

Fabricated Barriers for Air Filtration Sealing

by Mid-Mountain Materials, Inc.

Air leakage control is a critical activity for a wide spectrum of businesses. Contractors may be tasked with sealing building envelopes to prevent heat loss, thus energy wastage. Specialty manufacturers may be called upon to deliver precision fabricated parts that target specific pain points and air leakage paths. The only way to gain a deep understanding of where air infiltration, heat losses, or gas/particulate emissions are occurring in your workspace is through a thorough surveyance.

Combatting Air, Emission and Heat Leaks

In heavy-duty industries and high-temperature processing environments, seals are usually among the first components to succumb to wear-and-tear. Though designed to resist corrosion via process fumes and abrasion from being in contact with hard surfaces, all at high processing temperatures, air-tight seals will gradually degrade which leads to loss of functionality. This can have far-reaching ramifications, from reduced process efficiency to regulatory non-compliance. Maintaining effective insulation is subsequently a multi-faceted necessity.

At Mid-Mountain Materials, Inc. we specialize in the development of high-performance fabricated parts built on a foundation of expertise in thermal management materials. Our base fabrics and composites are suitable for an extremely broad temperature range spanning around 400°F (204°C) to as much as 5000° F (2760°C). We match this thermal performance with high physicochemical integrity, meaning they last longer in tough conditions.

But how can this help users who have identified air leakage pain points like cracked or broken seals?

Vertically Integrated Insulation Solutions

As a vertically integrated company, Mid-Mountain internally manufactures components that outperform standard insulation products available elsewhere, and we combine them to produce high performance seals. Our engineering team has extensive knowledge of materials science, and we fabricate seals to exact customer specifications, which are driven by the application. In developing a solution for an application, we choose from a range of base fabrics, coated materials, configurations, and sizes to develop a unique air-tight sealing solution designed to last in your specific use case. This goes for new operations building a workflow from the ground-up, and existing facilities looking to retrofit higher performance fabricated parts into existing systems.

Not only does vertical integration provide the opportunity to combine two or more stages of production normally operated by separate companies, it also provides a higher level of quality control throughout the manufacturing process, as well as a more competitive price for the end-user.



Examples of Vertically Integrated Sealing Products

Creating products for sealing applications has always been an integral part of manufacturing at Mid-Mountain. By combining our textiles products with our coatings and coated fabrics, we have developed a broad range of basic thermal insulation barriers used to control air flow and temperatures in challenging environments, with added value of chemical, abrasion and heat resistance.

External Cathode Bar Seal Boots

Mid-Mountain's patented THERMOPAK® EXTERNAL CATHODE BAR SEAL BOOTS is one of our most vertically integrated products. With the combination of four products manufactured internally by Mid-Mountain, we solved the universal problem faced by aluminium smelters of how to provide a hermetic seal for the full life of the reduction cell, where cathode bars penetrate the side wall of the reduction cell. In addition to providing an air-tight seal for the full service life of the pot, these boots have the added advantage of providing additional thermal insulation at each of the cathode bar penetrations.



Figure 1. Installed Cathode Bar Seal Boots

Rope Seals



Figure 2. Silicone Coated Braided Fiberglass Rope

Often times, the environment in industrial processing plants is extreme, and chemical, abrasion and high-temperature resistance are required in a sealing component for the safety of personnel and equipment. One of the most effective ways to prevent the release of air, heat or gases is by using a rope seal. Rope Seals can be manufactured specific to the application in a variety of configurations, and provide an air-tight seal, allowing for positive or negative pressure within a vessel.

Comprised with a dense fiberglass rope or extruded rubber core, Rope Seals can be coated with silicone which allows for a more positive seal and provides additional abrasion resistance, giving longer life cycles than uncoated seals. Adjusting the density of the core can accommodate the compression requirements of the application, which is often critical with oven door sealing.

Available in rectangular, square and round formations, Mid-Mountain's ARMATEX® Rope Seals are excellent for use in any application that requires an air-tight seal as well as resistance to chemicals, abrasion, and high-temperatures.



Figure 3. Overbraided/Coated Rope with fiberglass and extruded rubber cores.

Tadpole Gasket Seals

Tadpole Gasket Seals are comprised of an external cover material that is wrapped around a core material to form a cylindrical bulb. The edges of the tape or fabric are then fused together to form the characteristic tail. The flexible construction allows for ease of installation and conformity to uneven mating surfaces and joints, making an excellent airtight seal. Typical materials include a core of fiberglass or stainless steel rope and a silicone coated fabric cover, however other high-performance products can be used to form the tadpole gasket seal based on the application requirements. Adding a coating to a tadpole gasket seal can increase heat and abrasion resistance, thus creating a seal with higher performance properties. Mid-Mountain's THERMOPAK® Tadpole Gasket can be woven from various fibers or be fabricated from different materials, dependent upon the application.



Figure 4. Tadpole Gasket constructed of stainless steel mesh, silicone coated cover with stainless steel mesh overlay.



Figure 5. Tadpole Gasket woven from fiberglass, both plain and coated, to enhance performance.

CORE MATERIALS	TEMPERATURE LIMIT	COVER MATERIALS	TEMPERATURE LIMIT
Nomex®	400°F • 204°C	Nomex®	400°F • 204°C
Neoprene	450°F • 232°C	Kevlar®	450°F • 232°C
Silicone	450°F • 232°C	Aluminized Fiberglass	1000°F • 538°C
Kevlar®	450°F • 232°C	Fiberglass	1000°F • 538°C
Fiberglass	1000°F • 538°C	Stainless Steel Knitted Mesh	1000°F • 538°C
Stainless Steel Wire	1000°F • 538°C	Silica	1800°F • 982°C
Inconel Wire	1800°F • 982°C	Inconel Knitted Mesh	1800°F • 982°C

COATING MATERIALS	TEMPERATURE LIMIT
Neoprene	450°F • 232°C
Fluoroelastomer	450°F • 232°C
Silicone	450°F • 232°C
Aluminized	650°F • 343°C

Core and cover materials are combined to address the specific requirements of the application.

Cover Materials are often combined with coating materials to increase the performance of the tadpole gasket.

Figure 6. Table of available core, cover and coating options

Die-Cut Gaskets

Industrial sectors worldwide are subject to increasing pressure to simultaneously reduce their energy consumption and environmental pollution while increasing production output. This concerted industry push towards improved sustainability requires components and production processes with vastly improved capabilities.

Die-Cut Gaskets address the need to reduce emissions and thermal leakage by sealing the voids and mating surfaces between components in extreme environments. As an example, the mating surfaces of furnace doors, flues, or thermal piping must be correctly sealed to maintain optimal levels of device efficiency and reduce the impact of energy wastage and environmental emissions. This is often achieved via the application of die-cut gaskets tailored for specific thermodynamic conditions.

THERMOPAK® Die-cut gaskets can be successfully manufactured using a wide range of materials including fiberglass paper and mat, coated fabrics, silica, calcium-silicate and rubber, among others.

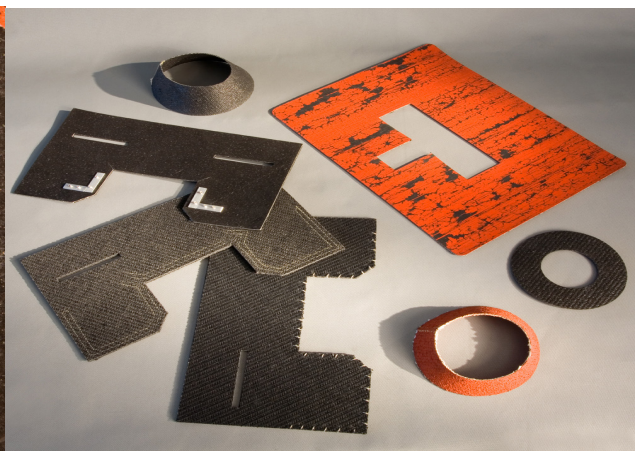


Figure 7. Die-Cut Gaskets made from ARMATEX® Coated Fabrics Figure 8. Various THERMOPAK® Die-Cut Parts

Mid-Mountain Materials, Inc. began in the late 1960's replacing asbestos seals with fiberglass and ceramic fiber. Incorporated in 1976, Mid-Mountain has been developing products for sealing applications for industries across the globe. Our mission has always been to be the global industry leader through vertical integration, providing high quality and fast to market products with new technologies and materials. Our success is marked by innovation, quality and commitment, and our desire to manufacture products that protect our planet, your people, and your processes.



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