chamber Liners, Boilers & Heaters
- Expansion Joints
- Board over Blanket Linings

MaxForm™ Shapes are available with various densities upon request and are available in a wide variety of shape configurations.

Technical Specifications	LD-2300	HD-2300	3000 HT
Maximum Use Temperature, °F (°C)	2300 (1260)	2300 (1260)	3000 (1650)
Continuous Use Temperature, °F (°C)	2100 (1149)	2100 (1149)	2700 (1482)
Melting Point °F (°C)	3150 (1732)	3150 (1732)	3400 (1871)
Density (lbs./ft^3) kg / m^3	14 - 20 (224 - 320)	20 - 28 (320 - 448)	9 - 12 (144 -192)
Thermal Shrinkage (%) 24 Hrs. @ 2200°F (1200 °C)			
	2 - 3	1 - 2	< 2
Chemical Analysis (%)			
Al_2O_3	39 - 41	43 - 45	54 - 58
SiO_2	52 - 54	47 - 49	41 - 45
Others	2 - 3	2 - 3	1
L.O.I. Organic / Inorganic	4 - 6/ 0	4 - 5/ 0	4 - 7

MaxBoard™ products are processed from alumina and silica blends for applications with temperatures up to 3000°F (1650°C).

MaxBoard™ are vacuum formed products that are made to resist high velocities. These products provide low thermal conductivity, low heat loss and heat storage. Vacuum Formed Boards are ideal for furnace linings, boiler ducts and stacks.

MaxBoard™ can be made with Organic or Inorganic (no smoke) formulations to meet your product requirements.

All Board Dimensions	Standard
Thickness:	½", 1", 1½", 2", 2½", 3"
Width:	12", 24"
Length:	36", 48"
Technical Specifications	**LD-2300**
Maximum Use Temperature, °F (°C)	2300 (1260)
Continuous Use Limit, °F (°C)	2100 (1149)
Melting Point, °F (°C)	3150 (1732)
Density m^3 / Kg (ft^3/lbs.)	14-20 (224-320)
Thermal Shrinkage (%) 24 Hrs. @ 2192°F (1200°C)	2 - 3
Color	White to Tan
Chemical Analysis (%)	
Al_2O_3	39 - 41
SiO_2	52 - 54
ZrO_2	-
Others	2 - 3
L.O.I. Organic / Inorganic	4 - 6/ 0

TYPICAL APPLICATIONS

- Refractory Lining for Industrial Furnaces
- Combustion Chamber Liners, Boilers & Heaters
- Expansion Joints
- Board over Blanket Linings
- Back-Up Insulation

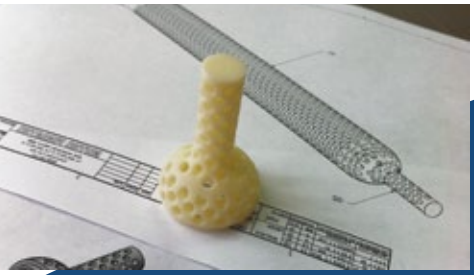
FEATURES

- Low Thermal Conductivity
- Low Heat Loss & Storage
- Lightweight
- Resistance to High Velocity
- Easy to Install
- Resistant to Non-Ferrous Metals
- Contains No Asbestos

HD-2300	HDZ-2600	2600 HT	3000 HT
2300 (1260)	2600 (1425)	2600 (1345)	3000 (1650)
2100 (1149)	2300 (1260)	2450 (1345)	2750 (1510)
3150 (1732)	3236 (1780)	3300 (1816)	3400 (1871)
20 - 28 (320 - 448)	23 - 29 (368 - 464)	12 - 16(192 - 256)	9 - 12 (144 - 192)
1 - 2 White to Tan	1 - 2 White to Tan	< 2 White to Tan	< 2 White to Tan
43 - 45 47 - 49 - 2 - 3	50-66 33-39 7-13 1	48-52 47-51 - 1	54-58 41-45 - 1
4 - 5/ 0	4 - 5/ 0	4 - 7	4 - 7

Technology

/ Research & Development



Included in the Mexican operation is a pilot plant. The pilot plant is a scaled down version of the production forming process. It has a mix system and molds to form samples.

The pilot plant will allow us to do comparative testing of raw material for new and existing products. This will give us the ability to grow our product portfolio.

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