



DynaGuard™ Ladle Liner Microporous Insulation

DynaGuard™ Ladle Liner Insulation Systems

DynaGuard™ Ladle Liner Insulation Systems represent one of Thermo Dyne's microporous products for primary use in industrial and commercial applications. Each DynaGuard™ Ladle Liner system is a flexible, textile encased, comparatively dense material with high compression resistance and exceptional strength, and its superior thermal performance allows the maximum amount of thermal protection to be provided within minimum space and weight requirements.

DynaGuard™ Ladle Liner systems are also specially formulated to minimize heat transfer via conduction, convection and radiation through the material by use of the following:

Ceramic Powders with Intrinsically Low Thermal Conductivity

The microporous core materials used in the manufacture of DynaGuard™ Ladle Liner systems possess a thermal conductivity even lower than that of still air, and minimize the solid conduction of energy through the material.

Microporous Structure

The microporous structure of the DynaGuard™ Ladle Liner system inherently minimizes the possibility for air current convection through the material as void spaces too small for air currents to exist form between the core material components.

Special Opacifiers

The introduction of special opacifiers into the DynaGuard™ Ladle Liner formulation ensures that the transmission of infrared radiation through the material is kept to the lowest possible levels.

DynaGuard™ Ladle Liner Materials of Construction

The DynaGuard™ Ladle Liner microporous core material is an 1,800°F continuous use formulation, and is compressed into a uniform thickness and density to ensure the proper distribution of the core material. After compression, the material is quilted on 1" parallel centers with high temperature thread in order to provide both flexibility and greater vibration resistance for the material.

Unlike other DynaGuard™ products, DynaGuard™ Ladle Liner also possesses a hydrophobic component in its core formulation. This material makes the microporous structure highly resistant to the presence of moisture during

use and installation, and is capable of performing at temperatures as high as 900°F before burning out of the microporous formulation.

In addition to the hydrophobic microporous core, DynaGuard™ Ladle Liner systems are supplied encased in a high temperature textile shell. This shell provides additional structure, strength, ease of handling and installation, and consistent distribution of the core material, and may also be used to increase the overall composite temperature use limit of the assembly as specified by individual customer needs.

DynaGuard™ Ladle Liner systems are supplied standard at 16 lbs/ft³ density, 36"x 72", in thicknesses of 1/8" to 1/2", and with a fiberglass textile shell (1,000°F use limit). Other densities, sizes, thicknesses and cloth facings are available upon request.

DynaGuard™ Ladle Liner Insulation Systems Advantages

Lowest Thermal Conductivity

Because DynaGuard™ Ladle Liner systems inherently possess a thermal conductivity lower than that of still air, even at elevated temperatures, they are ideal in environments where materials with low thermal conductivity, thermal diffusivity and heat storage are necessary.

Space and Weight Savings

Because smaller amounts of DynaGuard™ Ladle Liner are needed for thermal management, it is an ideal material for industrial and commercial applications where considerable space and/or weight savings are valuable in increasing capacity or efficiency without sacrificing the thermal performance of the system.

High Temperature Capability

DynaGuard™ Ladle Liner systems can be manufactured to meet continuous high temperature environments up to 1,800°F, but are also capable of performing in intermittent exposure to 2,000°F temperatures.

Easy Fabrication

Shapes can be fabricated in the field by various cutting methods, but Thermo Dyne also provides a virtually limitless range of custom pre-fabricated and intricate shapes upon request.

Thermal Conductivity Data (Btu - in/hr - ft² - °F)*

DynaGuard™ Ladle Liner 16 lbs/ft³

Mean Temp. °F (°C)	Thermal Conductivity
0°F (-17°C)	0.11 (.016 W(m-K))
500°F (260°C)	0.12 (.017 W(m-K))
1,000°F (538°C)	0.14 (.020 W(m-K))
1,500°F (816°C)	0.23 (.033 W(m-K))

*NOTE: All thermal conductivity values have been measured in accordance with ASTM Test Procedure C-177. When comparing similar data, it is advisable to check the validity of all thermal conductivity values and ensure the resulting heat flow calculations are based on the same condition factors. Variations in any of these factors will result in significant differences in the calculated data.

Typical Characteristics

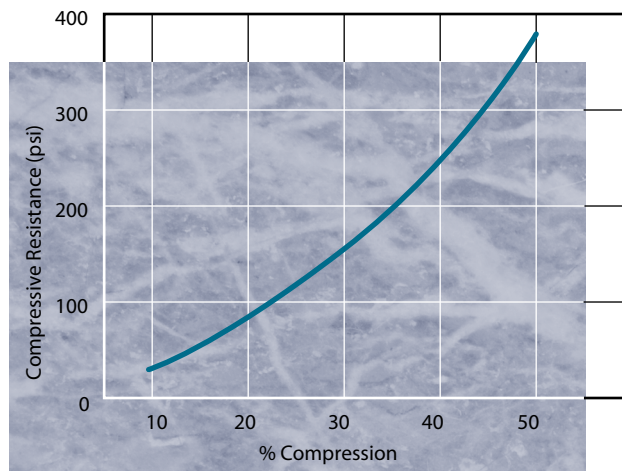
Core Density 16 lbs/ft³ (258kg/m³) Standard
10 lbs/ft³ (161kg/m³) Lightweight

Thickness 1/8" to 1/2" (3.17mm to 12.7mm)

Pad Size 36"x 72" (91.44cm x 182.88cm) Standard

NOTE: Other non-standard sizes are available in many thicknesses and densities.

DynaGuard™ Compression Data For 16 lbs/ft³



Application Comparison Example

Material	DynaGuard™ Ladle Liner 16 lbs/ft ³	Ceramic Fiber Blanket 8 lbs/ft ³
Thickness	1" (24.5mm)	1" (24.5mm)
Ambient	80°F (26.7°C)	80°F (26.7°C)
Convection	Natural	Natural
Hot Face	1,800°F (982°C)	1,800°F (982°C)
Resultant Cold Face	281°F (138°C)	470°F (243°C)
Heat Flux	484 Btu/hr/ft ² /°F	1,335 Btu/hr/ft ² /°F

NOTE: Figures are based on computer simulations using thermal performance calculations conforming to ASTM C-680, and should be used for comparisons and approximations rather than for exact design specifications.

For technical and installation support for DynaGuard™ Microporous Insulation, please contact Thermo Dyne's application engineering team.

Approximate Energy Savings Comparison

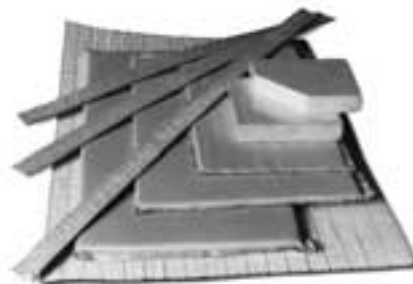
The two materials used in the above example have the following differences in temperature and heat flux:

Difference in Cold Face Temperature = 189°F (87°C)

Difference in Heat Flux = 851 Btu/hr/ft²/°F

Result = DynaGuard™ Ladle Liner saves approximately \$.016/kilowatt hr/ft² over Ceramic Fiber Blanket of equal thickness.

NOTE: Assumes 1kWh = 3,413 Btu, \$.065/kWh estimated energy cost.



DynaGuard™ Space Savings

A 3" layered thickness (66% more material) of 8 lbs/ft³ Ceramic Fiber Blanket is necessary to achieve equal thermal performance of 1" DynaGuard™ Ladle Liner 16 lbs/ft³.

DynaGuard™ Weight Savings

Amount of weight saved by using 1" of DynaGuard™ Ladle Liner 16 lbs/ft³ as opposed to 3" of 8 lbs/ft³ Ceramic Fiber Blanket = .7 lbs/ft².

DynaGuard™ products offer a variety of solutions.

Industrial

Power plant pipes, ducts
Incinerators
Molten metal ladle backup
Glass tank forehearth
Fuel cells

Commercial

Lab furnaces
Gas boilers
Appliances
Night storage heaters
Vending machines
Exhaust systems



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