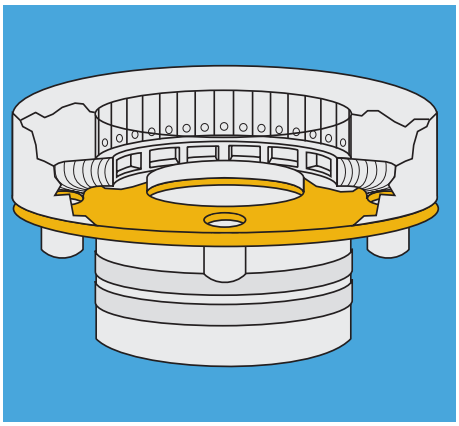
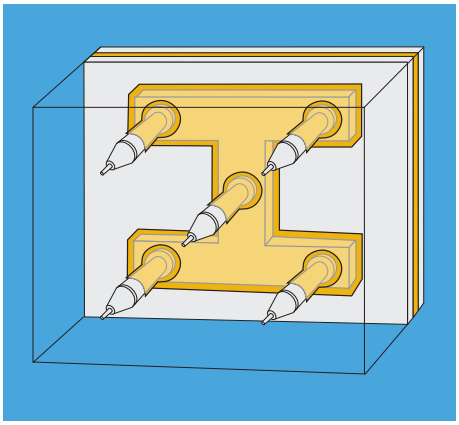
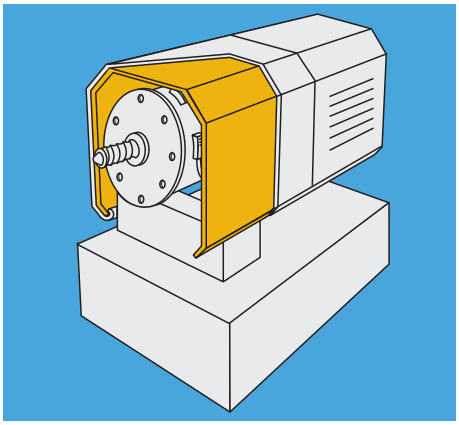
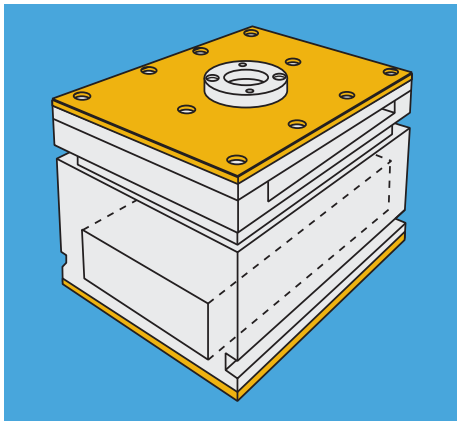
Rigid Insulation for Plastics and Rubber Processing









PYROPEL®

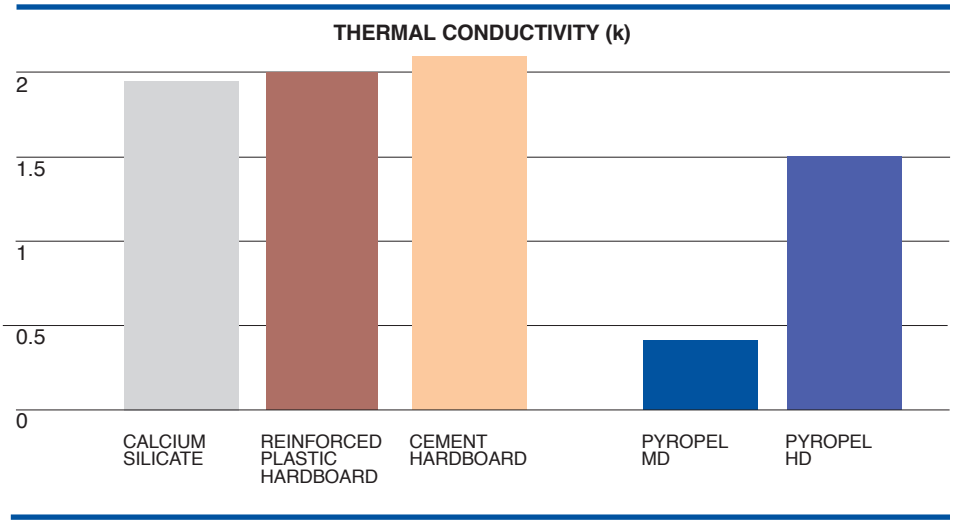
POLYIMIDE PRODUCTS

The First Insulation Designed Specifically

Superior Insulating Properties and Unmatched Ease of Use

Pyropel® is the first insulation developed specifically to meet the stringent demands of plastics and rubber processors. Pyropel is a unique rigid, lightweight polyimide fiberboard with superior insulating properties across a broad temperature range. Produced through a patented process in which it is three-dimensionally reinforced, It is self-supporting and exceptionally tough and durable.

Pyropel offers an unmatched combination of insulating performance and design and assembly advantages.



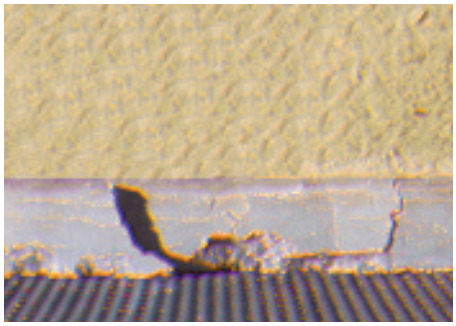
2 to 4 Times More Effective Than Other Common Insulations

Thermal conductivity is a measure of the amount of heat transferred by or through a material. Obviously, when comparing insulations, the lower its thermal conductivity, the better a material's insulating capability.

As the graph above shows, Pyropel is 2 to 4 times more effective than other insulation materials typically used in plastics and rubber processing. This superior insulating capability is due to a patented manufacturing process that creates sintered fiber bundles. These bundles give Pyropel its rigidity, compressive strength, and durability. They also trap and hold air which makes Pyropel a highly effective insulator.

Will Not Crack Under Pressure

Many organic insulation boards crack when subjected to compression forces, applied thermal expansion, or thermal shock.

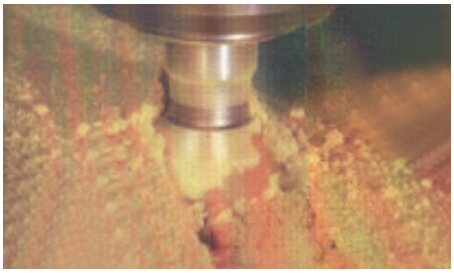


Because of its unique thermoset fiber construction, Pyropel is compression-resistant, yet nonbrittle. It will not crack— even in extreme conditions. Consequently, Pyropel offers significantly longer service life and dramatically reduces the time spent replacing worn or broken insulation.

Easy to Cut, Machine, and Fabricate

Common insulation boards are hard to work with. In many cases, they require special tools and machining skills—tools and skills which many plastics processors do not have in-house. As a result, many plastics processors pay outside specialists to fabricate their insulation boards.

Pyropel is easy to use and requires no special tools. It handles like wood or any free-machining plastic. Pyropel can be drilled, milled, routed, and sawed using standard wood or metalworking tools.



for Plastics and Rubber Processing

Pyropel can also be easily fabricated into custom insulation packages for areas that previously could not be insulated.

Easy To Install Using Mechanical Fasteners or Adhesives

Pyropel can be easily installed on process equipment or tooling using simple fasteners or adhesives. Rigid and self-supporting, it eliminates the need for special support structures or other design considerations.

Available in a Range of Thicknesses and Densities

Manufactured in a wide variety of product types, Pyropel is available in a thickness and density to meet your specific application

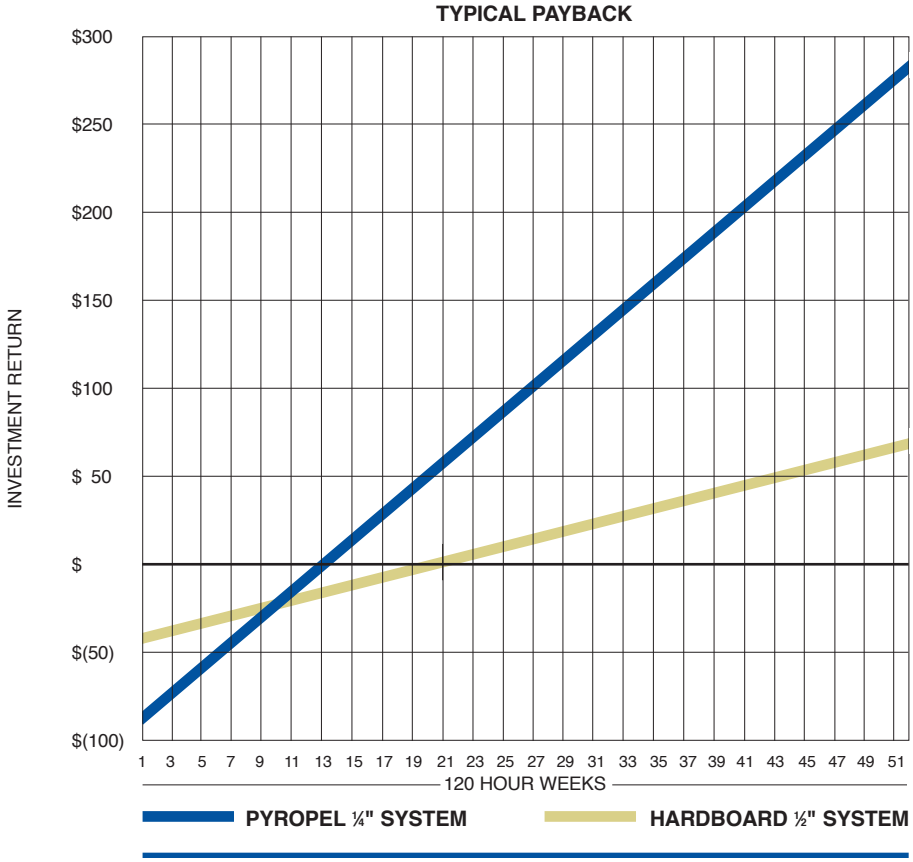
needs. This choice of thickness and density lets you select the proper balance of physical and thermal characteristics without having to compromise.

Pays for Itself In Months

In most cases, Pyropel pays for itself in energy savings alone in a matter of months. Durable and long-lasting, it continues to yield savings long after other insulations have failed or worn out.

In addition to reducing energy costs, Pyropel also reduces the cost of installing and maintaining insulation. It can also reduce unnecessary plant heating, increasing employee comfort and safety.

Most important of all, Pyropel can make your process more efficient and, therefore, faster and more profitable. By allowing more efficient heating and cooling, Pyropel can decrease cycle times and increase line speed, product quality, and profitability.



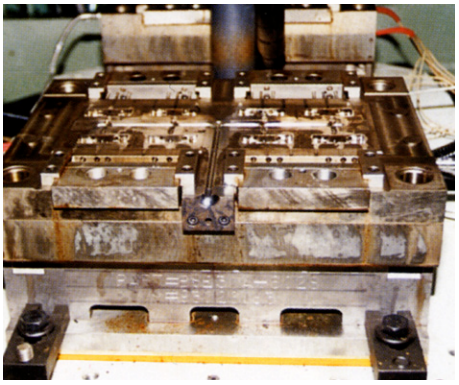
Superior Performance in a Wide Range of

Used in a wide range of processing applications where more efficient heating and/or cooling are required, Pyropel is particularly well-suited to the demands of plastics and rubber processing.

The following selector guide lists various plastics and rubber processing applications and the recommended Pyropel product(s) for the job.

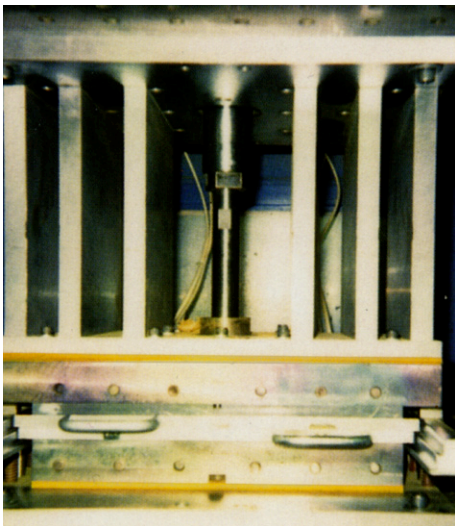
If you have any questions or need additional assistance, please contact our **Technical Service Hotline:**

1-888-PYROPEL
(1-888-797-6735)



▲ *Pyropel insulation ensures optimum temperature and flow conditions for exotic engineering grade polymers in hot runner injection molding.*

Pyropel tool base insulation not only saves this Chicago compression transfer molder thousands of dollars each year in energy costs, it also increases machine productivity. ▼



Process	Application
EXTRUSION	
BARREL COVERS	Pyropel is bonded or mechanically fastened inside of guard.
MOUNTINGS	Pyropel is machined thermal spacers.
COMPRESSION MOLDING	
PLATENS	Pyropel is mounted between heated platen and press bed, as well as between press and heated tool.
	Pyropel is normally an option for large, lower pressure molds. Its use requires thermal spacers.
PERIMETER	Used to insulate sides of tooling or heated platens, Pyropel is bonded using high-temperature adhesive or can be mechanically fastened.
INJECTION MOLDING	
TOOL BASE	Pyropel is mounted to the base using adhesives or counter sunk flat head screws.
HOT RUNNER SYSTEMS	Pyropel can be installed inside the manifold cavity using adhesives. Normally, its thickness should be 1/2 that of the air gap.
THERMOSET/ ELASTOMER/RIM	See compression molding and injection molding/tool base.
FILM AND SHEET	
AIR RINGS	Pyropel is installed between the top die and the air ring. Typically, no fasteners or adhesives are required.
BLOWN FILM DIES	Pyropel is designed into new dies to insulate IBC system. It can also be fabricated into insulation covers to contain and control die heat.
FLAT EXTRUSION DIES	Pyropel is bonded or mechanically fastened to existing dies.
	Pyropel is specified as a critical component in new dies. Recommended Pyropel product depends on the demands of each specific application. Pyropel HD should be considered for highly critical areas.
SECONDARY PROCESSING OPERATIONS: • *HEAT SEALING* • *DECORATION* • *BRANDING*	

Legend of Benefits

1 Energy savings
2 Faster start-up
3 Increased heater life
4 Reduced thickness variation
5 Faster line speed

Plastics and Rubber Processing Applications

Recommended Product	Benefits	Comments
MD-12	1, 10, 11	Barrel covers or blankets are normally not used or discarded because of difficulties in servicing the equipment. They also slow down cooling, cause overheating, and can mask heater burnouts. Insulating the guard provides most of the desired benefits without any drawbacks.
HD	8	
MD-30 MD-50 MD-60	1, 2, 12, 3, 8, 7, 9, 12	Molding pressures under 300 psi Molding pressures between 300 and 600 psi Molding pressures over 600 psi
MD-12 MD-18		Metal or Pyropel HD standoffs are required to withstand loading.
MD-12 MD-18 MD-30	1, 2, 10, 11, 13	In selecting a Pyropel product, users should take into consideration the amount of abuse the insulation will encounter in normal operation.
MD-60	1, 7, 8, 13	Maximum pressure limits apply. Functionality is a factor of temperature, pressure, and cycle time.
MD-12 MD-18	1, 2, 3, 7, 13	For maximum effectiveness, the perimeter should be insulated as well as the top and bottom of the cavity.
	1, 2, 6, 7, 8, 10, 11, 12, 13	Care should be taken in a RIM process not to allow overheating from the chemical reactions taking place.
MD-12	1, 5, 4, 11	Typically, processors have many die sizes. To maximize material use, Pyropel is normally supplied in sheets, not cut rings. Cutting ring insulators is easy and requires no special knowledge or equipment.
LD-6 MD-12 MD-18	1, 2, 7, 10, 11	In both internal and external applications, Pyropel is self-supporting and requires only limited support systems. Pyropel LD is normally chosen for short-term or small applications. Pyropel MD offers longer term, more permanent solutions.
MD-12 MD-18 Design Driven	1, 2, 3, 4	Typically, extrusion dies have no external loading but benefit from perimeter insulation. This could be applied externally to existing dies or designed as an internal structural plate, isolating the heater section from external structures.

- *BAG MAKING*

PERIPHERAL EQUIPMENT: • *TRANSFER PUMPS* • *TRANSFER LINES*

6 Better tool closure, less flash

7 Ease of use

8 Reduced thermal stress on equipment

9 No need to grind tool base on large low pressure tools

10 Employee safety

11 Employee comfort/ Reduced load on plant environmental systems

12 Reduced cycle times

13 More uniform temperature profile

Physical Properties

Products for a Wide Range of Applications

Pyropel is available in three different forms:

Low Density

A flexible form of Pyropel, Pyropel LD is an industrial nonwoven. Typically used where thermal control is the major engineering concern, Pyropel LD can be easily wrapped around complex shapes or converted into insulation kits. Unlike other blanket type insulators, Pyropel LD is binder-free and has none of the shedding concerns associated with common fiber-based materials.

Medium Density

Pyropel MD is a lightweight fiberboard with superior insulation properties. Pyropel MD-12, MD-18, and MD-30 are semi-rigid and are normally used in areas that require both thermal isolation and limited mechanical resistance.

Pyropel MD-50 and MD-60 are rigid insulations for mechanically demanding areas. More resilient, MD-50 is ideal when loading is not evenly distributed or when equipment alignment is not perfect. MD-60 is the most structurally rigid grade of Pyropel MD and offers the highest compression resistance and physical tolerances.

High Density

Pure polyimide plate, Pyropel HD is easily machined to make both mechanical and thermal components for highly engineered equipment. These components include high- temperature spacers, washers, slides, and bearings.

	TEST METHOD	LD			
		LD-6		MD-12	
		English	Metric	English	Metric
PHYSICAL					
Form:		Flexible Blanket	Flexible Blanket	Semi-Rigid Fiberboard	Semi-Rigid Fiberboard
Color:		Yellow	Yellow	Gold	Gold
Density:		6 lb/ft³	0.10 g/cm³	12 lb/ft³	.19 g/cm³
Standard Thickness:[1]		1/8" - 1"	3.2 - 25.4 mm	1/8" - 3/8"	3.2 - 9.5 mm
Standard Sheet Size:[1]		54" wide	1.37 m	4' x 8'	1.2 x 2.4 m
MECHANICAL					
Tensile Modulus:	D-638	—	—	15,000 psi	107,000 kPa
Yield Strength (2% Offset):	D-638	—	—	1,500 psi	10,340 kPa
% Elongation:					
@ 2% Offset		—	—	6%	6%
@ Break		—	—	31%	31%
Compression Modulus:	D 638	—	—	800 psi	5,500 kPa
Strength @ 2% Strain:	D-695	—	—	10 psi	70 kPa
Flexural Modulus:	D-790	—	—	1,940 psi	13,380 kPa
THERMAL					
Continuous Use Temperature:		450°F	232°F	550° F	288° C
Glass Transition Temp (Tg):		600°F	315°C	600° F	315° C
Thermal Conductivity (k):					
@ 25°C (77°F)		0.22	0.032	0.24	0.036
@ 93°C (200°F)	C-177	0.27	0.039	0.26	0.038
@ 149°C (300°F)		0.31	0.045	—	—
@ 204°C (400°F)		0.38	0.055	0.32	0.046
Flammability Rating:	UL-94	—	—	94V-0	94V-0

[1]Custom sizes and thicknesses available. Consult Technical Services.

Design Considerations

Pyropel is a superior insulator and is very easy to work with. However, users should consider the following when forming or fabricating it into parts or structures.

- Under normal conditions, Pyropel will not shed fibers, but cutting, milling, drilling, or routing it will generate loose fibers. While these fibers pose no health risks, we recommend that workers wear masks and safety glasses for their own comfort.
- Pyropel provides excellent heat resistance. However, when fabricating Pyropel into components, housings, or other parts, users should consider the heat resistance of any mechanical fasteners or adhesives.
- Pyropel offers excellent chemical resistance. Certain Pyropel products, however, will wick oils and fuels slightly. If this is unacceptable, Pyropel should be faced or sealed to prevent absorption.

	MD								HD	
	MD-18		MD-30		MD-50		MD-60		HD Plate	
	English	Metric	English	Metric	English	Metric	English	Metric	English	Metric
	Semi-Rigid Fiberboard	Semi-Rigid Fiberboard	Semi-Rigid Fiberboard	Semi-Rigid Fiberboard	Rigid Fiberboard	Rigid Fiberboard	Rigid Fiberboard	Rigid Fiberboard	Solid Plastic	Solid Plastic
	Gold	Gold	Gold	Gold	Gold	Gold	Light Brown	Light Brown	Black	Black
	18 lb/ft³	.29 g/cm³	30 lb/ft³	.48 g/cm³	50 lb/ft³	.80 g/cm³	60 lb/ft³	.96 g/cm³	85 lb/ft³	1.36 g/cm³
	1/8" - 1/4"	3.2 -6.4 mm	5/16"	8 mm	5/16"	8 mm	5/32", 1/4"	4, 6.4 mm	1/4", 1/2"	6.4, 12.7 mm
	4' x 8'	1.2 x 2.4 m	2' x 3'	0.6 x 0.9 m	2' x 3'	0.6 x 0.9 m	2' x 3'	0.6 x 0.9 m	12" x 12"	305 x 305 mm
	27,000 psi	186,200 kPa	31,000 psi	216,500 kPa	110,000 psi	750,000 kPa	164,000 psi	1,150 MPa	570,000 psi	3,930 MPa
	1,700 psi	11,720 kPa	670 psi	4,620 kPa	1,960 psi	13,510 kPa	3,070 psi	21,170 kPa	10,000 psi	70 MPa
	6% 22%	6% 22%	4% 29%	4% 29%	4% 13%	4% 13%	4% 6%	4% 6%	— 2%	— 2%
	2,200 psi	15,170 kPa	15,000 psi	103,420 kPa	46,000 psi	317,160 kPa	58,000 psi	104,110 kPa	540,000 psi	3,720 MPa
	15 psi	100 kPa	60 psi	410 kPa	275 psi	1,900 kPa	1,150 psi	7,930 kPa	—	—
	6,620 psi	45,640 kPa	20,030 psi	138,100 kPa	49,390 psi	340,530 kPa	132,260 psi	911,910 kPa	550,000 psi	3,790 MPa
	550°F	288° C	550°F	288°C	550°F	288° C	550°F	288° C	550°F	288° C
	600° F	315° C	600° F	315° C	600° F	315° C	600° F	315° C	600° F	315° C
	0.27 0.31 — 0.36	0.041 0.046 — 0.052	0.34 0.36 0.39 0.44	0.049 0.052 0.056 0.063	0.49 0.51 0.56 0.62	0.070 0.074 0.080 0.089	0.80 0.83 0.86 0.90	0.114 0.119 0.123 0.129	1.57 — — 2.09	0.23 — — 0.3
	94V-0	94V-0	94V-0	94V-0	94V-0	94V-0	94V-0	94V-0	—	—

Other Pyropel Applications

Technical Service Hotline

If you have questions about or need assistance with any Pyropel products, please call our Technical Service Hotline during normal business hours:

1-888-PYROPEL
(1-888-797-6735)

Aerospace

Originally developed to meet the critical weight and fire safety demands of passenger airplanes, Pyropel is ideal for passenger compartment/cabin applications. Lightweight and easy to fabricate, Pyropel is nonflammable, nontoxic, and produces very little smoke when subjected to flame.

OEM Applications

Pyropel offers designers benefits unmatched by other forms of insulation. Superior insulating ability; light weight; resistance to heat, fire, chemicals, and mildew; and ease of fabrication make Pyropel the logical choice for products from electronics to refrigerated trucks to the Space Shuttle.

Acoustic Insulation

In addition to being an excellent thermal insulation, Pyropel offers impressive sound deadening capability. It is particularly well suited to applications where its rigidity and ease of fabrication simplify design or reduce assembly labor.

Pioneering Advanced Materials for Industry

REGARDING THIS INFORMATION

All statements and technical information contained herein are based on tests we believe to be reliable. There is no guarantee of the accuracy and completeness of the information and the following is made in lieu of all warranties, expressed or implied.

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