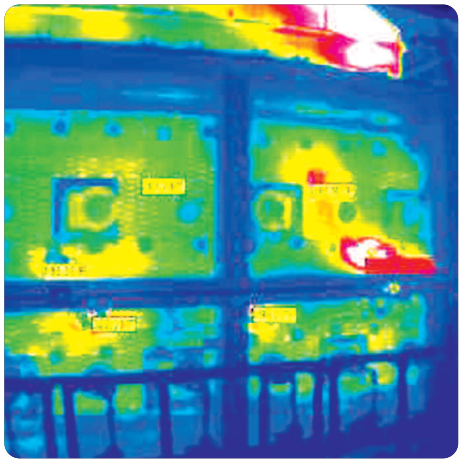


Save energy...

...seeing is believing

Superwool® Plus fibre is the most energy efficient fibrous insulation material; it can reduce energy losses without occupying more space or using increased mass.

- Reduces thermal conductivity and energy loss and thereby reduces the outside furnace temperature
- Provides significant energy savings compared to other tested AES and RCF fibres
- Minimises the weight and thickness of the insulation layer saving up to 25% in material
- Reduces carbon emissions
- Provides more…for less…

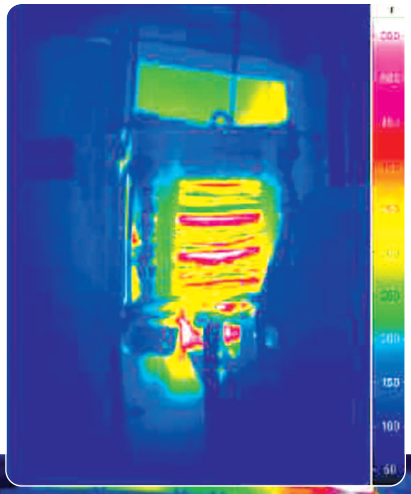
Thermal imaging...infrared camera...energy efficiency

Maintenance of your furnace lining and insulation system can result in significant energy savings. In many cases, the extra cost of more efficient lining materials can often be recouped within a year or two.

Manufacturing costs, especially in energy-intensive processes requiring furnaces and kilns, have been negatively impacted by rising fuel costs.

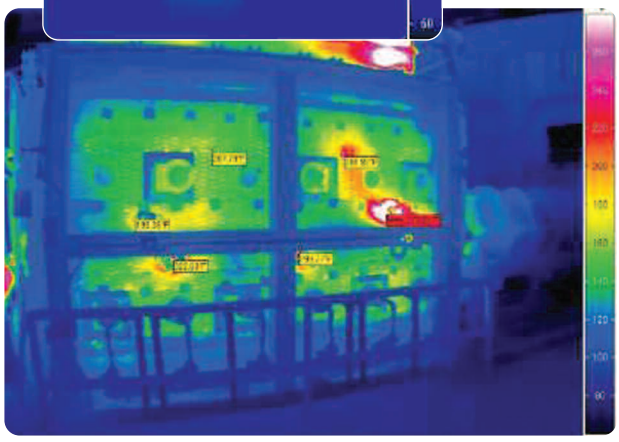
The key to the energy efficiency of your furnaces and kilns is how well the refractory insulation lining is working. Refractory insulation provides many heat-saving benefits and it needs to be maintained and repaired during service. Before replacing materials, it is better to first conduct a thorough evaluation of the furnace lining condition.

The analysis of the existing furnace is critical to determining which steps to take in lining maintenance. In addition to observing the general integrity of the furnace lining, using engineering services like heat-flow calculations, infrared cameras and energy analysis enables insulation inefficiencies and inadequacies that are essential in establishing maintenance priorities to be discovered.



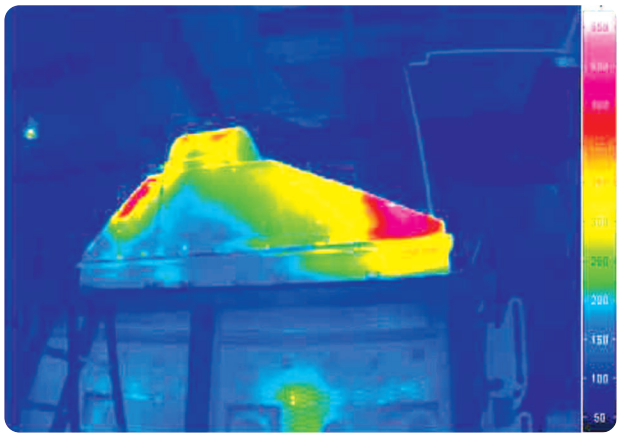
Infrared cameras can survey the furnace lining while the unit is operating to determine the location and severity of furnace hot spots. The infrared camera captures the thermographic data needed to assess the thermal efficiency of the existing insulation lining.

Each Morgan Thermal Ceramics sales division is equipped with its own thermal imaging camera and is able to conduct a furnace survey and assist in recommending a more energy efficient solution if available.



Energy costs continue to rise and furnace maintenance in heat-intensive industries is crucial to keeping fuel expenses under control. Routine engineering audits of the furnace lining help determine the condition of the existing equipment.

Maintaining the lining in your furnace and making the recommended and necessary changes enables you and your business to reduce energy waste and improve operating efficiencies and process consistency.



Examples of conducted furnace surveys

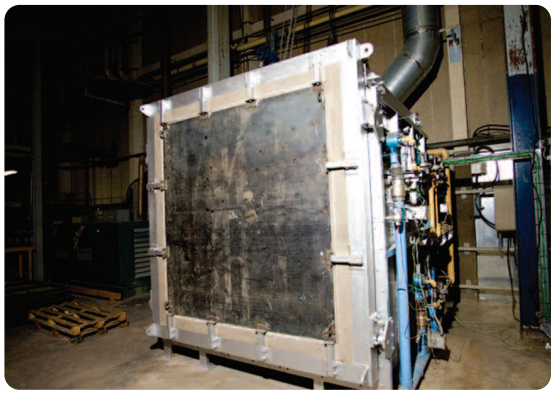
Can Superwool® Plus blanket help with energy and material weight savings?

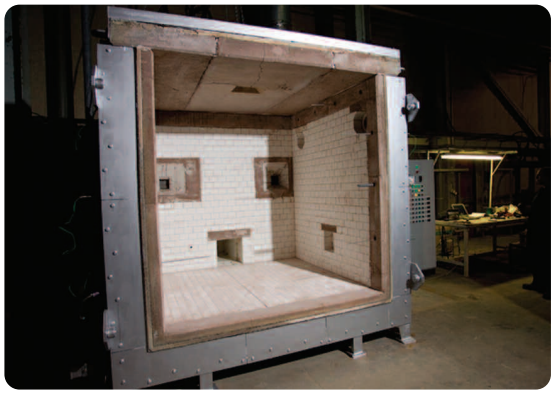
The ability to perform tests "in-house" brings expertise and product development at a much faster rate than could be achieved by only using external laboratories.

Morgan Thermal Ceramics' research and development facility houses a purpose designed gas-fired kiln which has the ability to test all forms of furnace wall and roof construction and to measure resulting cold face temperatures. By having a test furnace facility on-site, we are able to work closely with our customers to ensure their requirements and solutions are met.

Our furnace:

- is a 1.5 MW gas powered kiln, with 6 burners
- is 2m high x 2m deep, with a volume of 8m^3
- has 2 control thermocouples and 8 monitoring thermocouples ensure uniform heat distribution in all zones
- has a maximum temperature 1300°C (2372°F) with rapid heating to allow simulation of hydrocarbon fires as well as cellulose fires
- can be set up to test bulk head (wall) or deck head (roof) panels or to test samples totally enclosed inside the furnace
- can test a complete new furnace lining using a combination of refractory products: such as blanket, modules and boards
- internal and external temperatures can be measured with up to 40 thermocouples or using an infra red camera





At Morgan Thermal Ceramics we have conducted a benchmark test in our R&D centre using Superwool® **Plus** fibre with a competitor AES blanket and Cerablanket RCF.

On the same panel, 1m² blanket was installed with 4 different insulation layers:

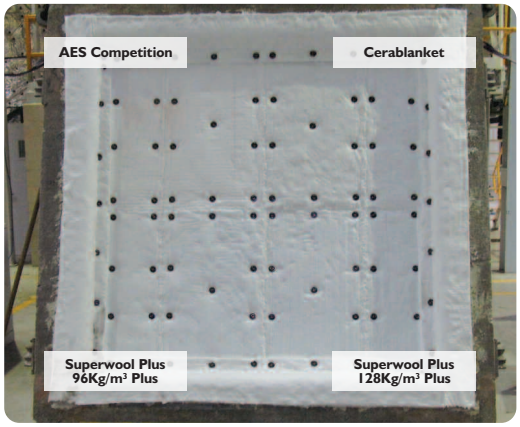
2x25mm (2x1inch)	128kg/m³ (8lbs/ft³)	competitor AES blanket
2x25mm (2x1inch)	128kg/m³ (8lbs/ft³)	Cerablanket RCF
2x25mm (2x1inch)	96kg/m³ (6lbs/ft³)	Superwool® **Plus** blanket
2x25mm (2x1inch)	128kg/m³ (8lbs/ft³)	Superwool® **Plus** blanket

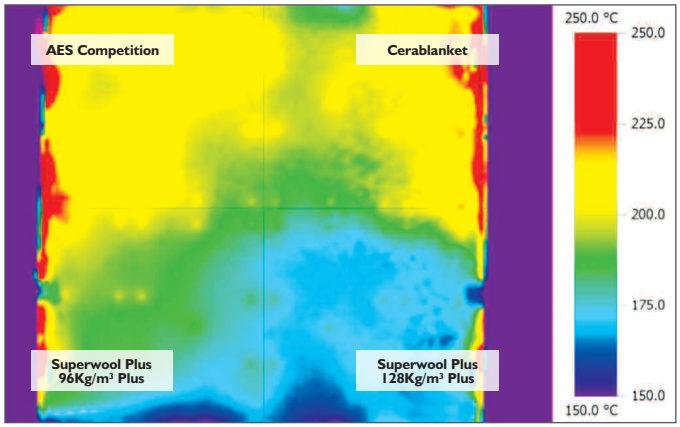
We clearly observed that:

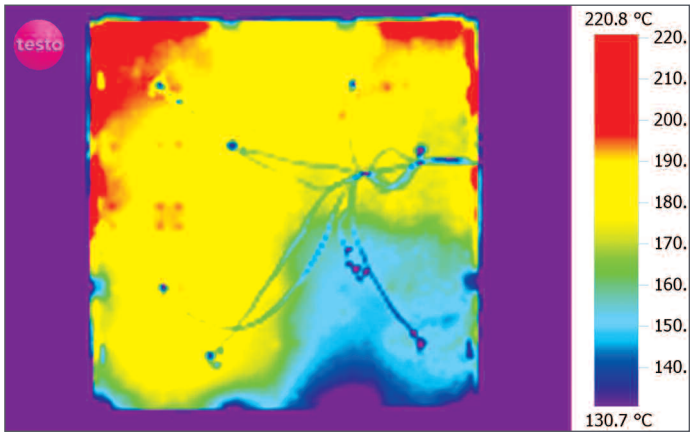
- **Superwool® Plus 128 blanket** provides a significantly lower cold face temperature than a competitor AES 128Kg/m³ (8lbs/ft³) blanket and Cerablanket RCF 128Kg/m³ (8lbs/ft³)

- **Superwool® Plus 96 blanket** provides a lower cold face temperature compared to a competitor AES blanket 128Kg/m³ (8lbs/ft³) and Cerablanket RCF 128Kg/m³ (8lbs/ft³)

The results outline the thermal insulation superiority of Superwool® Plus fibre with energy savings up to 25%





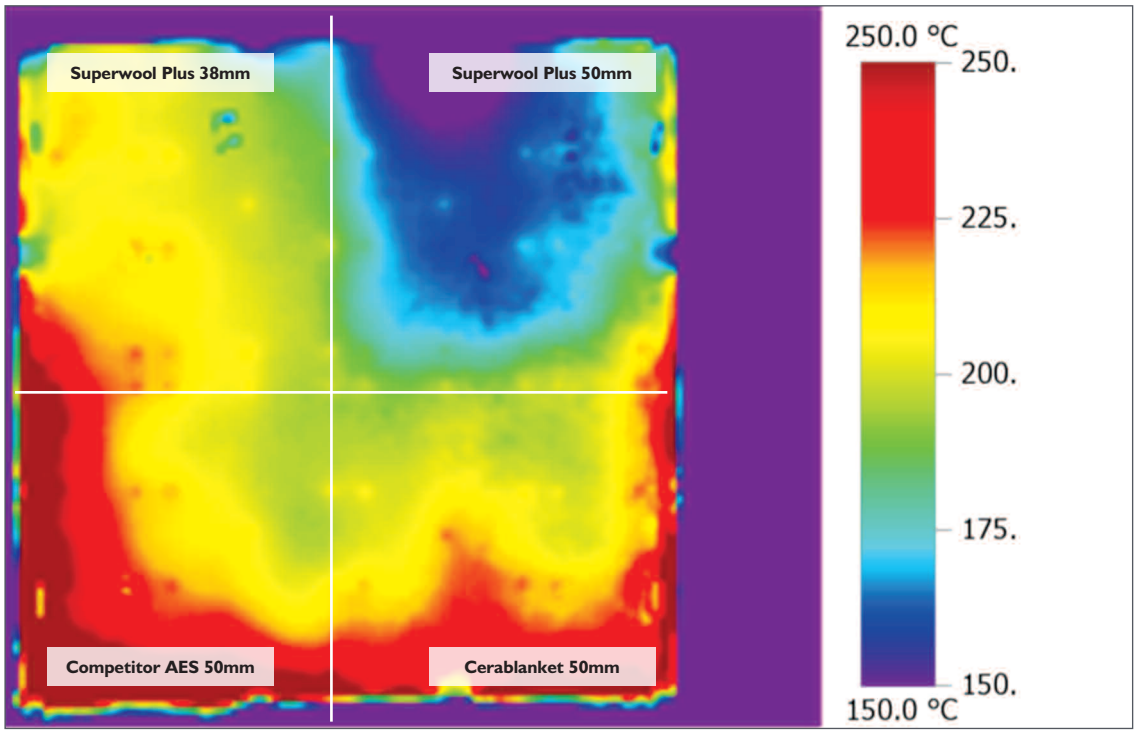


The panel was heated up to a temperature of 1000°C (1832°F) for 2 hours until steady state was achieved. Thermocouples were placed on the cold face (casing) of the 4 zones to follow the temperature evolution in real time.

A second test was performed with another set of insulation materials. The layout aimed to show that a thinner insulation of Superwool® Plus blanket will perform comparably to competitor AES or RCF blankets:

- 2 layers of 25mm 128Kg/m³ (2 layers of 1 inch 8lbs/ft³) Superwool® **Plus** blanket
- 1 layer of 38mm 128Kg/m³ (1 layer of 1.5 inches 8lbs/ft³) Superwool® **Plus** blanket
- 2 layers of 25mm 128Kg/m³ (2 layers of 1 inch 8lbs/ft³) Cerablanket RCF
- 2 layers of 25 mm 128Kg/m³ (2 layers of 1 inch 8lbs/ft³) a competitor AES blanket

These materials were heated up to a hot face temperature of 1000°C (1832°F) for 2 hours until steady state was achieved. Thermocouples were placed on the cold face (casing) of the 4 zones to follow in real time the temperature evolution.



	Superwool® Plus 50mm (2 inches)	Superwool® Plus 38mm (1.5 inches)	Cerablanket 50mm (2 inches)	AES competition 50mm (2 inches)
Average cold face temperature (°C)	164 (327°F)	202 (395°F)	213 (415°F)	208 (406°F)

Our thermal image shows that at the same thickness of material, 50mm (2 inches), Superwool® **Plus** blanket out-performs all other materials. If you were to use a thinner insulation lining, just 38mm (1.5 inches) of our Superwool® **Plus** blanket performs better than 50mm (2 inches) of Cerablanket RCF and a competitor AES blanket.

Superwool® Plus

Insulating fibre

Features	Benefits
An engineered solution (unique)	**Takes insulation beyond normal performance**
Patented technology	Proven chemical formulation
High temperature insulating wools (Superwool® range of products) not classified according to European Regulation (EC) 1272/2008	Restrictions on use do not apply. No special requirements for dust control, can be supplied to the general public and considered as non-hazardous waste for disposal
Lower thermal conductivity	Improves insulation by 20%
Up to 30% more fibres	Efficient prevention of heat transfer and greater strength
Less shot	Cleaner workplace
High Fibre Index	Up to 20% reduction in thermal conductivity giving energy saving
Stronger with good handleability (no tearing)	Ease of installation saving time and waste
Improved handling	Operator satisfaction
Soft & smooth feel	Less mechanical skin irritation
Consistent use of pure raw materials	Higher classification temperature, low shrinkage and consistent quality
Lower density grade for the same result	Material weight savings up to 25%
Thinner lining for the same result	Create more working space within unit
Resistant to vibration	Allows long lifetime under vibration conditions where other products fail
An environmental solution	Potential savings on waste disposal
Worldwide production	Availability